DOE/CF-0161
Volume 1

Department of Energy

FY 2021 Congressional Budget Request

National Nuclear Security Administration

Federal Salaries and Expenses
Weapons Activities
Defense Nuclear Nonproliferation
Naval Reactors

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February 2020 Office of Chief Financial Officer Volume 1

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DEPARTMENT OF ENERGY
Appropriation Summary
FY 2021
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs. FY 2020 Enacted	
				$	%
Department of Energy Budget by Appropriation					
Energy Efficiency and Renewable Energy	2,379,000	2,777,277	719,563	-2,057,714	-74.09%
Electricity	156,000	190,000	195,045	5,045	2.66%
Cybersecurity, Energy Security and Emergency Response	120,000	156,000	184,621	28,621	18.35%
Nuclear Energy*	1,180,000	1,340,000	1,042,131	-297,869	-22.23%
Uranium Reserve	0	0	150,000	150,000	0.00%
Interim Storage and Nuclear Waste Fund Oversight	0	0	27,500	27,500	0.00%
Fossil Energy Research and Development	740,000	750,000	730,601	-19,399	-2.59%
Strategic Petroleum Reserve	235,000	195,000	187,081	-7,919	-4.06%
Naval Petroleum and Oil Shale Reserve	10,000	14,000	13,006	-994	-7.10%
Strategic Petroleum Reserve Petroleum Account	10,000	10,000	0	-10,000	-100.00%
Northeast Home Heating Oil Reserve	10,000	10,000	0	-10,000	-100.00%
Total, Fossil Energy Petroleum Reserve Accounts	**265,000**	**229,000**	**200,087**	**-28,913**	**-12.63%**
Total, Fossil Energy Programs	**1,005,000**	**979,000**	**930,688**	**-48,312**	**-4.93%**
Uranium Enrichment Decontamination and Decommissioning (D&D) Fund	841,129	881,000	806,244	-74,756	-8.49%
Energy Information Administration	125,000	126,800	128,710	1,910	1.51%
Non-Defense Environmental Cleanup	310,000	319,200	275,820	-43,380	-13.59%
Science	6,585,000	7,000,000	5,837,806	-1,162,194	-16.60%
Artificial Intelligence Technology Office	0	0	4,912	4,912	0.00%
Advanced Research Projects Agency - Energy	366,000	425,000	-310,744	-735,744	-173.12%
Departmental Administration	165,858	161,000	136,094	-24,906	-15.47%
Indian Energy Policy and Programs	18,000	22,000	8,005	-13,995	-63.61%
Inspector General	51,330	54,215	57,739	3,524	6.50%
International Affairs	0	0	32,959	32,959	0.00%
Title 17 Innovative Technology Loan Guarantee Program	12,311	29,000	-160,659	-189,659	-654.00%
Advanced Technology Vehicles Manufacturing Loan Program	5,000	5,000	0	-5,000	-100.00%
Tribal Energy Loan Guarantee Program	1,000	2,000	-8,500	-10,500	-525.00%
Total, Credit Programs	**18,311**	**36,000**	**-169,159**	**-205,159**	**-569.89%**
Total, Energy Programs	**13,320,628**	**14,467,492**	**10,057,934**	**-4,409,558**	**-30.48%**
Federal Salaries and Expenses	410,000	434,699	454,000	19,301	4.44%
Weapons Activities	11,100,000	12,457,097	15,602,000	3,144,903	25.25%
Defense Nuclear Nonproliferation	1,930,000	2,164,400	2,031,000	-133,400	-6.16%
Naval Reactors*	1,788,618	1,648,396	1,684,000	35,604	2.16%
Total, National Nuclear Security Administration	**15,228,618**	**16,704,592**	**19,771,000**	**3,066,408**	**18.36%**
Defense Environmental Cleanup	6,024,000	6,255,000	4,983,608	-1,271,392	-20.33%
Nuclear Energy	146,090	153,408	137,800	-15,608	-10.17%
Other Defense Programs	860,292	906,000	1,054,727	148,727	16.42%
Total, Environmental and Other Defense Activities	**7,030,382**	**7,314,408**	**6,176,135**	**-1,138,273**	**-15.56%**
Total, Atomic Energy Defense Activities	**22,259,000**	**24,019,000**	**25,947,135**	**1,928,135**	**8.03%**
Southwestern Power Administration	10,400	10,400	10,400	0	0.00%
Western Area Power Administration	89,372	89,196	89,372	176	0.20%
Falcon and Amistad Operating and Maintenance Fund	228	228	228	0	0.00%
Colorado River Basins Power Marketing Fund	0	-42,800	-21,400	21,400	**-50.00%**
Total, Power Marketing Administrations	**100,000**	**57,024**	**78,600**	**21,576**	**37.84%**
Total, Energy and Water Development and Related Agencies	**35,656,628**	**38,527,516**	**36,083,669**	**-2,443,847**	**-6.34%**
Excess Fees and Recoveries, FERC	-16,000	-16,000	-9,000	7,000	-43.78%
Title XVII Loan Guarantee Program Section 1703 Negative Credit Subsidy Receipt	-107,000	-15,000	-49,000	-34,000	226.67%
Sale of Northeast Home Heating Oil Reserve	0	0	-75,000	-75,000	0.00%
Sale of Oil from Strategic Petroleum Reserve**	0	0	-589,000	-589,000	0.00%
Total, Funding by Appropriation	**35,533,628**	**38,512,516**	**35,361,669**	**-3,150,847**	**-8.18%**
DOE Budget Function	**35,533,628**	**38,512,516**	**35,361,669**	**-3,150,847**	**-8.18%**
NNSA Defense (050) Total	15,228,618	16,704,592	19,771,000	3,066,408	18.36%
Non-NNSA Defense (050) Total	7,030,382	7,314,408	6,176,135	-1,138,273	-15.56%
Defense (050)	*22,259,000*	*24,019,000*	*25,947,135*	*1,928,135*	*8.03%*
Science (250)	6,585,000	7,000,000	5,837,806	-1,162,194	-16.60%
Energy (270)	6,689,628	7,493,516	3,576,728	-3,916,788	-52.27%
Non-Defense (Non-050)	*13,274,628*	*14,493,516*	*9,414,534*	*-5,078,982*	*-35.04%*

* Funding does not reflect statutory transfer of funds from Naval Reactors to Nuclear Energy for maintenance and operation of the Advanced Test Reactor ($85.5M in FY19; $88.5M in FY20).

**Includes a $50M sale from the Northeast Gasoline Supply Reserve.

National Nuclear Security Administration
Overview

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs. FY 2020 $	FY 2021 vs. FY 2020 %
National Nuclear Security Administration					
Federal Salaries and Expenses	410,000	434,699	454,000	+19,301	4.4%
Weapons Activities	11,100,000	12,457,097	15,602,000	+3,144,903	25.2%
Defense Nuclear Nonproliferation	1,930,000	2,164,400	2,031,000	-133,400	-6.2%
Naval Reactors[a]	1,788,618	1,648,396	1,684,000	+35,604	2.2%
Total, National Nuclear Security Administration	**15,228,618**	**16,704,592**	**19,771,000**	**+3,066,408**	**18.4%**

The National Nuclear Security Administration (NNSA) FY 2021 Request is $19,771,000,000, an increase of $3,066,408,000 (18.4 percent) above the FY 2020 Enacted level to support the security and safety of our nation. NNSA's FY 2021 Budget Request pursues five major national security endeavors: (1) maintain a safe, secure, and effective nuclear weapons stockpile; (2) reduce global nuclear threats and keep materials out of the hands of terrorists; (3) strengthen key science, technology and engineering capabilities in support of certification, assessment, and current and future life extension programs; (4) provide safe and militarily-effective integrated nuclear propulsion systems for the U.S. Navy; and (5) modernize the Nuclear Security infrastructure. Key to all of these efforts is to upgrade where necessary and maintain infrastructure and provide the necessary federal oversight for growing mission requirements. NNSA has pursued a disciplined process in defining the requirements to meet nuclear security and nonproliferation policy goals, support the Navy, and support a highly skilled federal workforce.

NNSA Future-Years Nuclear Security Program

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
National Nuclear Security Administration				
Federal Salaries and Expenses	464,000	474,000	484,000	494,000
Weapons Activities	15,937,000	16,271,000	16,613,000	16,963,000
Defense Nuclear Nonproliferation	2,074,000	2,118,000	2,162,000	2,207,000
Naval Reactors	1,711,000	1,747,000	1,784,000	1,821,000
Total, National Nuclear Security Administration	**20,186,000**	**20,610,000**	**21,043,000**	**21,485,000**

NNSA's Future Years Nuclear Security Program (FYNSP) topline for FY 2022 – FY 2025 is $83.3 billion. This Request supports the modernization efforts and the scientific tools necessary to execute the *2018 Nuclear Posture Review*. The Request continues to modernize America's nuclear stockpile and infrastructure, and the underlying science that supports strategic decisions and certification of the stockpile, as detailed in the annual *Stockpile Stewardship and Management Plan (SSMP)*. The Request supports the U.S. Navy's nuclear fleet through safe and effective integrated nuclear propulsion systems. The Request also supports the nonproliferation goals outlined in NNSA's *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (NPCR)*.

Public Law Authorizations

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-92, National Defense Authorization Act for Fiscal Year 2020
- P.L. 116-94, Further Consolidated Appropriations Act, 2020

[a] Funding does not reflect the mandated transfer of $85.5 million in FY 2019 and $88.5 million in FY 2020 to the Office of Nuclear Energy for operation of the Advanced Test Reactor.

Appropriation Summary by Program
Funding

(Dollars in Thousands)

	FY 2019 Enacted (Comparable)	FY 2020 Enacted (Comparable)	FY 2021 Request	FY 2021 vs FY 2020
Federal Salaries and Expenses				
Program Direction	410,000	434,699	454,000	+19,301
Total, Federal Salaries and Expenses	**410,000**	**434,699**	**454,000**	**+19,301**
Weapons Activities Appropriation				
Stockpile Management	3,403,790	3,680,051	4,284,244	+604,193
Production Modernization	1,024,747	1,565,523	2,457,900	+892,377
Stockpile Research, Technology, and Engineering	2,174,294	2,553,119	2,782,131	+229,012
Infrastructure and Operations	3,157,505	3,199,544	4,383,577	+1,184,033
Secure Transportation Asset	278,639	292,660	390,074	+97,414
Defense Nuclear Security	690,638	775,000	826,895	+51,895
Information Technology and Cybersecurity	221,175	300,000	375,511	+75,511
Legacy Contractor Pensions	162,292	91,200	101,668	+10,468
Subtotal, Weapons Activities	**11,113,080**	**12,457,097**	**15,602,000**	**+3,144,903**
Use of Prior Year Balances	-13,080	0	0	0
Total, Weapons Activities Appropriation	**11,100,000**	**12,457,097**	**15,602,000**	**+3,144,903**
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation Programs				
Global Material Security	407,108	442,909	400,480	-42,429
Material Management and Minimization	293,794	363,533	400,711	37,178
Nonproliferation and Arms Control	129,703	140,000	138,708	-1,292
National Technical Nuclear Forensics R&D	0	0	40,000	40,000
Defense Nuclear Nonproliferation R&D	575,570	533,163	531,651	-1,512
Nonproliferation Construction	220,000	299,000	148,589	-150,411
Subtotal, Defense Nuclear Nonproliferation Programs	**1,626,175**	**1,778,605**	**1,660,139**	**-118,466**
Nuclear Counterterrorism and Incident Response Program	319,185	372,095	377,513	+5,418
Legacy Contractor Pensions	28,640	13,700	14,348	+648
Use of Prior Year Balances	-25,000	0	-21,000	-21,000
Subtotal, Defense Nuclear Nonproliferation Appropriation	**1,949,000**	**2,164,400**	**2,031,000**	**-133,400**
Prior Year Balance Rescission	-19,000	0	0	0
Total, Defense Nuclear Nonproliferation Appropriation	**1,930,000**	**2,164,400**	**2,031,000**	**-133,400**
Naval Reactors				
Naval Reactors	1,788,618	1,648,396	1,684,000	+35,604
Total, Naval Reactors[a]	**1,788,618**	**1,648,396**	**1,684,000**	**+35,604**
Total, NNSA	**15,228,618**	**16,704,592**	**19,771,000**	**+3,066,408**

[a] Funding does not reflect the mandated transfer of $85.5 million in FY 2019 and $88.5 million in FY 2020 to the Office of Nuclear Energy for operation of the Advanced Test Reactor.

Outyear Appropriation Summary by Program
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Federal Salaries and Expenses				
Program Direction	464,000	474,000	484,000	494,000
Total, Federal Salaries and Expenses	**464,000**	**474,000**	**484,000**	**494,000**
Weapons Activities Appropriation				
Stockpile Management	4,562,467	4,612,608	4,723,271	5,182,248
Production Modernization	2,999,498	3,503,993	3,393,257	3,172,767
Stockpile Research, Technology, and Engineering	2,746,255	2,778,716	2,940,211	2,961,699
Infrastructure and Operations	3,944,752	3,674,558	3,784,836	3,839,768
Secure Transportation Asset	336,764	345,333	354,676	380,973
Defense Nuclear Security	916,522	880,117	939,920	932,800
Information Technology and Cybersecurity	387,308	394,045	403,374	415,165
Legacy Contractor Pensions	43,434	81,630	73,455	77,580
Subtotal, Weapons Activities	**15,937,000**	**16,271,000**	**16,613,000**	**16,963,000**
Total, Weapons Activities Appropriation	**15,937,000**	**16,271,000**	**16,613,000**	**16,963,000**
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation Programs				
Global Material Security	408,890	413,796	419,589	438,471
Material Management and Minimization	410,230	415,298	422,067	441,390
Nonproliferation and Arms Control	141,621	143,320	145,326	151,866
Defense Nuclear Nonproliferation R&D	542,816	549,330	557,021	593,798
National Technical Nulcear Forensics R&D	40,840	41,330	41,909	43,795
Nonproliferation Construction	132,362	152,560	168,261	120,713
Subtotal, Defense Nuclear Nonproliferation Programs	**1,676,759**	**1,715,634**	**1,754,173**	**1,778,322**
Nuclear Counterterrorism and Incident Response Program	385,441	390,066	395,527	401,614
Legacy Contractor Pensions	11,800	12,300	12,300	15,353
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,074,000**	**2,118,000**	**2,162,000**	**2,207,000**
Total, Defense Nuclear Nonproliferation Appropriation	**2,074,000**	**2,118,000**	**2,162,000**	**2,207,000**
Naval Reactors				
Naval Reactors	1,711,000	1,747,000	1,784,000	1,821,000
Total, Naval Reactors	**1,711,000**	**1,747,000**	**1,784,000**	**1,821,000**
Total, NNSA	**20,186,000**	**20,610,000**	**21,043,000**	**21,485,000**

Overview

The National Nuclear Security Administration (NNSA) FY 2021 Request is $19,771,000,000, an increase of $3,066,408,000 (18.4 percent) above the FY 2020 Enacted level to support the security and safety of our Nation. NNSA's FY 2021 Budget Request pursues five major national security endeavors: (1) maintain a safe, secure, and effective nuclear weapons stockpile; (2) reduce global nuclear threats and keep materials out of the hands of terrorists; (3) strengthen key science, technology and engineering capabilities in support of certification, assessment, and current and future life extension programs; (4) provide safe and militarily-effective integrated nuclear propulsion systems for the U.S. Navy; and (5) modernize the nuclear security infrastructure and provide necessary federal oversight for growing mission requirements. NNSA has pursued a disciplined process in defining the requirements to meet nuclear security and nonproliferation policy goals, support the Navy, and support a highly skilled federal workforce. The increase reflects investments to the infrastructure needed to sustain the U.S. nuclear stockpile. Over the past several decades, the U.S. nuclear weapons infrastructure has suffered the effects of age and underfunding.

The Request continues to modernize America's nuclear stockpile and infrastructure, and the underlying science that supports strategic decisions and certification of the stockpile, as detailed in the annual *Stockpile Stewardship and Management Plan (SSMP)*. The Request supports the U.S Navy's nuclear fleet through safe and effective integrated nuclear propulsion systems. The Request also supports the nonproliferation goals outlined in NNSA's *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (NPCR)*.

The FY 2021 Budget Request for **Weapons Activities (WA)** is $15,602,000,000, a $3,144,903,000 (25.2 percent) increase above the FY 2020 Enacted level. Weapons Activities funds programs primarily at eight NNSA Management and Operating (M&O) sites through a workforce managed by a Federal workforce composed of civilian and military staff. The Request is aligned with Department of Defense (DoD) requirements to ensure the U.S. nuclear deterrent continues to be safe, secure, and effective. Weapons Activities provides for the maintenance and refurbishment of nuclear weapons to continue sustained confidence in their safety, reliability, and performance; continued investment in scientific, engineering, and manufacturing capabilities to enable production and certification of the enduring nuclear weapons stockpile; and manufacture of nuclear weapon components. Weapons Activities also provides for continued maintenance and investment in the NNSA Nuclear Security Enterprise (NSE) to be more responsive and resilient. A key priority is rebuilding the production capability and capacity to produce necessary warhead components.

The FY 2021 Request is presented in a new structure that consolidates various funding sources, better aligns with current and future workload, and improves transparency to the American public and Congress.

The major elements of the appropriation account include the following:

- **Stockpile Management** - Maintains a safe, secure, and effective nuclear weapons stockpile. Activities include: extending the expected life of the weapons stockpile; maintenance, surveillance, assessments carried out annually, development, and program planning; providing safe and secure dismantlement of nuclear weapons and components; and providing sustainment of needed manufacturing capabilities and capacities, including process improvements and investments focused on increased efficiency of production operations. Production Operations provides the manufacturing-based program that drives individual site production capabilities for life extension programs (LEP), production for limited life component (LLC) exchanges, surveillance, and weapon assembly and disassembly.

- **Production Modernization** - Focuses on the production capabilities of nuclear weapons, including primaries, canned subassemblies, radiation cases and non-nuclear components which are critical to weapon performance. The program supports production modernization and qualification of explosive, pyrotechnic, and propellant materials for supplying the NSE across five management and operating (M&O) sites; funds modernization of uranium operations, ensuring delivery of secondary components needed to maintain the stockpile, as well as providing support to the U.S. Navy, and nuclear nonproliferation programs; enables the restart and modernization of lapsed depleted uranium (DU) alloying and component manufacturing capabilities to ensure NNSA can meet short and long-term mission requirements; maintains production of the Nation's enriched lithium supply; operates the national capability for producing tritium

and is building the additional capacity to meet national security requirements, and provides funding to modernize production of non-nuclear components for multiple weapon systems. The Request includes required funding the capability to produce 80 pits per year (ppy) during 2030, consistent with federal law, national policy, and Department of Defense's (DoD) requirements. Pits will be produced at two locations – Los Alamos National Laboratory (LANL) and the Savannah River Site (SRS).

- **Stockpile Research, Technology, and Engineering** – Provides the scientific foundation for science-based stockpile decisions, including the capabilities, tools, and components needed to enable assessment and certification, and focuses on the most pressing investments the nuclear security enterprise required to meet DoD warhead needs and schedules; Also delivers modern technologies necessary to enhance secure manufacturing capabilities and to provide support to critical needs of the stockpile; provides the knowledge and expertise needed to maintain confidence in the nuclear weapons stockpile without additional explosive nuclear testing, and develops future generations of highly-trained technical workers to support the NNSA core mission, ensuring a strong community of technical peers external to the NNSA national laboratories, capable of providing peer review and scientific competition to strengthen the basic fields of research relevant to the NNSA.

- **Infrastructure and Operations (I&O) -** I&O maintains, operates, and modernizes the NNSA infrastructure in a safe, secure, and cost-effective manner to support program results while maximizing return on investment and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools. The program includes Operations of Facilities, Safety and Environmental Operations, Maintenance and Repair of Facilities, Recapitalization, and both Programmatic and Mission Enabling Construction, which will address requirements within the 2018 NPR infrastructure modernization plan. Furthermore, the program will reduce deferred maintenance; execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease operating costs for old, inefficient facilities by replacing them with new, more efficient facilities; and reduce safety, security, environmental, and program risk.

  The Request includes funding for 13 major construction projects including the Uranium Processing Facility (UPF) which will phase out mission dependency of Building 9212 at the Y-12 National Security Complex and the Chemistry and Metallurgy Research Replacement (CMRR) project at LANL.

- **Secure Transportation Asset -** Provides for the safe, secure transport of nuclear weapons, weapon components, and special nuclear materials to meet mission requirements. The Program Direction subprogram provides for the secure transportation workforce, including the Federal agents.

- **Defense Nuclear Security -** Provides protection for NNSA personnel, facilities, nuclear weapons, and materials from a full spectrum of threats, ranging from minor security incidents to acts of terrorism. The Request provides funding for key security program areas at all NNSA facilities.

- **Information Technology and Cybersecurity -** The program is responsible for information sharing and information safeguarding to support the mission of NNSA. The program provides information technology (IT) and cybersecurity solutions, including continuous monitoring, cloud-based technologies, and enterprise security technologies (i.e., identity, credential, and access management) to help meet security challenges.

The FY 2021 Budget Request for **Defense Nuclear Nonproliferation (DNN**) is $2,031,000,000, a $133,400,000 (6.2 percent) decrease from the FY 2020 Enacted level. After adjusting for the $220 million appropriated for MOX termination in FY 2020, the FY 2021 request is $87 million (4.5 percent) higher than FY 2020 enacted reflecting the Administration's commitment to advance nonproliferation programs as stated in the 2018 NPR.

The nuclear nonproliferation strategy is to work to prevent adversaries from acquiring nuclear weapons or weapons-usable materials, technologies, and expertise; counter efforts to acquire such weapons or materials; and respond to nuclear or radiological accidents and incidents domestically and abroad. NNSA's nonproliferation and counterterrorism activities extend the nation's defenses far beyond America's borders. The DNN Request provides policy and technical leadership to prevent or limit the spread of materials, technology, and expertise related to weapons of mass destruction; develops

technologies to detect nuclear proliferation; secures or eliminates inventories of weapons related materials and infrastructure; ensures technically trained teams and state-of-the-art equipment are prepared to respond to any nuclear or radiological incident worldwide; and supports emergency management. The Request also includes a new National Technical Nuclear Forensics initiative to develop and maintain advanced technical nuclear forensics analysis capabilities at the National Laboratories that can support time-critical decisions in the event of a nuclear or radiological incident and assist in determining the origin of interdicted materials or devices.

The FY 2021 Budget Request for **Naval Reactors (NR)** is $1,684,000,000, a $35,604,000 (2.2 percent) increase from the FY 2020 Enacted level, not including the mandated transfer of $88.5 million to Nuclear Energy for operation of the Advanced Test Reactor. The increase is primarily in Naval Reactors Development to support unique technologies that are critical to delivering improvements in reactor performance and reliability, and in the Spent Fuel Handling Recapitalization Project consistent with the project's revised baseline. The increases are partially offset by decreases in Naval Reactors Operations and Infrastructure, S8G Prototype Refueling, and Columbia-Class Reactor Systems Development consistent with project profiles and the revised schedule for MARF defueling and layup. The NR appropriation provides for safe and effective integrated nuclear propulsion systems for the U.S. Navy and supports operations, infrastructure, and development for the Navy's fleet of nuclear-powered aircraft carriers and submarines. This funding also provides for Naval Reactors' Federal program direction activities.

The FY 2021 Budget Request for NNSA **Federal Salaries and Expenses (FSE)** is $454,000,000, a $19,301,000 (4.4 percent) increase above the FY 2020 enacted level for the salaries, benefits, and the other expenses of 1,858 federal full-time equivalents (FTEs), 1,836 directly paid from FSE and 22 paid through the Working Capital Fund. The increase reflects the funding required for 83 additional FTEs over the FY 2020 planned level and is consistent with NNSA's planned number of staff on-board at the end of FY 2020. The request also provides funding for travel, training, support service contracts, space and occupancy needs, funding for DOE's Working Capital Fund, and other expenses. FSE funds recruiting, training, and retention of federal staff to perform program and project management and oversight of approximately $17.2 billion in Weapons Activities (WA) and Defense Nuclear Nonproliferation (DNN) funding across the nuclear security enterprise.

Highlights and Major Changes in the FY 2021 Budget

Weapons Activities

- **Stockpile Management -** The FY 2021 Request includes increases for the W80-4 LEP and the W87-1 Modernization Program to maintain first production unit (FPU) schedules of FY 2025 and FY 2030, respectively. The FY 2021 Request also increases funding for the B61-12 LEP to maintain the revised FPU of FY 2022 following technical issues with electrical components. Funding is also requested to initiate Concept Assessment for the W93.

- **Production Modernization** — The FY 2021 Request includes increases to produce a capability of 80 ppy during 2030, consistent with federal law, national policy, and DoD requirements. Pits will be produced at two locations – LANL and SRS. The FY 2021 Request supports pit production personnel and capabilities necessary to produce War Reserve pits starting in 2025 at LANL, production activities at KCNSC, certification activities at LLNL and design, long lead material procurements, and planning for demolition and equipment removal at SRS. The Request also includes increases to support other key production capability modernization activities for strategic materials and non-nuclear components.

- **Stockpile Research, Technology, and Engineering -** The FY 2021 Request supports the continued implementation of the Enhanced Capabilities for Subcritical Experiments (ECSE) and procurement of and LLNL site preparation for NNSA's first exascale system to be delivered in 2022 and ready for program use in 2023. Both of these capabilities are required to meet W80-4 LEP and W87-1 Modification certification requirements. In addition to the procurement and implementation of NNSA's first Exascale machine, funding will support the necessary development of the design and engineering codes needed to support stockpile decisions to operate on this new platform. Funding in this area also supports warhead component and production technology development and maturation needed for on-going, planned, and future warhead modernization programs. Two important activities in this area for FY 2021 include development of a new, more efficient production method for radiation cases and canned subassemblies. Programs within this funding area are also key to ensuring the workforce is adequately trained to gain skills, knowledge, and abilities to ensure a safe, secure, and military effective stockpile now and into the future.

- **Infrastructure and Operations (I&O) -** The FY 2021 Request increases funding for Operations of Facilities, Safety and Environmental Operations, Maintenance and Repair of Facilities, Recapitalization, and both Programmatic and Mission Enabling Construction, which will support 30 ppy production capability at LANL, meet LEP schedules, and address requirements in the NPR infrastructure modernization plan. Furthermore, the funding will continue the stabilization of deferred maintenance, execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease overall operating costs; and reduce safety, security, environmental, and program risk.

  The FY 2021 Request also supports an increase in Programmatic Construction funding for the Uranium Processing Facility (UPF) efforts to phase out mission dependency in the existing aged facilities. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project, the U1a Complex Enhancements Project, the Lithium Processing Facility, the Tritium Finishing Facility, the High Explosive Science & Engineering Facility, Exascale Computing Facility Modernization project, TA-55 Reinvestment Project, HE Synthesis, Formulation and Production project, and the Transuranic Liquid Waste Facility. The increase in Mission Enabling Construction is to support the transition to construction for Nevada 138kV Power Transmission System Replacement and Emergency Operations Centers (EOCs) at LLNL and Sandia National Laboratories (SNL).

- **Secure Transportation Asset (STA) -** The FY 2021 Request funds increases to support modernizing STA transportation assets, including life extension of the Safeguards Transporter (until the Mobile Guardian Transporter becomes operational in FY 2025), vehicle sustainment, replacement armored tractors, escort and support vehicles, upgrade of the Tractor Control Unit to accommodate for communications and security and continued development and testing of the Mobile Guardian Transporter, and replacement of DC-9 aircraft. Funding also supports a commitment to a stable human resources strategy that recruits and retains Federal Agents and staff with the requisite skills.

- **Defense Nuclear Security** - The FY 2021 Request includes funding to fill positions in key security program areas required to implement a risk-based, layered protection strategy at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning; supports sustaining operations of and implementing improvements to the classified network that supports the NNSA Special Access Program; and supports sustaining implementation and operation of counter unmanned aircraft systems at sites possessing Category 0/I special nuclear material. DNS also includes funding to continue efforts to recapitalize security infrastructure through Security Infrastructure Revitalization Program projects, which address high-priority security systems and related security infrastructure and equipment refresh needs; and the West End Protected Area Reduction project, which will install a new Perimeter Intrusion Detection and Assessment System section, reducing the Y-12 Protected Area by approximately 50%.

- **Information Technology and Cybersecurity -** The FY 2021 Request enables the development of integrated IT initiatives that provide an effective and secure technology infrastructure to provide adequate support to the NNSA NSE shared services. These initiatives will fundamentally redesign the NNSA IT environments to provide a more secure and agile set of capabilities including unified communication, agile cloud infrastructure, and next-generation collaboration services across the NSE. Additionally, the NNSA IT and Cybersecurity Program will create a plan to utilize information technology research and development capabilities, operational technology, and artificial intelligence in order to implement tools and capabilities to secure future NNSA operations.

Defense Nuclear Nonproliferation

DNN's efforts reduce the danger that hostile nations or terrorist groups may acquire nuclear devices, radiological dispersal devices, weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise. These efforts are carried out in five existing programs and a new National Technical Nuclear Forensics initiative. These six programs, as part of a whole-of-government approach, provide policy and technical leadership to prevent or limit the spread of weapons of mass destruction (WMD)-related materials, technology, and expertise; develop technologies to detect nuclear proliferation; secure or eliminate inventories of nuclear weapons-related materials and infrastructure; and ensure that technically trained emergency management personnel are available to respond to nuclear and radiological incidents and accidents domestically and overseas. The FY 2021 Budget Request provides increases in Material

Management and Minimization to support additional cooperative agreements for Molybdenum-99, and for the dilute and dispose strategy and activities associated with the acceleration of removing plutonium from the state of South Carolina. The Request also includes $80 million for nuclear forensics, and a new budget line was added for research and development (R&D) efforts in this area to elevate visibility and transparency of this work, and to reflect NNSA's emerging role as lead agency. Nuclear forensics funding is split between two programs: $40 million is included in the forensics line for research and development and $40 million is included in the Nuclear Counterterrorism and Incident Response line.

Naval Reactors

The FY 2021 Budget Request continues NR's core objective of supporting the daily safe and reliable operation of the Nation's nuclear fleet (68 submarines, 11 aircraft carriers, and 4 research, development, and training platforms), constituting over 40 percent of the Navy's major combatants. The Request supports three major DOE initiatives: *Columbia*-class Reactor Systems Development, Land-based S8G Prototype Refueling Overhaul, and Spent Fuel Handling Recapitalization Project. Funding is also requested for the program direction account for NR federal employees who directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.

NNSA Federal Salaries and Expenses

The FY 2021 Budget Request builds upon ongoing efforts to improve the effectiveness and efficiency of NNSA federal oversight and to meet current and future workforce needs. The request provides for 1,858 Federal FTEs (1,836 directly funded from FSE, 22 funded through the Working Capital Fund for overseas representation). The NNSA workforce is critical to the success of the Nation's nuclear security enterprise. It is essential to have sufficient people, with the right capabilities, to meet growing mission requirements and commitments as described in the 2018 NPR including modernizing the nuclear deterrent, recapitalizing the aging infrastructure, and continuing to meet the requirements of nonproliferation and counterterrorism programs. Multiple staffing studies and evaluations have recommended that NNSA may need to eventually increase its Federal staff to 2,100 FTEs to meet the growing mission as described in the 2018 NPR. NNSA will use a variety of innovative methods to include recruitment events and use of the expanded excepted service hiring authority. NNSA will continue to monitor the evolving need for federal oversight in support of the nuclear modernization missions and adjust future staffing plans accordingly. NNSA will also leverage partnerships with academic alliances to grow the workforce with early identification and recruitment of top science, technology, engineering, and math talent.

Entry Level Hires: The NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), the Minority Serving Institutions Partnership Program (MSIPP), and the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment in the NNSA nuclear security enterprise.

Department of Energy (DOE) Working Capital Fund (WCF) Support

NNSA's FY 2021 Budget Request includes $76,082,000 for NNSA's projected support to the DOE Working Capital Fund (WCF). Of this amount, $36,129,000 will be paid out of FSE; $32,530,000 out of WA; $4,860,000 out of DNN; and $2,563,000 out of NR. This funding covers selected shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

Legacy Contractor Pensions

NNSA requests $116,016,000 in FY 2021 for Legacy Contractor Pensions split between Weapons Activities and Defense Nuclear Nonproliferation, $11,116,000 more than the FY 2020 Enacted level. This funding provides the annual NNSA share of DOE's reimbursement of payments made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The UCRP benefit for these individuals is a legacy cost and DOE's annual payment to the UC is required by contract. The amount of the annual payment is based on the actuarial valuation report and is covered by the terms described in the contracts. The increase is based upon the funded status of the plan and was increased after the State of California changed its pension discount rates. NNSA is also covering the cost of the actuarial report included in this total.

Top 15 Property Leases at NNSA

Rebuilding the NNSA nuclear security enterprise infrastructure requires both federal funding and public-private partnerships. NNSA has leveraged leasing arrangements, to take advantage of using private sector construction expertise and economies-of-scale to quickly and cost-effectively acquire modern, efficient facilities for public use. The top fifteen leases for NNSA are included below with the property name, annual rent, and usable square feet as well as the funding mechanism of direct or indirect is included.

Direct Funded Leases
(Dollars in Thousands)

Site	Property Name	Annual Rent	Usable Square Feet	Funding Source
Kansas City National Security Campus	National Security Campus NNSA Complex, 14500 Botts Road	$50,859	973,516	Direct
Kansas City National Security Campus	National Security Manufacturing Center Building, 14500 Botts Road	$13,777	260,906	Direct
Pantex Plant	John C. Drummond Center Office Building (formerly known as ASC)	$6,188	273,600	Direct
Kansas City National Security Campus	Building 22	$1,860	80,000	Direct
Kansas City National Security Campus	Building 21	$1,541	56,011	Direct
Kansas City National Security Campus	Building 23	$1,156	275,193	Direct
Nevada National Security Site – Las Vegas	Southern Nevada Science Center II	$1,156	32,535	Direct

Indirect Funded Leases
(Dollars in Thousands)

Site	Property Name	Annual Rent	Usable Square Feet	Funding Source
Y-12 National Security Complex	Jack Case Office Building	$8,799	288,286	Indirect
Sandia National Laboratories – New Mexico	Innovation Parkway Office Center	$3,850	118,738	Indirect
Y-12 National Security Complex	New Hope Center	$2,924	96,431	Indirect
Sandia National Labs – New Mexico	Sandia @ Buena Vista	$2,397	119,560	Indirect
Sandia National Laboratories – New Mexico	Center for Global Security and Cooperation	$1,754	45,617	Indirect
Nevada National Security Site – Los Alamos	Los Alamos Operations	$1,256	45,275	Indirect
Los Alamos National Laboratory	Office Building	$1,148	22,659	Indirect
Nevada National Security	Livermore Operations	$936	35,687	Indirect

Minor Construction

Minor Construction Projects

Pursuant to Section 3121 of the Ike Skelton National Defense Authorization Act for FY 2011 (P.L. 111-383), notification is being provided for minor construction projects with a total estimated cost of more than $5 million planned for execution. Projects with a total estimated cost of more than $10 million that are planned for execution are listed in a separate section below.

Minor Construction Projects
(Dollars in Thousands)

Weapons Activities – Kansas City National Security Campus

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
Building 23 Inspection, Mechanical Assembly, & Testing Installation	Infrastructure and Operations: Infrastructure and Safety	7,281	Construct a low humidity 40% room with Electro Static Discharge flooring, vapor barriers and upgraded HVAC, and power infrastructure (utility grid).	0	728	6,553	0	728
Building 2 Assembly & Electrical Fabrication & Machining Revitalization	Infrastructure and Operations: Infrastructure and Safety	5,656	Upgrades to existing area utilities including rearrangements of existing utility grid to accommodate LEP production needs	0	5,656	0	0	565
Building 2 Electronics, Testing, Machining, & Surfaces Revitalization	Infrastructure and Operations: Infrastructure and Safety	8,688	Buildout utility distribution, electrical grid rearrangement, compressed gasses, exhaust modification and expansions. Construction of special exhaust, expansion of negative pressure room, HVAC, and ESD flooring.	0	0	8,688	0	869

Weapons Activities – Lawrence Livermore National Laboratory

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
Buildings 832 & 836 Environmental Test & Materials Storage Facilities Upgrades	Infrastructure and Operations: Infrastructure and Safety	8,200	Upgrade B836C, 836B and 832 at Site 300. Retrofit B836B from an existing warehouse into a High Explosive cell to perform test experiments for the LEPs. The facility will also be modified to become a secure space. B836C will be modified to house new equipment for environmental testing of weapons. B832 is the shipping and receiving location for Site 300. All classified and hazardous materials, including HE, are routed through B832 before moving on throughout the site. B832 will be upgraded to revitalize secure space back up to code to be operational and increase the office space for the staff.	0	0	8,200	0	820
B321 Air Handling Unit & Electrical Upgrades	Infrastructure and Operations: Infrastructure and Safety	6,400	Replace the most critical, aged and unreliable HVAC units with new energy efficient HVAC units and provide redundancy where needed. Will also modernize the 1960 vintage electrical distribution system which includes Motor Control Centers, panels, breakers and transformers.	0	0	6,400	0	475

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
B391 Sustainable Chilled Water & Heating Hot Water System Upgrade	Infrastructure and Operations: Infrastructure and Safety	6,400	Upgrade HVAC chilled water and heating hot water systems to increase temperature sustainability and reliability to tolerances within the limits required for the optics production capabilities performed in this facility.	0[a]	6,400	0	0	0

Weapons Activities – Los Alamos National Laboratory

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
HPC Staging Facility	Stockpile Research Technology and Engineering: Advanced Simulation and Computing	5,000	Modifications to the storage and staging areas for the Crossroads supercomputer delivery. This will allow uncleared vendors to perform system integration prior to acceptance. Example modifications include, but are not limited to, power, cooling, cabling, and rack storage.	0	0	400	4,600	400

[a] Design in the amount of $337,000 was funded and completed under a different project. The design cost is not included in the total project cost.

Weapons Activities – Nevada National Security Site

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
New DAF Water Storage Tank	Infrastructure and Operations: Infrastructure and Safety	8,000	Procure and install a new Fire Suppression System water tank to replace the current tank.	0	0	8,000	0	800
New U1a Refuge Station Build-out	Infrastructure and Operations: Infrastructure and Safety	6,000	Outfits the refuge station space and installs electrical and communications connections.	0	0	6,000	0	600
U1a Potable & Fire Water System Upgrade	Infrastructure and Operations: Infrastructure and Safety	9,000	Upgrade and replace potable water and fire protection water feed line from Mercury Highway into the U1a Complex. The upgraded water loop will feed into the U1a Complex taking into account the future water and pressure demands of the future surface buildings that will replace most of the site trailers. Installations will include, fire hydrants, valves, and water tank for fire water.	0	9,000	0	0	550

Weapons Activities – Sandia National Laboratories

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
B894 Dehumidifier Replacements	Infrastructure and Operations: Infrastructure and Safety	9,000	Replace or rehabilitate the five dehumidifier units supporting the dry rooms in B894 to correct decreasing reliability and increasing maintenance requirements.	0	0	9,000	0	500

Defense Nuclear Nonproliferation – Savannah River Site

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
K-Area Protected Area Perimeter Entry Control Facility (ECF)	Material Management and Minimization: Material Disposition	8,000	Add a new ECF to facilitate increased personnel flow into the Protected Area.	0	0	8,000	0	1,000

Weapons Activities – Y-12 National Security Complex

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
Building 9204-2E Transformers 814 & 815 Replacement	Infrastructure and Operations: Infrastructure and Safety	6,560	Replace the 814 and 815 transformers and associated interrupters, switches, and underground cables that supply Building 9204-2E to minimize the probability of negative safety and production impacts associated with failed electrical components.	0	0	6,560	0	572
Building 9215 Supply Fan SF-205 Revitalization	Infrastructure and Operations: Infrastructure and Safety	5,223	Revitalize Supply Fan 205 (SF-205) in Building 9215 including the fan motor, fan enclosure, defective steam/chilled water components, and the catch pans.	0	0	5,223	0	270
Building 9215 Switchgear & Transformer 253 Replacement	Infrastructure and Operations: Infrastructure and Safety	5,886	Replace Switchgear and Transformer 253 and associated branch feeder cables in Building 9215 to minimize the probability of negative safety and production impacts associated	0	5,886	0	0	1,500

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
			with failed electrical components.					
Building 9201-1 Pangborn Upgrades	Stockpile Management: Production Operations	5,000	The scope of this project is to refurbish the Pangborn exhaust system. The current system has exceeded it design life and reliability is a major concern. This project will provide the necessary ventilation to effectively remove and collect graphite dust from the processing area.	0	0	5,000		300
9225-3 Process Support	Production Modernization: Secondary Capability Modernization	9,500	9925-3 is being re-purposed for future production use after completing its initial mission. Utilities upgrades are needed to enable future use. Electrical power availability needs to be increased by several 100 KVA. Other upgrades include providing industrial gas service and cooling water capacity.	0	0	9,500	0	500
Equipment Demolition and Removal Phase 2 9225-3	Production Modernization: Secondary Capability Modernization	9,000	Project is to make 9225-3 ready for its next production mission by removing and disposing internal tanks, glove boxes and process equipment.	0	0	9,000	0	500

Defense Nuclear Nonproliferation – Nevada National Security Site

LYNM PE-1 - Infrastructure Upgrades	Defense Nuclear Nonproliferation Research and Development: Proliferation Detection	6,777,	Repair and upgrade of existing utility of infrastructure in U12p. The existing ventilation, electrical, lighting, communications, compressed air and non-potable water systems will be upgraded in the U12p.06 Bypass Drift to support PE1 testbed development. Additionally, a ~100 foot extension to the U12p Ventilation Drift will be mined to provide a secondary means of egress from the facility.	0	6,777	0	0	680

Naval Reactors – Naval Nuclear Laboratory

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
KS CAS Relocation	Naval Reactors Operations and Infrastructure	6,100	Renovate the current Kesselring Site Security Central Alarm Station (CAS).	0	0	300	5,355	300

50 US Code 2746 requires that if the total estimated cost for construction design in connection with any construction project exceeds $2,000,000, funds for that design must be specifically authorized by law. NNSA requests Congressional Authorization for 2021 minor construction projects exceeding the $2,000,000 design threshold for the following projects**:**

FY 2021 Minor Construction Projects – Design Over $2 Million
(Dollars in Thousands)

Weapons Activities – Los Alamos National Laboratory

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
New TA-15 DARHT Hydro Vessel Repair Facility	Infrastructure and Operations: Infrastructure and Safety	16,491	Construct a new DARHT Hydro Vessel Repair Facility. The new Hydro Vessel Facility will include one cleanout bay capable of processing up to 8' diameter vessels, one repair bay, a buffer area, change rooms, and bathrooms/showers for workers. This processing output/capability is required to meet DARHT's projected shot schedule over the next decade.	0	0	2,800	13,691	2,800

Weapons Activities – Nevada National Security Site

Project Title	Program	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
U1a.03 Test Bed Facility Improvements	Stockpile Research Technology and Engineering: Assessment Science	16,000	Facility Improvements for the U1a.03 Test Bed include certain Functional Requirements that directly tie to the U1a Complex, including: modifications to Plug 8, the .03 drifts themselves, power, ventilation, control and diagnostic rooms, fire protection, and safety basis.	0	4,000	6,400	5,600	4,800

Minor Construction

Projects Subject to Section 3119 of the FY 2018 National Defense Authorization Act
(Dollars in Thousands)

As directed in the FY 2018 National Defense Authorization Act, this section provides the requested project information for projects with a total project cost (TPC) over $10 million.

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
Building 2 Low Humidity Production Revitalization	KCNSC	Upgrade HVAC and dryers, modify penthouse and expand utility grid, and install ESD flooring to expand low humidity production space (15% and 40%) and create a flexible manufacturing space. Current low humidity production space is not sufficient for required mission for testers to support B61-12 and W88 Alt 370 Respin LPU Pull-in.	Infrastructure and Operations: Infrastructure and Safety	14,865	1,500	FY 2020	FY 2020	FY 2021
Building 23 Classified Space Conversion & Electrical Testing, Weld Lab, and Mechanical Assembly Buildout Portfolio	KCNSC	Convert a portion of Building 23 to classified operations and install a low humidity room, with HVAC and dryers, ESD flooring, vapor barrier walls, utility grid, roof exhaust penetrations, electrical utilities and compressed gases. KCNSC does not have adequate classified space to support contingency for the required current mission scope for B61-12 and W88 Alt 370.	Infrastructure and Operations: Infrastructure and Safety	13,440	1,344	FY 2021	FY 2021	FY 2022
Building 23 Tool Room & Model Shop Machining Revitalization	KCNSC	Construction of crane, electrical distribution grid, epoxy floor, special foundations, exhaust, compressed gasses and room constructions.	Infrastructure and Operations: Infrastructure and Safety	12,694	1,270	FY 2021	FY 2021	FY 2022

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
B321A Radiological & Material Characterization Capabilities Revitalization	LLNL	Revitalize approximately 12,000 square feet of existing space in 321A to accommodate radiological and material characterization capabilities. The scope of work includes selective demolition to interior walls, floors and ceilings, new wet and dry mechanical utilities installation, electrical upgrades, and modification to meet ADA compliance.	Infrastructure and Operations: Infrastructure and Safety	11,500	1,500	FY 2021	FY 2021	FY 2023
New Weapons LEP Office Building	LLNL	Construct new classified modular facility near existing weapons offices for contiguous, team-based collaboration between physicists and engineers in Block 1400. The W87-1 LEP and the ramp up for the W80-4 LEP will surge ~200 staff over the FYNSP.	Infrastructure and Operations: Infrastructure and Safety	17,940	1,790	FY 2021	FY 2021	FY 2023
PF-4 High Pressure Water Supply Feed Separation	LANL	Separate the high pressure feed from the fire water loop for TA-55 by installing a new high pressure water line from TA-48 to TA-55. Currently the water supply to the PF-4 Fire Loop is provided by two low pressure lines.	Infrastructure and Operations: Infrastructure and Safety	10,227	1,259	FY 2022	FY 2022	FY 2022
New TA-15 DARHT Hydro Vessel Repair Facility	LANL	Construct a new DARHT Hydro Vessel Repair Facility. The new Hydro Vessel Facility will include one cleanout bay capable of processing up to 8' diameter vessels and one repair bay, a buffer area, change rooms, and bathrooms/showers for workers. This processing output/capability is required to meet DARHT's projected shot schedule over the next decade.	Infrastructure and Operations: Infrastructure and Safety	16,491	2,800	FY 2022	FY 2022	FY 2023

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
TA-15 DARHT Electrical Circuit Upgrade	LANL	Install a new 13.2 kV circuit from the Western Technical Area substation to DARHT (primary service), connecting the Eastern Technical Area substation through a new circuit as a secondary power circuit to the existing S-13 circuit from the TA-03 substation. The project includes new circuits, new poles, and supporting electrical equipment.	Infrastructure and Operations: Infrastructure and Safety	13,909	1,968	FY 2022	FY 2022	FY 2023
U1a.03 Test Bed Facility Improvements	NNSS	Facility Improvements for the U1a.03 Test Bed include certain Functional Requirements that directly tie to the U1a Complex, including: modifications to Plug 8, the .03 drifts themselves, power, ventilation, control and diagnostic rooms, fire protection, and safety basis.	Stockpile Research Technology and Engineering: Assessment Science	16,000	4,800	FY 2020	FY 2021	FY 2022
New SNL/CA Limited Area Multi-Program High Bay Laboratory Facility	SNL	Construct a new SNL CA Limited Area high-bay Laboratory to replace high-bay laboratory space for mission-critical operations in C914 high-bay labs that is seismically inadequate. Seismic reinforcement of C914 is not a cost effective solution to the seismic vulnerability.	Infrastructure and Operations: Infrastructure and Safety	19,000	1,900	FY 2020	FY 2021	FY 2022
TA-IV District Chilled Water Expansion	SNL	Replace evaporative cooling systems with poor humidity and dust control with better-controlled chilled water cooling and install chilled water systems to the accelerators located in Building 981 (Saturn) and Building 970 (Hermes) and other major facilities located at the southern end of TA-IV. This expansion will provide redundancy, cost and energy savings, and better control of the mission critical cooling systems for the buildings in this area.	Infrastructure and Operations: Infrastructure and Safety	18,250	1,500	FY 2021	FY 2022	FY 2023

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
TA-I Substation 35 Replacement	SNL	Replace Substation 35 which is past the end of its design life and runs an increased risk of failure.	Infrastructure and Operations: Infrastructure and Safety	10,000	1,000	FY 2021	FY 2022	FY 2023
Agent Operations Western Command; Design/Build Federal Agent Facility	STA	Agent Operations Western Command site adapt, design and construct Federal Agent Facility and fence, T-bars, and pavement. Currently operating in temporary facility.	STA	10,000	1,000	FY 2020	FY 2021	FY 2022
Production Development Facility Acquisition and Revitalization	Y-12	Acquire 73,000 sq. ft. facility located on a secure and fenced 21-acre campus. Modify and revitalize existing facility laboratories, production areas, and utilities to support development capabilities supporting Y12 production mission.	Infrastructure and Operations: Infrastructure and Safety	16,000	500	FY 2021	FY 2021	FY 2022
Enhanced Training Center (ETC)	Y-12	The Enhanced Training Center (ETC) will be a configurable facility that will host graduate-level training for high consequence emergency management, security operations, safety, and safeguards.	Global Material Security: Domestic Radiological Security	18,000	1,500	FY 2020	FY 2021	FY 2022
KL Legacy Eliminating Office Building	Naval Nuclear Laboratory	This project creates an additional ~350 office seats to provide offices for the planned increase in staffing and to support the transition from non-professional to professional office spaces.	Naval Reactors - Infrastructure and Operations	19,000	0	FY 2021	FY 2021	FY 2023

Institutional Minor Construction Projects for NNSA – (>$10M)
(Dollars in Thousands)

Project	Site	Project Description	TPC	Construction Design Estimate	Project Milestones		
					Project Start	Design Complete	Construction Complete
New B265 Environmental Safety & Health Office Building	LLNL	Construct an approximately 20,000 SF office building with ~100 offices to allow for migration out of substandard space and to create quality new office space for growing mission. Work includes building construction as well as site preparation, parking, landscaping, and interties with the nearest utilities on the 2600 block. The building is being constructed to replace one of the oldest general purpose office trailers on site, T3726 which is a trailer approaching 45 years old. The trailer will be emptied and demolished after LLNL passes through the employee hiring surge and/or further new office space is created.	19,000	1,000	FY 2020	FY 2020	FY 2021
TA-3-2587 CEFC (BSL-2) Building (Previously notified as New Technical Area 3 Laboratory/Office Building) [a]	LANL	Construct a modular laboratory building to consolidate material sciences, chemistry, and biological science research and development capabilities into TA-03 and enable the elimination of larger, older, and more remote facilities.	10,600	600	FY 2018	FY 2019	FY 2020

[a] Previously notified Minor Construction project with a TEC of $9.5M, updated notification is required because TEC has increased over $10 million.

Project	Site	Project Description	TPC	Construction Design Estimate	Project Milestones		
					Project Start	Design Complete	Construction Complete
PREP Feed to North Main Substation Installation	Pantex	Install an alternate, second overhead feed from the Pantex PREP Windfarm to the Pantex Plant and install sectionalizing switches between the five wind turbines allowing for turbines to be isolated for maintenance/repair and allow for the turbines to be split between two feeds to the Pantex Plant.	15,900	750	FY 2021	FY 2021	FY 2022
SNL/CA New Limited Area Multi-Program Secure Office Building	SNL	Construct a 25,000 and 27,000 square foot facility for approximately 100 to 120 tenants to support systems engineering for various programs led from SNL/CA. SNL/CA site has increasing subsystem and component engineering and production support responsibilities for Gas Transfer Systems, Joint Test Assemblies, and safety products across the entire portfolio of existing and planned major warhead activities. Beyond NNSA, other classified defense, systems analysis, and cyber security programs need additional and adjacent spaces for their national security missions.	18,500	1,850	FY 2020	FY 2021	FY 2023
Bldg. 9117 Data Center[a]	Y-12	Infrastructure improvements include design, procurement/installation of generator, increased sizing of the electrical wiring and equipment to accommodate double the current power demands of the facility. Replacing the existing computer room floor is included in the scope to accommodate more modern IT equipment.	11,207	500	FY 2019	FY 2019	FY 2021

[a] Previously notified with a TEC of $8 million, an updated notification is required because TEC has increased over $10 million.

Institutional Major Item of Equipment for NNSA – (>$5M)

Project Title	Site	Total	Project Description	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	Outyears	Construction Design Estimate
Institutional High Performance Computing System (Bravo)	LANL	26,600	Acquisition of innovative, robust and shared high performance computing capabilities to enable a broad portfolio of diversely sponsored R&D.	1,100	5,500	5,000	15,000	0
Systems Application and Products (SAP)	LANL	9,320	Improved procurement system - Ariba/Fieldglass	1,820	5,000	2,500	0	0
Enterprise Data Services	LANL	11,031	Provide a secure, reliable, and responsive data access, reporting and analytics replacement platform to enable business, management, and mission to make well informed decisions. Current platform (OBI) is at end of life and unsupported.	3,224	2,404	1,500	0	0
IT ERP SAP Consolidation	Y-12	35,427	This project consolidates Plant Maintenance, Operations Support, Supply Chain Management, Org Development & Training into SAP HANA and integrate into an enterprise solution between both sites, PX and Y12.	10,500	8,337	8,400	2,000	800
TOPIC	Y-12	10,575	Develop a single point data entry system supporting the sharing of info (e.g., issue, event, assessment, correspondence) on SAP HANA.	3,054	3,002	3,002	0	750

This report responds to legislative language set forth in Conference Report (H.R. Conf. Rep. No. 108-10) accompanying the Consolidated Appropriations Resolution, 2003 (Public Law 108-7) (pages 886-887), which directs the Department of Energy provide an annual year-end report on maintenance expenditures to the Committees on Appropriations.

Direct-Funded Maintenance and Repair[a]

(Dollars in Thousands)

Maintenance - Working Facilities	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Kansas City National Security Campus	91,662	64,000	104,000	104,000	104,000	105,000	105,000
Lawrence Livermore National Laboratory	48,934	36,000	76,000	76,000	76,000	76,000	77,000
Los Alamos National Laboratory	118,428	82,000	153,000	159,000	165,000	175,000	179,000
Naval Nuclear Laboratory	19,090	22,040	25,615	30,272	32,830	33,118	31,841
Nevada National Security Site	45,369	38,000	65,000	65,000	65,000	65,000	65,000
Pantex Plant	109,834	82,000	125,000	125,000	125,000	125,000	125,000
Sandia National Laboratories	14,605	19,000	46,000	46,000	46,000	46,000	46,000
Savannah River Site	42,380	31,000	55,000	56,000	56,000	56,000	56,000
Y-12 National Security Complex	122,996	92,000	132,000	133,000	133,000	134,000	134,000
Grand Total	**613,298**	**466,040**	**781,615**	**794,272**	**802,830**	**815,118**	**818,841**

Indirect-Funded Maintenance and Repair

(Dollars in Thousands)

Maintenance - Working Facilities	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Kansas City National Security Campus	0	0	0	0	0	0	0
Lawrence Livermore National Laboratory	59,227	62,238	75,048	76,038	76,546	77,636	78,324
Los Alamos National Laboratory	60,351	71,256	93,598	114,407	115,230	116,166	117,015
Naval Nuclear Laboratory	0	0	0	0	0	0	0
Nevada National Security Site	30,167	29,584	27,100	26,500	26,000	25,600	25,100
Pantex Plant	20,932	18,265	15,519	15,829	16,146	16,469	16,798
Sandia National Laboratories	64,375	55,700	52,100	53,600	55,200	56,800	58,600
Savannah River Site	0	0	0	0	0	0	0
Y-12 National Security Complex	42,778	42,780	45,434	46,307	46,297	48,505	49,231
Grand Total	**277,830**	**279,823**	**256,699**	**279,082**	**280,219**	**284,375**	**286,468**

[a] Additional Direct-Funded Maintenance and Repair detail for all sites except the Naval Nuclear Laboratory is included in the Infrastructure and Operations section of the Congressional Justification.

Direct Funded Excess Facilities
(Dollars in Thousands)

Maintenance - Retired Facilities	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Kansas City National Security Campus	0	0	0	0	0	0	0
Lawrence Livermore National Laboratory	0	0	0	0	0	0	0
Los Alamos National Laboratory	0	0	0	0	0	0	0
Naval Nuclear Laboratory	900	817	983	1,199	1,313	2,748	2,046
Nevada National Security Site	0	0	0	0	0	0	0
Pantex Plant	0	0	0	0	0	0	0
Sandia National Laboratories	0	0	0	0	0	0	0
Savannah River Site	0	0	0	0	0	0	0
Y-12 National Security Complex	0	0	0	0	0	0	0
Grand Total	**900**	**817**	**983**	**1,199**	**1,313**	**2,748**	**2,046**

Indirect Funded Excess Facilities
(Dollars in Thousands)

Maintenance - Retired Facilities	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Kansas City National Security Campus	0	0	0	0	0	0	0
Lawrence Livermore National Laboratory	137	139	140	142	146	149	152
Los Alamos National Laboratory	217	360	360	360	360	360	360
Naval Nuclear Laboratory	0	0	0	0	0	0	0
Nevada National Security Site	0	0	0	0	0	0	0
Pantex Plant	0	0	0	0	0	0	0
Sandia National Laboratories	242	249	256	195	201	207	213
Savannah River Site	0	0	0	0	0	0	0
Y-12 National Security Complex	1,310	1,336	1,362	1,390	1,418	1,446	1,446
Grand Total	**1,906**	**2,084**	**2,118**	**2,087**	**2,125**	**2,162**	**2,171**
Total Direct	**614,198**	**466,857**	**782,598**	**795,471**	**804,143**	**817,866**	**820,887**
Total Indirect	**279,736**	**281,907**	**258,817**	**281,169**	**282,344**	**286,537**	**288,639**

Site Estimates
(Dollars in Thousands)

Site	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request				
			FSE	WA	NN	NR	Total
Argonne National Laboratory	52,353	52,814	428	3,827	47,575	-	51,830
Bettis Atomic Power Laboratory	432,317	386,962	-	-	-	375,825	375,825
Brookhaven National Laboratory	9,729	11,378	-	445	10,987	-	11,432
Carlsbad Area Office	545	-	-	-	-	-	-
Chicago Operations Office	2,000	2,000	-	-	-	-	-
Consolidated Business Center	2,200	2,100	2,100	-	-	-	2,100
Fermi National Accelerator Laboratory	-	500	-	-	492	-	492
Fluor Marine Propulsion, LLC	-	826	-	-	-	-	-
Idaho National Laboratory	326,807	324,909	-	2,505	88,703	251,822	343,030
Kansas City National Security Complex (KCNSC)	753,943	1,013,064	-	1,134,432	64,854	-	1,199,286
Kansas City Site Office	7,602	7,587	7,503	130	-	-	7,633
Knolls Atomic Power Laboratory	768,005	730,718	-	-	-	661,840	661,840
Lawrence Berkeley National Laboratory	9,206	6,693	-	650	5,622	-	6,272
Lawrence Livermore National Laboratory	1,484,773	1,739,577	-	1,794,430	165,598	-	1,960,028
Livermore Site Office	17,591	19,116	18,925	-	-	-	18,925
Los Alamos National Laboratory	2,191,038	2,238,076	-	2,907,469	304,457	-	3,211,926
Los Alamos Site Office	15,699	17,364	17,689	51	-	-	17,740
National Energy Technology Laboratory	19,667	43,362	113	61,512	-	-	61,625
Naval Reactors Facility	279,551	235,256	-	-	-	328,905	328,905
Naval Reactors Laboratory Field Office	19,484	20,200	-	-	-	21,480	21,480
Naval Research Laboratory	10,250	10,600	-	8,590	-	-	8,590
Nevada Field Office	97,333	97,614	17,222	84,616	-	-	101,838
Nevada National Security Site	359,511	454,709	-	588,388	99,947	-	688,335
NNSA Albuquerque Complex	898,241	940,695	-	636,329	171,610	-	807,939
NNSA Production Office (NPO)	38,045	32,617	25,305	-	10,190	-	35,495
Oak Ridge Institute for Science & Education	2,790	2,586	570	-	1,973	-	2,543
Oak Ridge National Laboratory	163,464	149,795	81	51,372	106,431	-	157,884
Office of Scientific & Technical Information	465	473	-	433	40	-	473
Pacific Northwest National Laboratory	266,821	255,362	1,400	64,478	208,253	-	274,131
Pantex Plant	825,920	885,453	-	992,633	9,382	-	1,002,015
Princeton Plasma Physics Laboratory	-	10	-	-	-	-	-
Princeton Site Office	170	300	-	-	295	-	295
Renssalaer Polytechnic Institute	-	-	-	436	-	-	436
Richland Operations Office	1,804	1,858	-	-	2,914	-	2,914
Sandia National Laboratories	2,149,371	2,296,805	-	2,395,852	232,398	-	2,628,250
Sandia Site Office	23,895	25,640	23,481	1,017	-	-	24,498
Savannah River Operations Office	10,483	8,349	8,519	2,087	850	-	11,456
Savannah River Site	587,363	964,250	-	866,796	225,994	-	1,092,790
SLAC National Accelerator Laboratory	1,852	1,825	-	180	2,568	-	2,748
University of Rochester	80,000	76,480	-	75,000	-	-	75,000
Washington Headquarters	1,493,356	1,757,391	330,664	1,744,302	227,788	44,128	2,346,882
Waste Isolation Pilot Plant	10,084	2,706	-	-	4,763	-	4,763
Y-12 National Security Complex	1,871,970	1,886,572	-	2,184,040	58,316	-	2,242,356
Adjustments	(57,080)	-	-	-	(21,000)	-	(21,000)
Grand Total	**15,228,618**	**16,704,592**	**454,000**	**15,602,000**	**2,031,000**	**1,684,000**	**19,771,000**

FY 2018 NDAA Requirement

Section 3132—Annual Report on Service Support Contracts of the National Nuclear Security Administration. Requires the Administrator to submit, along with NNSA's annual report on service support contracts, information regarding the cost of service support contracts and identification of the program or program direction accounts that support each such contract.

FY 2017 NDAA Requirement

"…require with each budget submission the NNSA provide a report that provides the number of full time equivalent employees under section 3241A of the NNSA Act (50 U.S.C. 2441a), the number of service support contracts and whether the contracts are funded with program funds, the number of full time equivalent employees under each contract and the number in each contract that have been employed for more than 2 years."

Service support Contracts

SEC. 3138. ANNUAL REPORT ON NUMBER OF FULL-TIME EQUIVALENT EMPLOYEES AND CONTRACTOR EMPLOYEES. Section 3241A of the National Nuclear Security Administration Act (50 U.S.C. 2441a) is amended by adding at the end the following new subsection:

''(f) ANNUAL REPORT.—The Administrator shall include in the budget justification materials submitted to Congress in support of the budget of the Administration for each fiscal year (as submitted with the budget of the President under section 1105(a) of title 31, United States Code) a report containing the following information as of the date of the report:

''(1) The number of full-time equivalent employees of the Office of the Administrator, as counted under subsection (a).

''(2) The number of service support contracts of the Administration and whether such contracts are funded using program or program direction funds.

''(3) The number of full-time equivalent contractor employees working under each contract identified under paragraph
(2).

''(4) The number of full-time equivalent contractor employees described in paragraph (3) that have been employed under such a contract for a period greater than two years.''.

The FSE chapter of the budget provides information for (f)(1). The following table provides information required by paragraphs (f)(2) and (f)(3). This information does not address paragraph (f)(4). As noted in recent responses to the GAO audit for support service contracts, NNSA has been fully transparent in its budget justification materials regarding data limitations that prevent accurate, reliable reporting of this information. Accessing badging records to obtain the information, as suggested in the report, would not be an appropriate use of the data (considered personally identifiable information) and, as such, access is not permitted for this purpose. If access was granted, the data would still be limited to only on-site contractors, omitting a significant portion of the contractor work force (approximately 31% off-site workers per FY 2018 SSC data). Further, NNSA does not have access to contractor personnel systems, and collecting and reporting such data could run counter to regulations/statutes regarding employer/employee relationships. In this case, the vendor, not NNSA, is the employer and we must avoid any activities that would give the appearance of attempting to manage or oversee contractor employees or staffing. NNSA will, however, meet with congressional staff on ways to further enhance the reported data to meet their needs.

For this Annual Service Support table, we continue to include Technical and Management (professional) support service contracts and exclude the following services: Management and Operating contracts, contracts for housekeeping, custodial, physical security, IT helpline, maintenance, and facilities maintenance. The total number of SSC that were active during FY 2019 is 192, with 1,049 contractor Full Time Equivalents (FTEs) reported:

NDAA Annual NNSA Support Service Contracts
Active throughout FY 2019
(As of 10/3/2019)

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
ALUTIIQ COMMERCIAL ENTERPRISES LLC	NA0002827	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$500,000		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0002827 Total		**$500,000**	**11**	**0**
ALVAREZ & ASSOCIATES LLC	89233118FNA000026	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$3,628,301		
	89233118FNA000026 Total		**$3,628,301**	**10**	**0**
	89233119FNA000049	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$15,072,558		
	89233119FNA000049 Total		**$15,072,558**	**7**	**0**
APOGEE GROUP, LLC	89233118CNA000056	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$0		
	89233118CNA000056 Total		**$0**	**1**	**0**
BANDA GROUP INTERNATIONAL, LLC	NA0002388	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	NA0002388 Total		**$0**	**5**	**0**
BANDA GROUP INTERNATIONAL,LLC	NA0002903	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$229,564		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		

[a] Active or Follow-on for FY 2019 expired contract.
[b] Expired Requirement with a Follow-on starting in FY 2019.

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	NA0002903 Total	**Expired requirement with a follow-on starting in FY19.**	**$229,564**	**0**	**3**
	NA0002903 89233119CNA000066	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,200,000		
	NA0002903 89233119CNA000066 Total	**Follow-on for FY19 expired contract.**	**$1,200,000**	**5**	**0**
	NA0003412	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	NA0003412 Total		**$0**	**2**	**0**
	NA0003413	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$92,692		
	NA0003413 Total		**$92,692**	**2**	**0**
CE2 CORPORATION INC	89233118FNA400024	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$522,468		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400024 Total		**$522,468**	**6**	**0**
	DT0007776	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$57,921		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0007776 Total		**$57,921**	**8**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0008938	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,862,408		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0008938 Total		**$1,862,408**	**15**	**0**
	DT0009471	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$297,539		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0009471 Total		**$297,539**	**4**	**0**
	DT0009761	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$2,151,811		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0009761 Total		**$2,151,811**	**14**	**0**
	DT0011828	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$446,066		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0011828 Total		**$446,066**	**3**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0012670	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$798,451		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012670 Total		**$798,451**	**5.25**	**0**
	DT0012834	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012834 Total	**Expired requirement with a follow-on starting in FY19.**	**$0**	**0**	**3**
CHENEGA PROFESSIONAL & TECHNICAL SERVICES, LLC	DT0012824	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$151,920		
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$980,000		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012824 Total		**$1,131,920**	**19**	**0**
	NA0003754	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,200,000		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	NA0003754 Total		**$1,200,000**	**14**	**0**
COGENT SECURITY CONSULTING LLC	89233119FNA400197	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$260,015		
	89233119FNA400197 Total		**$260,015**	**4**	**0**
COHNREZNICK LLP	89233118FNA000030	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	-$581,011		
	89233118FNA000030 Total		**-$581,011**	**4.8**	**0**
	89233119FNA000042	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$10,272		
	89233119FNA000042 Total		**$10,272**	**0**	**0**
	BP0005348	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$40,008		
	BP0005348 Total		**$40,008**	**4.8**	**0**
CORPORATE ALLOCATION SERVICES, INC	BP0005605	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$431,650		
	BP0005605 Total		**$431,650**	**1**	**0**
	DT0011033	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$805,579		
	DT0011033 Total		**$805,579**	**6**	**0**
	DT0012654	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$154,207		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
		00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3T)	$103,918		
	DT0012654 Total		**$258,125**	**3**	**0**
COVENANT PARK INTEGRATED INITIATIVES	89233118FNA400044	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$1,292,075		
	89233118FNA400044 Total		**$1,292,075**	**4**	**0**
CRITERION SYSTEMS, INC.	89233118FNA000015	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$11,192,186		
	89233118FNA000015 Total		**$11,192,186**	**39**	**0**
	BP0005221	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,399,398		
	BP0005221 Total		**$2,399,398**	**11**	**0**
DIGON SYSTEMS, LLC	NA0003441	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$358,284		
	NA0003441 Total		**$358,284**	**2**	**0**
DOXCELERATE CORPORATION	NA0003349	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$32,814		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	NA0003349 Total		**$32,814**	**1.5**	**0**
FOX ROTHSCHILD LLP	89233119FNA400130	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$2,938,662		
	89233119FNA400130 Total		**$2,938,662**	**3.14**	**0**
	89233119FNA400158	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$2,833,645		
	89233119FNA400158 Total		**$2,833,645**	**3.5**	**0**
	89233119FNA400163	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$330,581		
	89233119FNA400163 Total		**$330,581**	**0.4**	**0**
	89233119FNA400182	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$159,343		
	89233119FNA400182 Total		**$159,343**	**0**	**0**
GARTNER, INC.	89233119FNA400138	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$790,632		
	89233119FNA400138 Total		**$790,632**	**0**	**0**
GENERAL ATOMICS	89233119CNA000063	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$9,586,460		
	89233119CNA000063 Total		**$9,586,460**	**44**	**0**
GRADILLAS COURT REPORTERS INC	DT0008344 89233119FNA400231	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$5,000		
	DT0008344 89233119FNA400231 Total		**$5,000**	**0**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
HENRY L STIMSON CENTER	NA0002456	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$103,000		
	NA0002456 Total	**Expired requirement with a follow-on starting in FY19.**	**$103,000**	**0**	**3**
	NA0002456 89233119CNA000075	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$691,549		
	NA0002456 89233119CNA000075 Total	**Follow-on for FY19 expired contract.**	**$691,549**	**7**	**0**
HYPERION TECHNOLOGIES LLC	89233119CNA000107	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$120,000		
	89233119CNA000107 Total		**$120,000**	**4.5**	**0**
INNOVATIVE REASONING LLC	DT0008760	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$6,964,825		
		00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3T)	$39,545		
	DT0008760 Total		**$7,004,370**	**65**	**0**
INNOVATIVE TECHNOLOGY PARTNERSHIPS LLC	DT0014072	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$498,100		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0014072 Total		**$498,100**	**2.5**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
INTERNATIONAL SERVICES AND ADVISORS INC	NA0003742	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$0		
	NA0003742 Total		**$0**	**4**	**0**
INTUITIVE INFORMATION SYSTEMS TECHNOLOGIES, LLC	DT0013389	00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3T)	$130,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$1,257,935		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0013389 Total		**$1,387,935**	**5.5**	**0**
J.G. Management Systems, Inc.	89233118FNA400103	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400103 Total		**$0**	**2**	**0**
	89233118FNA400104	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400104 Total		**$0**	**2**	**0**
JDG ASSOCIATES, INC.	DT0005869	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	-$142		
	DT0005869 Total	**Expired requirement with a follow-on starting in FY19.**	**-$142**	**0**	**1**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
JG MANAGEMENT SYSTEMS INC	89233118FNA400056	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$122,581		
	89233118FNA400056 Total		**$122,581**	**1**	**0**
	89233118FNA400094	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$308,213		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400094 Total		**$308,213**	**2**	**0**
	89233119FNA400184	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$5,376,666		
	89233119FNA400184 Total		**$5,376,666**	**9**	**0**
	BP0005948	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$17,739		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	BP0005948 Total		**$17,739**	**1.5**	**0**
	DT0008536	00909 - 089-X-0240 - WA Reimbursable Work with Non-Federal Entities (was 2T)	$168,345		
	DT0008536 Total		**$168,345**	**2**	**0**
	DT0011413	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$374,999		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0011413 Total		**$374,999**	**3**	**0**
	DT0011516	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,467,617		
	DT0011516 Total		**$1,467,617**	**7**	**0**
	DT0012665	01050 - 089-X-0243 - Other Defense Activities (ODA) Primary Fund (was TF)	$90,000		
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$417,488		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012665 Total		**$507,488**	**4**	**0**
LINK TECHNOLOGIES INC	DT0013473	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$597,636		
		00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3T)	$1,794,916		
	DT0013473 Total		**$2,392,552**	**17**	**0**
LONGENECKER AND ASSOCIATES, INC	89233118FNA400109	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$181,093		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400109 Total		**$181,093**	**0.5**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA400112	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$8,386,018		
	89233118FNA400112 Total		**$8,386,018**	**8**	**0**
	BP0003739	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$75,000		
	BP0003739 Total	**Expired requirement with a follow-on starting in FY19.**	**$75,000**	**0**	**2.25**
	BP0003739 89233119FNA400224	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$775,000		
	BP0003739 89233119FNA400224 Total	**Follow-on for FY19 expired contract.**	**$775,000**	**4**	**0**
	DT0007874	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$131,198		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0007874 Total		**$131,198**	**1**	**0**
	DT0008761	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,154,057		
	DT0008761 Total		**$2,154,057**	**21**	**0**
	DT0009564	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$820,365		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0009564 Total		**$820,365**	**7**	**0**
	DT0014047	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0014047 Total		**$0**	**2.35**	**0**
LTD GLOBAL, LLC	89233118CNA000052	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$831,015		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118CNA000052 Total		**$831,015**	**5**	**0**
	89233119CNA000062	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$771,000		
	89233119CNA000062 Total		**$771,000**	**0.85**	**0**
	NA0003116	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$541,010		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003116 Total		**$541,010**	**5**	**0**
	NA0003420	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$376,842		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003420 Total		**$376,842**	**3.16**	**0**
MELE ASSOCIATES INC	89233118FNA000008	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,677,509		
	89233118FNA000008 Total		**$2,677,509**	**14**	**0**
	89233119FNA400200	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$3,531,743		
	89233119FNA400200 Total		**$3,531,743**	**15.5**	**0**
	BP0003375	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$350,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$4,763,093		
	BP0003375 Total		**$5,113,093**	**22**	**0**
	BP0003826	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$266,702		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
		01055 - 089-X-0243 - ODA Reimbursable Work with Other Federal Agencies (was 3F)	$200,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$2,723,517		
	BP0003826 Total		**$2,656,816**	**22.09**	**0**
	BP0004561	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$450,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$3,168,030		
	BP0004561 Total		**$3,618,030**	**15.5**	**0**
	DT0013157	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$9,551,708		
	DT0013157 Total		**$9,551,708**	**26.5**	**0**
	DT0013826	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,604,000		
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$210,927		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0013826 Total		**$2,814,927**	**7**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
MONTECH INC.	NA0003226	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$200,000		
		70052 - 089-19/20-0240 - WA Program Direction	$9,528		
	NA0003226 Total		**$209,528**	**0**	**0**
	NA0003445	00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY)	$300,000		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		70052 - 089-19/20-0240 - WA Program Direction	$100,000		
	NA0003445 Total		**$400,000**	**2.53**	**0**
	NA0003599	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$97,700		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003599 Total		**$97,700**	**1**	**0**
	NA0003675	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
		00932 - 089-18/19-0240 - WA Program Direction	$0		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$59,817		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003675 Total		**$59,817**	**4**	**0**
NATIONAL ACADEMY OF PUBLIC ADMINISTRATION	NA0003411	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,393,676		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003411 Total		**$1,393,676**	**0**	**0**
NATIONAL ACADEMY OF SCIENCES	NA0003381	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$840,817		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003381 Total		**$840,817**	**0**	**0**
NAVARRO RESEARCH AND ENGINEERING, INC	89233118FNA400122	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$198,487		
	89233118FNA400122 Total		**$198,487**	**1**	**0**
PARSONS GOVERNMENT SERVICES INC	89233118FNA000001	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$388,502		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA000001 Total		**$388,502**	**0.5**	**0**
	89233118FNA000009	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$79,464		
	89233118FNA000009 Total		**-$79,464**	**3.5**	**0**
	89233118FNA000011	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$6,370		
	89233118FNA000011 Total		**-$6,370**	**0.75**	**0**
	89233118FNA000012	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$62,930		
	89233118FNA000012 Total		**$62,930**	**1**	**0**
	89233118FNA000013	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$24,203		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA000013 Total		**$24,203**	**0.27**	**0**
	89233118FNA000014	01278 - 089-19/20-0251 - Def. Env. Cleanup Program Direction	$80,000		
	89233118FNA000014 Total		**$80,000**	**2.7**	**0**
	89233118FNA000016	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$109,518		
	89233118FNA000016 Total		**$109,518**	**0.5**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA000017	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA000017 Total		**$0**	**0.8**	**0**
	89233118FNA000018	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$8,116		
	89233118FNA000018 Total		**-$8,116**	**1**	**0**
	89233118FNA000020	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA000020 Total		**$0**	**0.1**	**0**
	89233118FNA000021	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA000021 Total		**$0**	**3.75**	**0**
	89233118FNA000022	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$532,814		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA000022 Total		**$532,814**	**0.5**	**0**
	89233118FNA000023	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA000023 Total		**$0**	**2.25**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA000027	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA000027 Total		**$0**	**0.3**	**0**
	89233119FNA000035	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$226,819		
	89233119FNA000035 Total		**$226,819**	**0.5**	**0**
	89233119FNA000037	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,533,997		
	89233119FNA000037 Total		**$1,533,997**	**3**	**0**
	89233119FNA000039	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$11,278,267		
	89233119FNA000039 Total		**$11,278,267**	**10**	**0**
	89233119FNA000041	02400 - 089-X-4563 - Working Capital Fund (42 USC 5815) (was WF)	$320,114		
	89233119FNA000041 Total		**$320,114**	**0.8**	**0**
	89233119FNA000044	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,252,416		
	89233119FNA000044 Total		**$1,252,416**	**2**	**0**
	89233119FNA000045	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$100,000		
	89233119FNA000045 Total		**$100,000**	**0.2**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233119FNA000046	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,504,003		
	89233119FNA000046 Total		**$1,504,003**	**2.5**	**0**
	89233119FNA000050	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$200,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$200,000		
	89233119FNA000050 Total		**$400,000**	**0.25**	**0**
	89233119FNA000051	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$500,000		
	89233119FNA000051 Total		**$500,000**	**0.3**	**0**
	89233119FNA000057	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$670,000		
	89233119FNA000057 Total		**$670,000**	**0.85**	**0**
	89233119FNA000061	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$15,000		
	89233119FNA000061 Total		**$15,000**	**0.2**	**0**
	BP0005895	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$126,429		
	BP0005895 Total		**-$126,429**	**9.2**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	BP0005907	02400 - 089-X-4563 - Working Capital Fund (42 USC 5815) (was WF)	$0		
	BP0005907 Total		**$0**	**0.6**	**0**
	DT0008737	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	-$17,608		
	DT0008737 Total		**-$17,608**	**0**	**0**
	DT0009614	01260 - 089-X-0251 - Def. Env. Cleanup ORP Waste Treatment Plant 01-D-416(A-E) (OMB SF132 FY12)	$65,213		
	DT0009614 Total	**Expired requirement with a follow-on starting in FY19.**	**$65,213**	**0**	**2.75**
	DT0009614 89233119FNA000043	01260 - 089-X-0251 - Def. Env. Cleanup ORP Waste Treatment Plant 01-D-416(A-E) (OMB SF132 FY12)	$1,146,817		
	DT0009614 89233119FNA000043 Total	**Follow-on for FY19 expired contract.**	**$1,146,817**	**2.4**	**0**
	DT0010584	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$648,929		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0010584 Total		**$648,929**	**2.75**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0010585	01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0010585 Total		**$0**	**1.2**	**0**
	DT0010586	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$364,893		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0010586 Total		**$364,893**	**8.1**	**0**
	DT0010869	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$382,134		
	DT0010869 Total		**$382,134**	**1.5**	**0**
	DT0011750	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$602,392		
		00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY)	$36,495		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$0		
	DT0011750 Total		**$638,886**	**0.9**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0011792	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$319,757		
	DT0011792 Total		**-$319,757**	**0**	**0**
	DT0012465	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$210,660		
	DT0012465 Total		**-$210,660**	**0**	**0**
	DT0012466	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$62,303		
	DT0012466 Total		**-$62,303**	**0**	**0**
	DT0012626	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$235,852		
	DT0012626 Total		**$235,852**	**5.6**	**0**
	DT0012681	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$425,000		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012681 Total		**$425,000**	**2**	**0**
	DT0013042	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$119,948		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0013042 Total		**$119,948**	**0.75**	**0**
	DT0013131	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$284,091		
	DT0013131 Total		**$284,091**	**1**	**0**
	DT0013499	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$97,560		
	DT0013499 Total		**$97,560**	**0.4**	**0**
	DT0013580	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$352,171		
	DT0013580 Total		**$352,171**	**0.3**	**0**
Parsons Government Services Inc.	BP0005844	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	BP0005844 Total		**$0**	**1.5**	**0**
	DT0011157	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	DT0011157 Total		**$0**	**1.9**	**0**
PERIKIN ENTERPRISES, LLC	89233118CNA000039	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$22,200		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$38,703		
	89233118CNA000039 Total		**$60,903**	**1**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0010008 89233119CNA000080	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$50,000		
	DT0010008 89233119CNA000080 Total	**Follow-on for FY19 expired contract.**	**$50,000**	**1**	**0**
PERTEK 2, LLC	NA0003707	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$354,359		
	NA0003707 Total		**$354,359**	**8**	**0**
PERTEK, LLC	NA0003206	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$286,255		
	NA0003206 Total		**$286,255**	**4**	**0**
	NA0003207	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$863,264		
	NA0003207 Total		**$863,264**	**4**	**0**
PMTECH, INC	NA0002547	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$76,183		
	NA0002547 Total		**-$76,183**	**0**	**0**
PROJECT ENHANCEMENT CORPORATION	89233118FNA400114	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$422,268		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400114 Total		**$422,268**	**4.36**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0009849	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,744,997		
	DT0009849 Total		**$1,744,997**	**9**	**0**
	DT0010008	01686 - 089-16/17-0313 - Federal Salaries and Expenses Primary Fund	-$21,039		
		01687 - 089-15/16-0313 - Federal Salaries and Expenses Primary Fund (P.L. 113-235 FY15 128 STAT 2318)	-$11,196		
	DT0010008 Total	**Expired requirement with a follow-on starting in FY19.**	**-$32,235**	**0**	**0**
	DT0011426	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
		00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3T)	$214,757		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$18,048,158		
	DT0011426 Total		**$18,262,915**	**56**	**0**
RHINOCORPS LTD CO	NA0003782	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,137,044		
	NA0003782 Total		**$1,137,044**	**9**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
SABIO SYSTEMS, LLC	NA0003020	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$5,000		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
		01686 - 089-16/17-0313 - Federal Salaries and Expenses Primary Fund	$0		
	NA0003020 Total		**$5,000**	**0**	**0**
SIGMA SCIENCE INC	89233118FNA400080	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA400080 Total	**Expired requirement with a follow-on starting in FY19.**	**$0**	**0**	**1**
	89233118FNA400080 89233119FNA400185	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$372,000		
	89233118FNA400080 89233119FNA400185 Total	**Follow-on for FY19 expired contract.**	**$372,000**	**1**	**0**
	89233118FNA400081	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA400081 Total	**Expired requirement with a follow-on starting in FY19.**	**$0**	**0**	**1**
	89233118FNA400081 89233119FNA400186	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$788,385		
	89233118FNA400081 89233119FNA400186 Total	**Follow-on for FY19 expired contract.**	**$788,385**	**1**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA400084	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA400084 Total	**Expired requirement with a follow-on starting in FY19.**	**$0**	**0**	**1**
	89233118FNA400084 89233119FNA400188	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$365,000		
	89233118FNA400084 89233119FNA400188 Total	**Follow-on for FY19 expired contract.**	**$365,000**	**1**	**0**
	89233118FNA400085	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA400085 Total	**Expired requirement with a follow-on starting in FY19.**	**$0**	**0**	**1**
	89233118FNA400085 89233119FNA400196	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$672,556		
	89233118FNA400085 89233119FNA400196 Total	**Follow-on for FY19 expired contract.**	**$672,556**	**0.75**	**0**
	89233118FNA400089	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	89233118FNA400089 Total		**$0**	**1**	**0**
	89233118FNA400090	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$111,647		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA400090 Total	**Expired requirement with a follow-on starting in FY19.**	**$111,647**	**0**	**1**
	89233118FNA400090 89233119FNA400195	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$260,191		
		00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY)	$50,000		
		01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$138,353		
	89233118FNA400090 89233119FNA400195 Total	**Follow-on for FY19 expired contract.**	**$448,544**	**1**	**0**
	89233119FNA400189	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$950,000		
	89233119FNA400189 Total		**$950,000**	**1**	**0**
	89233119FNA400205	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$492,783		
	89233119FNA400205 Total		**$492,783**	**5**	**0**
	DT0012834 89233119FNA400172	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,046,655		
	DT0012834 89233119FNA400172 Total	**Follow-on for FY19 expired contract.**	**$1,046,655**	**8**	**0**
SUMMIT EXERCISES AND TRAINING LLC	89233118FNA400091	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$1,995,000		

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	89233118FNA400091 Total		**$1,995,000**	**12**	**0**
TECHNOLOGY VENTURES INC	89233119CNA000098	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$1,290,369		
	89233119CNA000098 Total		**$1,290,369**	**4**	**0**
TECHNOMICS INC	89233118FNA400047	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,673,396		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	-$1,309		
	89233118FNA400047 Total		**$1,672,086**	**7**	**0**
	89233119FNA400217	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,946,337		
	89233119FNA400217 Total		**$1,946,337**	**6**	**0**
TECHSOURCE INC	BP0004432	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$750,000		
		01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$2,200,000		
	BP0004432 Total		**$2,950,000**	**15**	**0**
	BP0005608	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$3,974,519		
	BP0005608 Total		**$3,974,519**	**9**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0010708	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$172,528		
		00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY)	$24,721		
	DT0010708 Total	**Expired requirement with a follow-on starting in FY19.**	**$197,249**	**0**	**2.5**
	DT0010708 89233119FNA400223	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$25,000		
	DT0010708 89233119FNA400223 Total	**Follow-on for FY19 expired contract.**	**$25,000**	**2.5**	**0**
	DT0011223	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$0		
	DT0011223 Total		**$0**	**2.5**	**0**
	DT0011895	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$1,400,000		
	DT0011895 Total		**$1,400,000**	**3.5**	**0**
	DT0012050	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,342,355		
	DT0012050 Total		**$1,342,355**	**5**	**0**
	DT0012554	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$651,436		
	DT0012554 Total		**$651,436**	**3**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0012831	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,050,000		
	DT0012831 Total		**$1,050,000**	**10**	**0**
	DT0013032	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$4,199,223		
	DT0013032 Total		**$4,199,223**	**9.5**	**0**
	DT0013055	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$5,077,653		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0013055 Total		**$5,077,653**	**20.5**	**0**
	DT0013256	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,347,000		
	DT0013256 Total		**$1,347,000**	**4.5**	**0**
	DT0013337	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$600,000		
	DT0013337 Total		**$600,000**	**3**	**0**
	DT0013591	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,443,063		
	DT0013591 Total		**$1,443,063**	**4**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
	DT0014080	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$800,000		
	DT0014080 Total		**$800,000**	**11**	**0**
TECHSOURCE, INC.	DT0012211	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	-$329,722		
	DT0012211 Total		**-$329,722**	**0.5**	**0**
TETRA TECH INC	89233119FNA400183	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,265,227		
	89233119FNA400183 Total		**$2,265,227**	**5**	**0**
THE A R GROUP LLP	DT0005869 89233119FNA400174	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$40,000		
	DT0005869 89233119FNA400174 Total	**Follow-on for FY19 expired contract.**	**$40,000**	**0**	**0**
THE LAKEWORTH GROUP, LLC	NA0002552	01250 - 089-X-0251 - Defense Environmental Cleanup Primary Fund (was Defense Facilities Closure Projects thru FY03; Defense Site Acceleration Completion thru FY06) (was TP)	$0		
	NA0002552 Total		**$0**	**0.25**	**0**
TUVA, LLC	NA0003424	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,074,885		
	NA0003424 Total		**$2,074,885**	**65**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
VECTOR RESOURCE INC	89233118FNA400001	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$800,000		
	89233118FNA400001 Total		**$800,000**	**4.5**	**0**
	89233118FNA400013	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$999,000		
	89233118FNA400013 Total		**$999,000**	**8**	**0**
	89233118FNA400053	01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund	$1,524,580		
		01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund	$0		
	89233118FNA400053 Total		**$1,524,580**	**4.5**	**0**
	89233119FNA400239	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$89,575		
	89233119FNA400239 Total		**$89,575**	**2.5**	**0**
	DT0012067	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$755,500		
	DT0012067 Total		**$755,500**	**3**	**0**
	DT0012586	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$8,822,052		
	DT0012586 Total		**$8,822,052**	**29.5**	**0**

Awardee Name / Vendor Name	Contract Number	Fund Value and Description	Total FY19 Obligations	Total FTEs for Active Contracts	Total FTEs for Expired Contracts
VECTOR RESOURCE, INC	DT0012209	01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund	$0		
	DT0012209 Total		**$0**	**1**	**0**
VETERANS TECH, LLC	89233119FNA400180	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$2,178,926		
	89233119FNA400180 Total		**$2,178,926**	**0**	**0**
WYANT DATA SYSTEMS, INC	DT0010108	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,452,743		
	DT0010108 Total	**Expired requirement with a follow-on starting in FY19.**	**$1,452,743**	**0**	**9**
	DT0010108 89233119FNA400230	00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC)	$1,513,718		
	DT0010108 89233119FNA400230 Total	**Follow-on for FY19 expired contract.**	**$1,513,718**	**6.5**	**0**
WYREMBELSKI, JULIE A	89233118CNA000026	01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was NS)	$17,107		
	89233118CNA000026 Total		**$17,107**	**1**	**0**
Grand Total			**$236,704,145**	**1049.4**	**31.5**
Total # of Support Service Contracts	**192**				
[1] Active or Follow-on for FY19 expired contract.					
[2] Expired Requirement with a Follow-on starting in FY19.					

Federal Salaries and Expenses

Federal Salaries and Expenses

Federal Salaries and Expenses
Proposed Appropriation Language

For National Nuclear Security Administration (NNSA) Federal Salaries and Expenses (FSE), [$434,699,000] *$454,000,000*, to remain available until September 30, [2021] *2022*. That of such amount, $17,000 shall be available for official reception and representation expenses.

Explanation of Changes

Changes to the appropriation language consist of changes to the overall amount and a change to maintain the two-year period of availability. The FY 2021 Budget Request for NNSA FSE is $454,000,000, a $19,301,000 (4 percent) increase above the FY 2020 enacted for the salaries, benefits, and the other expenses of 1,858 federal full-time equivalents (FTEs), 1,836 paid from FSE and 22 paid through the Working Capital Fund. The increase reflects the funding required for 83 additional FTEs over the FY 2020 planned level.

Public Law Authorizations

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-92, National Defense Authorization Act for Fiscal Year 2020
- P.L. 116-94, Further Consolidated Appropriations Act, 2020

Federal Salaries and Expenses

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
NNSA Federal Salaries and Expenses	**410,000**	**434,699**	**454,000**	**+19,301**

Out-years for Federal Salaries and Expenses

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
NNSA Federal Salaries and Expenses	**464,000**	**474,000**	**484,000**	**494,000**

Funding by Object Class

Salaries and Benefits: Provides $349,000,000 for salaries and benefits for the majority of the NNSA Federal staff. It does not include funding for the federal staff supporting the Weapons Activities (WA) Secure Transportation Asset program or the Naval Reactors (NR) account. The NNSA workforce consists of a diverse cadre of scientists, engineers, project and program managers, foreign affairs specialists, and highly technical support staff that perform program and project management and appropriate oversight of the national security missions related to the WA account and the Defense Nuclear Nonproliferation (DNN) account. The workforce is also comprised of mission support staff including management and program analysis, contracting, security administration, miscellaneous administration, human resource management, emergency management, information technology management, budget analysis, accounting, legal services (general and patent attorney, paralegal specialist), operations research, miscellaneous clerk and assistant, public affairs, quality assurance, general business and industry, government information specialists, industrial hygiene, industrial property management, realty, equal employment opportunity, grants management, environmental protection specialist, safety and occupational health management, logistics management, computer engineering, records and information management, telecommunications, writing and editing, computer science, procurement clerical and technician, inventory management, financial management, psychology, safety and electrical engineering, and architecture.

NNSA staff is located throughout the United States, reflecting NNSA's work with the nuclear security enterprise. The staff is geographically located in Washington, DC; Germantown, Maryland; Albuquerque, New Mexico; and at seven federal field offices: Kansas City Field Office (Missouri); Lawrence Livermore Field Office (California); Los Alamos Field Office (New Mexico); Nevada Field Office (Nevada); NNSA Production Office (Texas and Tennessee); Sandia Field Office (New Mexico and California); and Savannah River Field Office (South Carolina).

Travel: Provides $18,263,000 for travel necessary to conduct NNSA business. Domestic travel provides management oversight, public outreach, travel related to training, and national security assistance and interface between NNSA Headquarters, NNSA Field Offices, DOE laboratories and production facilities, and local governments. International travel is a key element of NNSA's nonproliferation work to share the United States' long experience in managing special nuclear materials with partners around the world to achieve international nonproliferation and counterterrorism goals.

Support Services: Includes $23,497,000 for Management and Professional Services to assist or train staff to achieve efficient and effective management and operation of activities and systems, including administrative support, funding for Environmental Safety and Health activities for General Counsel's support of the National Environmental Policy Act at Los Alamos Field Office, Corporate Project Management program, and the NNSA Graduate Fellowship Program (NGFP).

Other Related Expenses: Provides $63,240,000 for the following items:

- Training: Provides $5,179,000 for necessary learning, career development, and skills maintenance of the NNSA Federal staff. It does not include training for the federal staff supporting the WA Secure Transportation Asset

program or the Naval Reactors (NR) account. Training includes valuable learning activities for NNSA Headquarters and Field Offices, and corporate training, as managed by the NNSA's Chief Learning Officer. The NNSA corporate training program encompasses the Technical Qualification Program (TQP) and federal and agency mandated training (such as executive, managerial, and supervisory training). It also funds: Leadership Development Programs, Mid-Level Leadership Development Program, Executive Development Program, 360 Assessments, Rotations, NNSA 1st Year (Onboarding) Program, Mentoring, Coaching, and other learning events. NNSA's goal is to proactively address future workforce needs and Administration priorities, advance employee competencies, and demonstrate NNSA's commitment to the strategic development of all employees to allow them to reach their fullest potential.

Space and Occupancy: Provides $16,385,000 to support Space and Occupancy costs for Headquarters and the field.

Working Capital Fund: Provides $36,129,000 for FSE's contribution to the Department of Energy's (DOE) Working Capital Fund (WCF). The FSE contribution includes funding for DOE's overseas presence for administrative and operational support to Departmental personnel. The Department's overseas presence includes 22 DOE employees in 20 foreign countries. NNSA supervises both federal employees and locally employed staff, and reimburses the Department of State for International Cooperative Administrative Support Services (ICASS) and Capital Security Cost Sharing (CSCS) charges. The Department's WCF budget chapter provides detail on all of the programs funded through the WCF.

Other Expenses: Provides $5,547,000 in funding for activities required for NNSA's federal personnel, including field site investigations in coordination with the DOE General Counsel, headquarters security investigations costs, and other miscellaneous procurements, such as potential settlements. Also provides $17,000 for Reception and Representation funds.

Highlights of the FY 2021 Budget Request

The FY 2021 Request supports a federal staff of 1,858 FTEs providing appropriate oversight to ensure NNSA can meet growing mission requirements and commitments as described in the 2018 Nuclear Posture Review (NPR) including modernizing the nuclear deterrent, recapitalizing the aging infrastructure, and continuing to meet the requirements of nonproliferation and counterterrorism programs.

- Multiple staffing studies and evaluations have recommended approximately 2,100 FTE to meet growing mission as described in the 2018 NPR. In FY 2020, NNSA will continue to improve the workforce recruiting strategy and focus on hiring so that the Federal workforce enters FY 2021 with 1,858 personnel onboard.

FY 2021 - FY 2025 Strategy

NNSA will use a variety of innovative methods to grow and shape the professional staff including the use of recruitment events and expanded excepted service hiring authority. The NNSA will also continue to monitor the evolving need for federal oversight in support of the nuclear modernization missions and adjust future staffing plans accordingly. NNSA will also use partnerships with academic alliances to grow the workforce with early identification and recruitment of top science, technology, engineering, and math talent.

Entry Level Hires

The NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), the Minority Serving Institutions Partnership Program (MSIPP), and, where appropriate, the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment in the NNSA nuclear security enterprise.

In FY 2021, the FSE appropriation will provide up to $1,400,000 for NGFP support and development activities. The NNSA will utilize the NGFP and PMF programs to recruit qualified professionals to oversee the growing NNSA mission.

Federal Salaries and Expenses
Funding by Congressional Control

(Dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020 Enacted
NNSA Federal Salaries and Expenses	410,000	434,699	454,000	+19,301
FTEs (paid from FSE)	1,645	1,753	1,836	83
FTEs (paid from WCF)	22	22	22	0
Total FTEs	1,667	1,775	1,858	83

Program Direction

(Dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020 Enacted
NNSA Federal Salaries and Expenses				
Headquarters				
Salaries and Benefits	210,996	228,995	245,159.92	+16,165
Travel	16,342	14,533	15,824	+1,291
Support Services	25,613	24,684	21,579	-3,105
Other Related Expenses	45,089	45,764	50,693	+4,929
Total, Headquarters	298,040	313,976	333,256	+19,280
Total, Full Time Equivalents	1,138	1,212	1,285	73
Livermore Field Office				
Salaries and Benefits	15,193	16,692	16,856	+164
Travel	337	333	333	+0
Support Services	831	621	524	-97
Other Related Expenses	1,230	1,470	1,212	-258
Total, Livermore Field Office	17,591	19,116	18,925	-191
Total, Full Time Equivalents	77	80	80	0
Los Alamos Field Office				
Salaries and Benefits	14,163	15,887	16,403	+516
Travel	443	439	458	+19
Support Services	541	541	456	-85
Other Related Expenses	501	446	372	-74
Total, Los Alamos Field Office	15,648	17,313	17,689	+376
Total, Full Time Equivalents	78	89	91	2

Program Direction, Continued

(Dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020 Enacted
Sandia Field Office				
Salaries and Benefits	14,616	15,546	15,885	+339
Travel	322	305	309	+4
Support Services	564	162	136	-26
Other Related Expenses	7,376	8,610	7,151	-1,459
Total, Sandia Field Office	22,878	24,623	23,481	-1,142
Total, Full Time Equivalents	83	84	85	1
Nevada Field Office				
Salaries and Benefits	13,176	14,842	15,382	+540
Travel	264	261	297	+36
Support Services	417	417	352	-65
Other Related Expenses	1,488	1,488	1,191	-297
Total, Nevada Field Office	15,345	17,008	17,222	+214
Total, Full Time Equivalents	68	76	78	2
NNSA Production Office (NPO)				
Salaries and Benefits	22,759	24,030	24,633	+603
Travel	575	562	580	+18
Support Services	377	377	318	-59
Other Related Expenses	2,344	2,338	1,874	-464
Total, NNSA Production Office	26,055	27,307	27,405	+98
Total, Full Time Equivalents	128	132	134	2

Program Direction, Continued

(Dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020 Enacted
Kansas City Field Office				
Salaries and Benefits	6,250	6,574	6,638	+64
Travel	230	224	224	+0
Support Services	333	-	-	+0
Other Related Expenses	659	659	641	-18
Total, Kansas City Field Office	7,472	7,457	7,503	+46
Total, Full Time Equivalents	38	38	38	0
Savannah River Field Office				
Salaries and Benefits	6,406	7,434	8,043	+609
Travel	202	192	238	+46
Support Services	157	157	132	-25
Other Related Expenses	206	116	106	-10
Total, Savannah River Field Office	6,971	7,899	8,519	+620
Total, Full Time Equivalents	35	42	45	3
NNSA Federal Salaries and Expenses				
Salaries and Benefits	303,559	330,000	349,000	+19,000
Travel	18,715	16,849	18,263	+1,414
Support Services	28,833	26,959	23,497	-3,462
Other Related Expenses	58,893	60,891	63,240	+2,349
Total, NNSA Federal Salaries and Expenses	410,000	434,699	454,000	+19,301
FTEs (paid from FSE)	1,645	1,753	1,836	83
FTEs (paid from WCF)	22	22	22	0
Total FTEs	1,667	1,775	1,858	83

Support Services and Other Related Expenses

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Support Services				
Management and Professional Services	23,416	21,449	17,987	-3,462
Environmental Safety and Health Support	253	253	253	+0
Corporate Project Management Support	5,164	5,257	5,257	+0
Total, Support Services	**28,833**	**26,959**	**23,497**	**-3,462**
Other Related Expenses				
Training	3,897	4,025	5,179	+1,154
Space and Occupancy Costs	15,984	15,854	16,385	+531

Support Services and Other Related Expenses, Continued

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Headquarters Working Capital Fund (WCF)				
Supplies	458	423	547	+124
Building Occupancy	18,650	12,164	20,946	+8,782
Telecommunications	6,656	8,879	0	-8,879
Corporate Training Services	220	429	507	+78
iMANAGE	2,405	2,405	2,405	+0
Overseas Representation	4,692	11,259	11,401	+142
Health Services	112	270	323	+53
TOTAL, Headquarters Working Capital Fund (WCF)	33,193	35,829	36,129	+300
Other Expenses				
Other Services	5,807	5,166	5,530	+364
Reception and Representation	12	17	17	+0
Subtotal, Other Expenses	5,819	5,183	5,547	+364
Total, Other Related Expenses	**58,893**	**60,891**	**63,240**	**+2,349**

Federal Salaries and Expenses
Program Direction

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Salaries and Benefits $330,000,000	**Salaries and Benefits $349,000,000**	**Salaries and Benefits +$19,000,000**
• Provides support for an NNSA federal staff of 1,753 full-time equivalents (FTEs) • Includes 3.1% pay raise and 5.5% benefit escalation	• Provides support for an NNSA federal staff of 1,836 FTEs, not including 22 that are funded through the WCF • Includes 1% pay raise and 5.5% benefit escalation • Consistent with the President's Management Agency Workforce Cross Agency Priority Goal, and other performance management objectives, award spending will increase by 1% for non-SES, SL, and ST employees.	• Increase reflects 83 FTEs above the FY 2020 planned level • Reflects 1% pay raise and 5.5% benefit escalation • Increase at headquarters primarily in Defense Programs to support the next phase of the modernization program • Increase at Savannah River Field Office to support Pit Production
Travel $16,849,000	**Travel $18,263,000**	**Travel +$1,414,000**
• Supports domestic and foreign travel necessary as part of NNSA's mission	• Supports domestic and foreign travel necessary as part of NNSA's mission	• Reflects increased mission requirements and increased travel related to training
Support Services $26,959,000	**Support Services $23,497,000**	**Support Services -$3,462,000**
• Includes Management and Professional Services; Environment Safety and Health support; NGFP support ($21,702,000) • Includes Corporate Project Management program ($5,257,000)	• Includes Management and Professional Services; Environment Safety and Health support; NGFP support ($18,240,000) • Includes Corporate Project Management program ($5,257,000)	• **Management of Professional Services** (-$3,462,000): Reflects reductions due to ramp up of Federal staff

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Other Related Expenses $60,891,000	**Other Related Expenses $63,240,000**	**Other Related Expenses +$2,349,000**
• Provides funding for Space and Occupancy costs at Headquarters and field sites ($15,854,000). • Includes FSE's contribution to the DOE WCF ($35,829,000) • Provides necessary training and skills maintenance of the NNSA federal staff ($4,025,000) • Includes funding for miscellaneous procurements ($5,183,000)	• Provides funding for Space and Occupancy costs at Headquarters and field sites ($16,385,000). • Includes FSE's contribution to the DOE WCF ($36,129,000) • Provides necessary training and skills maintenance of the NNSA federal staff ($5,179,000) • Includes funding for miscellaneous procurements ($5,547,000)	• **Space and Occupancy** (+$531,000): Reflects a decrease of $2,400,000 in field space & occupancy to draw down uncosted balances, offset by an increase for required facility upgrades • **Working Capital Fund** (+$300,000): Reflects transfer of the Telecommunications Business Line cost of $8,547,000 to Weapons Activities ($7,350,000) and Defense Nuclear Nonproliferation ($1,197,000); total requirements consistent with prior years, FY 2020 requirements relied on uncosted balances • **Training** (+$1,154,000): Increase to address future workforce needs and administration priorities, advance employee competencies, and demonstrate NNSA's commitment to the strategic development of all employees • **Other Expenses (**+$364,000): Total requirements consistent with prior years

DEPARTMENT OF ENERGY
Funding by Site Detail
Federal Salaries and Expenses
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Argonne National Laboratory			
Federal Salaries and Expenses Programs	945	428	428
Total Argonne National Laboratory	**945**	**428**	**428**
Consolidated Business Center			
Federal Salaries and Expenses Programs	2,100	2,100	2,100
Total Consolidated Business Center	**2,100**	**2,100**	**2,100**
Kansas City Site Office			
Federal Salaries and Expenses Programs	7,472	7,457	7,503
Total Kansas City Site Office	**7,472**	**7,457**	**7,503**
Livermore Site Office			
Federal Salaries and Expenses Programs	17,591	19,116	18,925
Total Livermore Site Office	**17,591**	**19,116**	**18,925**
Los Alamos Site Office			
Federal Salaries and Expenses Programs	15,648	17,313	17,689
Total Los Alamos Site Office	**15,648**	**17,313**	**17,689**
National Energy Technology Lab			
Federal Salaries and Expenses Programs	113	113	113
Total National Energy Technology Lab	**113**	**113**	**113**
Nevada Field Office			
Federal Salaries and Expenses Programs	15,345	17,008	17,222
Total Nevada Field Office	**15,345**	**17,008**	**17,222**
NNSA Production Office (NPO)			
Federal Salaries and Expenses Programs	23,955	25,207	25,305
Total NNSA Production Office (NPO)	**23,955**	**25,207**	**25,305**
Oak Ridge Institute for Science & Education			
Federal Salaries and Expenses Programs	570	570	570
Total Oak Ridge Institute for Science & Education	**570**	**570**	**570**
Oak Ridge National Laboratory			
Federal Salaries and Expenses Programs	81	81	81
Total Oak Ridge National Laboratory	**81**	**81**	**81**
Pacific Northwest National Laboratory			
Federal Salaries and Expenses Programs	0	1,400	1,400
Total Pacific Northwest National Laboratory	**0**	**1,400**	**1,400**
Sandia National Laboratories			
Federal Salaries and Expenses Programs	22,878	24,623	23,481
Total Sandia National Laboratories	**22,878**	**24,623**	**23,481**
Savannah River Operations Office			
Federal Salaries and Expenses Programs	6,971	7,899	8,519
Total Savannah River Operations Office	**6,971**	**7,899**	**8,519**

DEPARTMENT OF ENERGY
Funding by Site Detail
Federal Salaries and Expenses
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Washington Headquarters			
Federal Salaries and Expenses Programs	296,331	311,384	330,664
Total Washington Headquarters	**296,331**	**311,384**	**330,664**

Weapons Activities

Weapons Activities

FY 2021 Congressional Budget Justification

Weapons Activities

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Weapons Activities
Proposed Appropriation Language

For Department of Energy expenses, including the purchase, construction, and acquisition of plant and capital equipment and other incidental expenses necessary for atomic energy defense weapons activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, and the purchase of not to exceed *one aircraft,* one ambulance, *and two passenger buses* for replacement only, [$12,457,097,000] *$15,602,000,000* to remain available until expended: Provided, That of such amount, [$107,660,000] *$123,684,000* shall be available until September 30, [2021] *2022*, for program direction.

Explanation of Change

Changes to appropriations language consist of adding authority to procure an aircraft and two passenger buses, changing amounts for the total appropriation and program direction, and changing the year so that program direction funding maintains a two-year period of availability. Funding increases support the ramp-up of the significant number of initiatives to support warhead upgrade rates of about one life extension program per decade to roughly five by 2030. Examples are the W80-4 Life Extension Program and the W87-1 Modification Program, plutonium pit production at Los Alamos National Laboratory and the Savannah River Site, modernization of NNSA's infrastructure, new depleted uranium scope to address near-term requirements, and research, technology, and engineering investments to support the current and future stockpile.

Public Law Authorizations

- P.L 106-65, National Nuclear Security Administration Act, as amended
- P.L 116-92, National Defense Authorization Act for FY 2020
- P.L 116-94, Further Consolidated Appropriations Act, 2020

Weapons Activities

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Weapons Activities	11,113,080	12,457,097	15,602,000	+3,144,903
Use of Prior Year Balances	-13,080	0	0	0
Total, Weapons Activities	**11,100,000**	**12,457,097**	**15,602,000**	**+3,144,903**

Overview

Programs funded in the Weapons Activities appropriation support the Nation's current and future defense posture and necessary nationwide infrastructure of science, technology, engineering and production capabilities without resuming nuclear explosive testing. Weapons Activities provides for the maintenance and refurbishment of nuclear weapons to continue sustained confidence in their safety, reliability, and military effectiveness; investment in scientific, engineering, and manufacturing capabilities for certification of the enduring nuclear weapons stockpile; and manufacture of nuclear weapon components. Weapons Activities also provides for maintenance and investment in the National Nuclear Security Administration (NNSA) nuclear complex infrastructure to be more responsive and resilient. This increase reflects investments to the infrastructure needed to sustain the U.S. nuclear stockpile. Over the past several decades, the U.S. nuclear weapons infrastructure has suffered the effects of age and underfunding.

NNSA's Management and Operating (M&Os) contractors employ approximately 50,000 people across the enterprise, predominantly at eight geographical sites; NNSA M&O partners are managed by a Federal workforce composed of civilian and military staff. Additional details about these programs will be included in the FY 2021 Stockpile Stewardship and Management Plan (SSMP).

Highlights and Major Changes in the FY 2021 Budget

The FY 2021 Weapons Activities appropriation reflects an updated structure that more effectively aligns with legacy and future weapons activities efforts; strategic materials production facilities and capabilities modernization efforts; and research, technology, and engineering efforts. The budget structure for the FY 2021 request improves alignment with current and future scope; consolidates similar activities; and facilitates improved program execution by grouping activities by how they are managed. These changes further simplify budget categories for effectiveness, accountability, and responsiveness. Crosswalk tables in the individual narratives reflect changes from the FY 2020 enacted budget structure to the new budget structure in the FY 2021 request.

Stockpile Management

The Stockpile Management program maintains a safe, secure, and militarily effective nuclear weapons stockpile; continues production for the majority of components on the B61-12 and W88 Alt 370; continues work to deliver the W80-4 Life Extension Program (LEP) and W87-1 Modification Program; begins Phase 1 (concept and Assessment Refinement activities) for the W93; sustains the current active stockpile to include the Annual Assessment Process; meets required stockpile sustainment activities to include maintenance, surveillance, development, and program planning; provides safe and secure dismantlement of nuclear weapons and components in accordance with the Nuclear Weapons Stockpile Plan; and provides sustainment of needed manufacturing capabilities and capacities, including process improvements, quality assurance and investments focused on increased efficiency of production operations. The Stockpile Management program encompasses four major subprograms that directly support the nation's nuclear weapons stockpile.

<u>Stockpile Major Modernization</u>

Stockpile Major Modernization is the stockpile management subprogram necessary to extend the expected life of stockpile systems for an additional 20 to 30 years and to develop warheads for new Department of Defense (DOD) delivery platforms, that are both based on current stockpile warheads and consistent with current military capabilities, for which current stockpile warheads cannot be made to work without significant impacts to required military requirements. NNSA, in conjunction with the Department of Defense (DOD), executes a LEP following the joint NNSA-DOD Phase 6.X weapons acquisition process guidelines, which provides a framework to conduct and manage refurbishment activities for existing weapons. Phase 6.1 (Concept Assessment) should provide sufficient information for the Nuclear Weapons Council (NWC) to authorize Phase 6.2 (Feasibility Study and Design Options). Follow-on phases include: Phase 6.2A (Design Definition and

Cost Study), Phase 6.3 (Development Engineering), Phase 6.4 (Production Engineering), Phase 6.5 (First Production) and Phase 6.6 (Full-Scale Production). The term "refurbishment" in this budget justification refers to all nuclear weapon alterations and modifications, including LEPs, modernization, and revised military requirements. The W93 modernization activity will utilize the joint NNSA-DoD phase 1-7 weapons acquisition process that is very similar to the Phase 6.X process.

Stockpile Sustainment

Stockpile Sustainment directly executes sustainment activities for the total (active and inactive) stockpile for the B61, W76, W78, W80, B83, W87, and W88 weapons. As required by 50 United States Code 2525, safety, security, and effectiveness assessments are carried out annually to determine whether the systems continue to meet their certified requirements without the need for an underground nuclear explosive test. Sustainment activities for each weapon system includes surveillance activities, Weapon Assessment activities, minor alterations (Alts), and production of limited life components (LLCs).

Weapons Dismantlement and Disposition

Weapons Dismantlement and Disposition (WDD) is a critical element of NNSA's integrated effort to transform the enterprise and the stockpile. Specific activities include weapons disassembly, recycling of material and hardware for LEPs, disposition of retired warhead system components, and ensuring components are available for safety testing. Other supporting activities specific to retired warheads include conducting hazard assessments, issuing safety analysis reports, conducting laboratory and production plant safety studies, and declassification and sanitization of component parts. WDD relies on several enabling programs to complete its mission, such as the Office of Stockpile Production Integration for shipping, receiving, and equipment maintenance; Infrastructure and Operations for infrastructure sustainment and containers; and the Office of Secure Transportation for the movement of weapons and weapon components. Activities in FY 2021 continue weapon and Canned Subassembly (CSA) dismantlements, component recycle requirements, and reduction of legacy component inventories.

Production Operations

The production mission is defined as weapon assembly, weapon disassembly, component production, surveillance, and weapon safety and reliability testing. Production Operations also enables the modernization of production capabilities to improve efficiency and ensure manufacturing operations meet future requirements. Production Operations requires close coordination with the Advanced Manufacturing Development program, which is charged with development and initial deployment of new manufacturing and production capabilities. Production Operations provide the multi-system manufacturing base that enables the individual site capability and capacity that will sustain NNSA's nuclear security enterprise's production mission in FY 2021.

Production Modernization

The Production Modernization program focuses on the production capabilities of nuclear weapons – including primaries, canned subassemblies (multiple components and materials), and radiation cases and non-nuclear components – which are critical to weapon performance.

Primary Capability Modernization

- The Primary Capability Modernization program consolidates management of nuclear material processing capabilities in the NNSA nuclear security enterprise needed for the production of primaries. The program includes (1) Plutonium Modernization and (2) High Explosives and Energetics. Activities in FY 2021 continue to restore the Nation's capability to produce 80 pits per year (ppy) by 2030. Critical activities include the performance of certification tests supporting production of the first War Reserve (WR) pit in 2023. The remaining equipment and infrastructure to achieve 30 pits in 2026 will be carried out as a line item as directed by Congress. FY 2021 funding will also support pit production activities at the Savannah River Site for the implementation of the Savannah River Plutonium Processing Facility (SRPPF) to include maturing the conceptual design, site and facility preparation, long lead procurement, and personnel hiring to meet ongoing and future pit production needs. Design work in support of SRPPF will include facility Balance of Plant, gloveboxes, and equipment layout. Primary Capability Modernization also supports qualification of explosive, pyrotechnic, and propellant materials for supplying NNSA's Nuclear Security Enterprise (NSE) across five M&O sites. Additionally, funds will be used to complete de-inventory of LANL Chemistry and Metallurgy Research (CMR), improve PF-4 vault facilities efficiency through inventory work off and optimization of footprint to support the transition to

plutonium production and improve Material at Risk (MAR) posture, and provide storage/staging and inventory management capabilities at LANL and Nevada National Security Site (NNSS) is support of Plutonium Pit Production Mission. Additionally, will provide a stable supply of all energetic materials to enable system and component level development and production and complete specification for Triaminotrinitrobenzene (TATB)/polymer-bonded explosives (PBX)-9502.

Secondary Capability Modernization

The Secondary Capability Modernization program is responsible for restoring and increasing manufacturing capabilities for nuclear weapon secondary stages to required levels within the NSE. This includes ensuring the availability of strategic materials and other sub-component streams that are managed by NNSA, as well as modernizing the facilities and operations required to process these materials and then fabricate and assemble the final components. The program includes (1) Uranium Modernization; (2) Depleted Uranium Modernization; and (3) Lithium Modernization In FY 2021, the program will continue activities that will allow NNSA to eventually phase out mission dependency on Building 9212 by supporting the transition of enriched uranium capabilities into existing and new-build facilities and deactivating out-of-service systems in Building 9212. The program will:

- Continue material de-inventory efforts to reduce safety and security risks; achieve and maintain target working inventory levels; and optimize the material composition of the uranium inventory;
- Develop, sustain, and increase the reliability of uranium analytical and manufacturing capabilities to reduce mission risks;
- Extend the operational life of enduring enriched uranium facilities;
- Reestablish radiation case production capacity;
- Continue purified metal-to-metal production and the processing and disposition of legacy materials to phase out mission dependency on Building 9212; and
- Improve HEU feedstock quality before and during transition to the new and enduring facilities.

Tritium and Domestic Uranium Enrichment

In FY 2021, Tritium Modernization will produce, recover, and recycle tritium to support national security. Tritium is indispensable to the proper functioning of the stockpile; however, tritium decays at approximately 5.5% per year. Thus, to maintain the required tritium inventory and to meet future requirements, tritium must be produced to replace what has decayed or to provide additional tritium if the inventory needs to be increased. The Domestic Uranium Enrichment (DUE) Program is responsible for establishing a reliable supply of enriched uranium to support U.S. national security and nuclear nonproliferation needs. NNSA requires unobligated enriched uranium to meet stockpile requirements, fuel reactors that produce tritium, and power the U.S. Navy. In addition, NNSA requires enriched uranium, but not necessarily unobligated enriched uranium, to fuel research and medical isotope reactors as part of its nonproliferation mission.

Non-Nuclear Capability Modernization

The Non-Nuclear Capability Modernization program provides funding to modernize production of non-nuclear components for active stockpile systems and in support of warhead modernization activities and production. In FY 2021, this program will consolidate management and oversight of strategic investments in technology, equipment, infrastructure, tools, and materials which focus on improving and/or increasing the capability and capacity of the Enterprise to manufacture stockpile components in component categories that include (but are not limited to): Cable Assemblies; Neutron Generators, Polymers; Electronic Assemblies; Gas Transfer System Production; Mechanisms; Microelectronics Packaging; Power Sources; Radiation Hardened Microelectronics; Testers, and Lighting Arrest Connectors.

Stockpile Research, Technology, and Engineering

The Stockpile Research, Technology, and Engineering (SRT&E) provides the foundation for science-based stockpile decisions, tools, and components; focuses on the most pressing investments nuclear security enterprise needs to meet DoD warhead needs and schedules; and enables assessment and certification capabilities used throughout the NSE. The program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without additional nuclear explosive testing. Funding requested for FY 2021 supports the continued implementation of the Enhanced Capabilities for Subcritical Experiments (ECSE) program and the procurement of and site preparation at Lawrence Livermore

National Laboratory for NNSA's first Exascale system to be delivered in 2022 and ready for program use in 2023. Both of these capabilities are needed to meet W80-4 LEP and W87-1 Modification certification requirements.

Assessment Science

The Assessment Science program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without nuclear explosive testing. Capabilities developed and maintained in the Assessment Science program provide: (1) the scientific underpinnings required to conduct annual assessments of weapon performance and certification of LEPs, (2) the information required to understand the impacts of surveillance findings to assure that the nuclear stockpile continues to remain safe, secure, and effective, and (3) the core technical expertise required to be responsive to technical developments and geopolitical drivers in FY 2021. Assessment Science deliverables also facilitate the assessment of current weapon and weapon component lifetimes, development and qualification of modern materials and manufacturing processes, certain concepts for component reuse, and modern safety concepts for sustainment.

Engineering and Integrated Assessments

The Engineering and Integrated Assessments Program is responsible for ensuring system agnostic survivability in present and future Stockpile to Target Sequences. This program supports four key mission areas: (1) strengthening the science, technology, and engineering base by maturing advanced technologies to improve future weapon systems, (2) providing tools for qualifying weapon components and certifying weapons without nuclear explosive testing, (3) supporting annual stockpile assessments through improved weapons surveillance technologies and warhead component aging assessments, and (4) providing capabilities that accelerate the nuclear weapons acquisition process and strengthen the ability of the United States to respond to unexpected developments that could threaten nuclear security.

Inertial Confinement Fusion

The Inertial Confinement Fusion (ICF) Program provides data, experimental tools, and supporting expertise required for the ongoing assessment and certification of the nuclear weapon stockpile. As nuclear warheads proceed through their LEP process, new materials and components must be qualified and accepted. The ICF Program activities in FY 2021 support the assessment of legacy stockpile systems, and qualification and certification of the LEPs by providing experimental and computational scientific capabilities that deliver a credible knowledge basis for the behavior of both existing materials and components residing in our enduring stockpile systems and new materials and components relevant to life-extended systems.

Advanced Simulation and Computing

The Advanced Simulation and Computing (ASC) program provides high-end simulation capabilities (e.g. modeling codes, computing platforms, and supporting infrastructure) to meet the requirements of the Stockpile Stewardship Program (SSP). Modeling the complexity of nuclear weapons systems is essential to maintaining confidence in the performance of our stockpile without additional nuclear explosive testing. The ASC program provides the weapon codes that provide the integrated assessment capability supporting annual assessment and future sustainment program qualification and certification of the stockpile. ASC is an integral element of the Stewardship Capability Delivery Schedule, as described in the SSMP. ASC will continue to provide critical capabilities that help inform decision-making related to the sustainment of the nuclear stockpile in support of U.S. national security objectives in FY 2021. The program also coordinates with the NNSA and other government agencies, to support nonproliferation, emergency response, nuclear forensics, and attribution activities.

Weapon Technology and Manufacturing Maturation

The Weapon Technology and Manufacturing Maturation program is responsible for developing agile, affordable, assured, and responsive technologies and capabilities for nuclear stockpile sustainment and modernization to enable Defense Programs' mission success and the future success of the NSE and will continue these activities in FY 2021. The core areas of work include agile, assured, and affordable technologies; partnership with stakeholders to meet stockpile and customer requirements; qualification and certification; and skilled technical workforce and enhanced capabilities.

Academic Programs

NNSA funds scientific academic programs in FY 2021 to develop the next generation of highly trained technical workers able to support its core mission and to ensure there is a strong community of technical peers, external to the NNSA national

laboratories, capable of providing peer review and scientific competition to strengthen the basic fields of research relevant to the NNSA.

Infrastructure and Operations (I&O)
I&O maintains, operates, and modernizes the NNSA infrastructure in a safe and secure manner to support program execution while seeking to maximize return on investment, enabling program results and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools. For FY 2021, the request increases funding for Operations of Facilities, Safety and Environmental Operations, Maintenance and Repair of Facilities, Recapitalization, and both Programmatic and Mission Enabling Construction, which will support production of 30 pits per year at Los Alamos National Laboratory (LANL), meet LEP schedules at Kansas City, and address requirements within the NPR for infrastructure modernization. Furthermore, the funding will reduce deferred maintenance; execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; reduce operating costs by replacing old, degraded facilities with new, more efficient facilities; and reduce safety, security, environmental, and program risk.

The FY 2021 request supports an increase in Programmatic Construction funding for the Uranium Processing Facility (UPF) project, which will help phase out mission dependency on existing, aged facilities at the Y-12 National Security Complex. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project, the U1a Complex Enhancements Project, the Lithium Processing Facility, the Tritium Finishing Facility, the High Explosive Science & Engineering Facility, the Exascale Computing Facility Modernization project, Phase III of the TA-55 Reinvestment Project, the HE Synthesis, Formulation and Production project, and the Transuranic Liquid Waste Facility project. The increase in Mission Enabling Construction supports the transition to construction for the Nevada 138kV Power Transmission System Replacement project and the Emergency Operations Centers (EOCs) at LLNL and Sandia National Laboratories (SNL).

Capital Acquisition Planning (CAP) Process
The NNSA developed the CAP (formerly CapAx) process to integrate the Weapons Activities planning, programming, budgeting and evaluation process with the DOE O 413.3B Capital Acquisition Process. This effort mirrors the NNSA LEP planning process by leveraging site expertise, programmatic reviews, and independent federal cost and schedule estimates. Representatives from all the sites and responsible federal offices provide support across NNSA. Senior NNSA leadership determines plans for the final 25-year schedule of major projects. This schedule includes both ongoing projects and new project proposals.

Planning for Programmatic Construction (Pre-CD-1)
Per DOE capital acquisition policy, Critical Decision 0 and Critical Decision 1— Approve Mission Need and Approve Alternative Selection and Cost Range, respectively—are prerequisites to commencing the execution phase of a line-item capital acquisition project. Both Critical Decisions (CD) include the development and approval of numerous deliverables, necessitating Other Project Cost (OPC) funding. The FY 2021 Budget Request consolidates Weapons Activities OPC funding for pre-CD-1 programmatic construction projects in a single control point in order to improve transparency when starting programmatic construction projects.

The following deliverables are required prior to achieving CD-0 for all NNSA line-item projects: a Mission Need Statement, a CD-0 Rough Order of Magnitude Estimate, and a Program Requirements Document. In addition, projects with an estimated cost greater than $750 million require an Independent Cost Review and nuclear facilities require a safety-in-design document. A Project Data Sheet is developed to be used for requesting funding after a Mission Need has been approved.

Following Mission Need Approval, the following deliverables are required prior to achieving CD-1 for all-line-item projects: Acquisition Strategy, Preliminary Project Execution Plan with a Tailoring Strategy (if required), Risk Management Plan, development of a Conceptual Design, Conceptual Design Report, an Analysis of Alternatives, Preliminary Hazard Analysis Report, Integrated Safety Management Plan, establishment of a Quality Assurance Program, National Environmental Policy Act Strategy, Environmental Compliance Strategy, updated Project Data Sheet, and Preliminary Security Vulnerability Assessment. In addition, projects with an estimated cost greater than $100 million require an Independent Cost Estimate and/or an Independent Cost Review. Furthermore, projects with an estimate cost greater than $750 million require the following: a Design Management Plan, a Technology Readiness

Assessment, and a Technology Maturation Plan if necessary. Finally, nuclear facilities require: Code of Record, Safety Design Strategy, Independent Project Review, Conceptual Safety Design Report, and a Safety Review Letter.

Secure Transportation Asset (STA)

STA supports the safe and secure transportation of nuclear weapons, special nuclear material, and weapon components to meet projected DOE, DOD, and other customer requirements. STA Program Direction provides funding for salaries and expenses of the secure transportation workforce, including federal agents (FA). The FY 2021 budget request supports modernizing STA transportation assets, including a replacement for STA's obsolete DC-9 aircraft; life extension of the Safeguards Transporter (SGT) (until the Mobile Guardian Transporter becomes operational in FY 2025); vehicle sustainment, replacement armored tractors, escort and support vehicles; and upgrade of the Tractor Control Unit (TCU) to accommodate communications and security and continued development and testing of the Mobile Guardian Transporter. Funding also supports a commitment to a stable human resources strategy to maintain the staff of Federal agents.

Defense Nuclear Security (DNS)

DNS provides protection for NNSA personnel, facilities, nuclear weapons, and materials from a full spectrum of threats, ranging from minor security incidents to acts of terrorism, at its national laboratories, production plants, processing facilities, and the Nevada National Security Site (NNSS). In addition, DNS provides nuclear security expertise for a broad set of 21st century national security needs, in line with its core mission, such as those in defense nuclear nonproliferation, homeland security, and intelligence. Employing more than 1,500 Protective Force officers, DNS secures more than 4,400 buildings and protects more than 50,000 personnel. The Budget Request for FY 2021 includes funding to fill positions in key security program areas required to implement a risk-based, layered protection strategy at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accounting (MC&A), and security program operations and planning. The Request also supports sustaining operations of and implementing improvements to the classified network that supports the NNSA special access programs (SAP) and sustaining implementation and operation of counter unmanned aircraft systems (CUAS) at sites possessing Category 0/I special nuclear material (SNM). The increased funding includes resourcing to address pit production at Los Alamos and known mission growth across the NNSA's NSE. It also includes funding to continue efforts to recapitalize security infrastructure through security incident response plan (SIRP) projects, which address high-priority security systems and related security infrastructure and equipment refresh needs; and the West End Protected Area Reduction (WEPAR) project, which will install a new Perimeter Intrusion Detection and Assessment System (PIDAS) section, reducing the Y-12 Protected Area by approximately 50%.

Information Technology and Cybersecurity

NNSA's Office of Information Management (IM) provides a range of information technology (IT) and Cybersecurity support functions, activities and manages cybersecurity operations and program areas at within NNSA's laboratories, plants, and sites. Additionally, the program executes and coordinates Public Key Infrastructure and other Committee on National Security Systems requirements, and leverages IT modernization efforts across the NNSA nuclear security enterprise to increase the efficiency and cost-effectiveness of NNSA IT services consistent with DOE strategies. The FY 2021 request enables the development of integrated IT initiatives that provide an effective and secure technology infrastructure to provide adequate support to the NNSA NSE shared services. These initiatives will fundamentally redesign the NNSA IT environments to provide a more secure and agile set of capabilities including unified communication, agile cloud infrastructure, and next-generation collaboration services across the NSE. Additionally, the NNSA Information Technology and Cybersecurity Program will create a plan to utilize information technology research and development capabilities, operational technology, and artificial intelligence in order to implement tools and capabilities to secure future NNSA operations.

DOE Working Capital Fund (WCF) Support

NNSA Weapons Activities appropriation projected contribution to the DOE WCF for FY 2021 is $32,530,000. This funding covers certain shared enterprise activities including managing enterprise-wide systems, data, and telecommunications and supporting the integrated acquisition environment.

Legacy Contractor Pensions
This funding provides the Weapons Activities share of the DOE's annual reimbursement made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The UCRP benefit for these individuals is a legacy cost and required by contract. The annual reimbursement is based on the actuarial valuation report and an annual assessment provided by UC and is covered by the terms described in the contracts. These contracts are paid through the Legacy Contractor Pensions line item.

Entry Level Hires
The NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), the Minority Serving Institutions Partnership Program (MSIPP), and the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment in the NNSA nuclear security enterprise. In FY 2021, the Weapons Activities appropriation anticipates spending approximately $7,797,751 on the NGFP program.

Weapons Activities
Funding by Program (Non-Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Weapons Activities Appropriation				
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	794,049	792,611	0	-792,611
W76 Life Extension Program	48,888	0	0	0
W76-2 Modification Program	65,000	10,000	0	-10,000
W88 Alteration Program	304,285	304,186	0	-304,186
W80-4 Life Extension Program	654,766	898,551	0	-898,551
IW-1	53,000	0	0	0
W87-1 Modification Program	0	112,011	0	-112,011
W93	0	0	0	0
Total, Life Extension Programs and Major Alterations	1,919,988	2,117,359	0	-2,117,359
Stockpile Systems				
Stockpile Systems				
B61 Stockpile Systems	64,547	71,232	0	-71,232
W76 Stockpile Systems	84,300	89,804	0	-89,804
W78 Stockpile Systems	81,329	81,299	0	-81,299
W80 Stockpile Systems	80,204	80,204	0	-80,204
B83 Stockpile Systems	35,082	51,543	0	-51,543
W87 Stockpile Systems	83,107	98,262	0	-98,262
W88 Stockpile Systems	170,913	157,815	0	-157,815
Total, Stockpile Systems	599,482	630,159	0	-630,159
Weapons Dismantlement and Disposition	56,000	56,000	0	-56,000
Stockpile Services				
Production Support	510,000	543,964	0	-543,964
Research and Development Support	36,150	39,339	0	-39,339
R&D Certification and Safety	201,840	236,235	0	-236,235
Management, Technology, and Production	300,736	305,000	0	-305,000
Total, Stockpile Services	1,048,726	1,124,538	0	-1,124,538
Strategic Materials				
Uranium Sustainment	87,182	94,146	0	-94,146
Plutonium Sustainment				
Plutonium Sustainment Operations	286,282	691,284	0	-691,284
Plutonium Pit Production Project	75,000	21,156	0	-21,156
Total, Plutonium Sustainment	361,282	712,440	0	-712,440
Tritium Sustainment	290,275	269,000	0	-269,000
Lithium Sustainment	29,135	28,800	0	-28,800
Domestic Uranium Enrichment	50,000	70,000	0	-70,000
HEU Downblend		90,000	0	-90,000
Strategic Materials Sustainment	216,196	256,808	0	-256,808
Total, Strategic Materials	1,034,070	1,521,194	0	-1,521,194
Total, Directed Stockpile Work	**4,658,266**	**5,449,250**	**0**	**-5,449,250**

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	0	0	815,710	+815,710
W76 Life Extension Program	0	0	0	0
W76-2 Modification Program	0	0	0	0
W88 Alteration Program	0	0	256,922	+256,922
W80-4 Life Extension Program	0	0	1,000,314	+1,000,314
W87-1 Modernization Program	0	0	541,000	+541,000
W93	0	0	53,000	53,000
Total, Stockpile Major Modernization	0	0	2,666,946	+2,666,946
Stockpile Sustainment	0	0	998,357	+998,357
Weapons Dismantlement and Disposition	0	0	50,000	+50,000
Production Operations	0	0	568,941	+568,941
Total, Stockpile Management	**0**	**0**	**4,284,244**	**+4,284,244**
Production Modernization				
Primary Capability Modernization				
Plutonium Modernization				
Los Alamos Plutonium Modernization				
Los Alamos Plutonium Operations	0	0	610,599	+610,599
21-D-512 Plutonium Pit Production Project, LANL	0	0	226,000	+226,000
Subtotal, Los Alamos Plutonium Modernization	0	0	836,599	+836,599
Savannah River Plutonium Modernization				
Savannah River Plutonium Operations	0	0	200,000	+200,000
21-D-511 Savannah River Plutonium Processing Facility, SRS	0	0	241,896	+241,896
Subtotal, Savannah River Plutonium Modernization	0	0	441,896	+441,896
Enterprise Plutonium Support	0	0	90,782	+90,782
Total, Plutonium Modernization	0	0	1,369,277	+1,369,277
High Explosives & Energetics	0	0	67,370	+67,370
Total, Primary Capability Modernization	0	0	1,436,647	+1,436,647
Secondary Capability Modernization	0	0	457,004	+457,004
Non-Nuclear Capability Modernization	0	0	107,137	+107,137
Tritium and Domestic Uranium Enrichment	0	0	457,112	+457,112
Total, Production Modernization	**0**	**0**	**2,457,900**	**+2,457,900**

	(Dollars in Thousands)			
	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Research, Development, Test and Evaluation				
Science				
Advanced Certification	57,710	57,710	0	-57,710
Primary Assessment Technologies	89,313	95,169	0	-95,169
Dynamic Materials Properties	120,000	128,000	0	-128,000
Advanced Radiography	32,544	32,710	0	-32,710
Secondary Assessment Technologies	77,553	77,553	0	-77,553
Academic Alliances and Partnerships	53,364	56,000	0	-56,000
Enhanced Capabilities for Subcritical Experiments	50,000	145,160	0	-145,160
Total, Science	**480,484**	**592,302**	**0**	**-592,302**
Engineering				
Enhanced Surety	39,717	43,000	0	-43,000
Weapons Systems Engineering Assessment Technology	23,029	0	0	0
Delivery Environments (formerly Weapons Systems Engineering Assessment Technology)	0	35,945	0	-35,945
Nuclear Survivability	48,230	53,932	0	-53,932
Studies and Assessments	0	5,607	0	-5,607
Enhanced Surveillance	45,147	55,000	0	-55,000
Stockpile Responsiveness	34,000	70,000	0	-70,000
Total, Engineering	**190,123**	**263,484**	**0**	**-263,484**
Inertial Confinement Fusion Ignition and High Yield				
Ignition	0	0	0	0
Support of Other Stockpile Programs	0	0	0	0
Ignition and Other Stockpile Programs	101,140	106,000	0	-106,000
Diagnostics, Cryogenics and Experimental Support	77,915	75,000	0	-75,000
Pulsed Power Inertial Confinement Fusion	6,596	8,571	0	-8,571
Joint Program in High Energy Density Laboratory Plasmas	8,492	8,492	0	-8,492
Facility Operations and Target Production	350,791	366,937	0	-366,937
Total, Inertial Confinement Fusion Ignition and High Yield	**544,934**	**565,000**	**0**	**-565,000**
Advanced Simulation and Computing				
Advanced Simulation and Computing	670,119	789,849	0	-789,849
Construction				
18-D-670 Exascale Class Computer Cooling Equipment, LANL	24,000	0	0	0
18-D-620 Exascale Computing Facility Modernization Project, LANL	23,000	50,000	0	-50,000
Subtotal, Construction	47,000	50,000	0	-50,000
Total, Advanced Simulation and Computing	**717,119**	**839,849**	**0**	**-839,849**
Advanced Manufacturing Development				
Additive Manufacturing	12,000	18,500	0	-18,500
Component Manufacturing Development	38,644	48,410	0	-48,410
Process Technology Development	30,914	70,000	0	-70,000
Total, Advanced Manufacturing Development	**81,558**	**136,910**	**0**	-136,910
Total, RDT&E	**2,014,218**	**2,397,545**	**0**	**-2,397,545**

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Research, Technology, and Engineering				
Assessment Science	0	0	613,124	+613,124
Engineering and Integrated Assessments	0	0	127,495	+127,495
Inertial Confinement Fusion	0	0	380,000	+380,000
Advanced Simulation and Computing	0	0	697,152	+697,152
Weapon Technology and Manufacturing Maturation	0	0	122,000	+122,000
Academic Programs	0	0	53,000	+53,000
Total, Stockpile Research and Engineering	**0**	**0**	**1,992,771**	**+1,992,771**
Infrastructure and Operations				
Operating				
Operations of Facilities	870,000	900,000	1,014,000	+114,000
Safety and Environmental Operations	110,000	110,000	165,354	+55,354
Maintenance and Repair of Facilities	515,000	456,000	792,000	+336,000
Recapitalization				
Infrastructure and Safety	450,000	447,657	670,000	+222,343
Capability Based Investments	109,057	135,341	149,117	+13,776
Planning for Programmatic Construction (Pre-CD-1)	0	0	84,787	84,787
Subtotal, Recapitalization	559,057	582,998	903,904	+320,906
Total, Operating	**2,054,057**	**2,048,998**	**2,875,258**	**+826,260**
Construction				
Programmatic Construction	985,842	1,087,444	1,386,319	+298,875
Mission Enabling Construction	47,953	15,000	122,000	+107,000
Total, Construction	**1,033,795**	**1,102,444**	**1,508,319**	**+405,875**
Total, Infrastructure and Operations	**3,087,852**	**3,151,442**	**4,383,577**	**+1,232,135**
Secure Transportation Asset				
Operations and Equipment	176,617	185,000	266,390	+81,390
Program Direction	102,022	107,660	123,684	+16,024
Total, Secure Transportation Asset	**278,639**	**292,660**	**390,074**	**+97,414**
Defense Nuclear Security				
Operations & Maintenance	690,638	750,000	815,895	+65,895
Construction				
17-D-710 West End Protected Area Reduction Project, Y-12	0	25,000	11,000	-14,000
Subtotal, DNS: Construction	0	25,000	11,000	-14,000
Total, Defense Nuclear Security	**690,638**	**775,000**	**826,895**	**+51,895**
Information Technology and Cyber Security	**221,175**	**300,000**	**375,511**	**+75,511**
Legacy Contractor Pensions	**162,292**	**91,200**	**101,668**	**+10,468**
Subtotal, Weapons Activities	**11,113,080**	**12,457,097**	**15,602,000**	**+3,144,903**
Use of Prior Year Balances	(13,080)	0	0	0
Rescission of Prior Year Balances	0	0	0	0
Total, Weapons Activities	**11,100,000**	**12,457,097**	**15,602,000**	**+3,144,903**

Weapons Activities
Funding by Program (Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Weapons Activities Appropriation				
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	794,049	792,611	815,710	+23,099
W76 Life Extension Program	48,888		0	0
W76-2 Modification Program	65,000	10,000	0	-10,000
W88 Alteration Program	304,285	304,186	256,922	-47,264
W80-4 Life Extension Program	654,766	898,551	1,000,314	+101,763
W87-1 Modernization Program	53,000	112,011	541,000	+428,989
W93	0	0	53,000	+53,000
Total, Stockpile Major Modernization	1,919,988	2,117,359	2,666,946	+549,587
Stockpile Sustainment	917,802	962,728	998,357	+35,629
Weapons Dismantlement and Disposition	56,000	56,000	50,000	-6,000
Production Operations	510,000	543,964	568,941	+24,977
Total, Stockpile Management	**3,403,790**	**3,680,051**	**4,284,244**	**+604,193**
Production Modernization				
Primary Capability Modernization				
Plutonium Modernization				
Los Alamos Plutonium Modernization				
Los Alamos Plutonium Operations	271,564	286,975	610,599	+323,624
21-D-512, Plutonium Pit Productiion Project, LANL	5,000	21,156	226,000	+204,844
Subtotal, Los Alamos Plutonium Modernization	276,564	308,131	836,599	+528,468
Savannah River Plutonium Operations	76,410	410,458	200,000	-210,458
21-D-511, SR Plutonium Processing Facility, SRS	0	0	241,896	+241,896
Subtotal, Savannah River Plutonium Modernization	76,410	410,458	441,896	+31,438
Enterprise Plutonium Support	53,710	79,216	90,782	+11,566
Total, Plutonium Modernization	406,684	797,805	1,369,277	+571,472
High Explosives & Energetics	8,750	13,768	67,370	+53,602
Total, Primary Capability Modernization	415,434	811,573	1,436,647	+625,074
Secondary Capability Modernization	249,989	293,545	457,004	+163,459
Non-Nuclear Capability Modernization	9,173	13,905	107,137	+93,232
Tritium and Domestic Uranium Enrichment	350,151	446,500	457,112	+10,612
Total, Production Modernization	**1,024,747**	**1,565,523**	**2,457,900**	**+892,377**

	(Dollars in Thousands)			
	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Research, Technology, and Engineering				
Assessment Science	469,328	594,834	773,111	+178,277
Engineering and Integrated Assessments	251,410	325,134	337,404	+12,270
Inertial Confinement Fusion	536,442	556,508	554,725	-1,783
Advanced Simulation and Computing	659,119	767,849	732,014	-35,835
Weapon Technology and Manufacturing Maturation	185,139	222,302	297,965	+75,663
Academic Programs	72,856	86,492	86,912	+420
Total, Stockpile Research and Engineering	**2,174,294**	**2,553,119**	**2,782,131**	**+229,012**
Infrastructure and Operations				
Operating				
Operations of Facilities	870,000	900,000	1,014,000	+114,000
Safety and Environmental Operations	129,226	130,970	165,354	+34,384
Maintenance and Repair of Facilities	515,000	456,000	792,000	+336,000
Recapitalization				
Infrastructure and Safety	450,000	447,657	670,000	+222,343
Capability Based Investments	95,307	112,473	149,117	+36,644
Planning for Programmatic Construction (Pre-CD-1)	0	0	84,787	+84,787
Subtotal, Recapitalization	545,307	560,130	903,904	+343,774
Total, Operating	**2,059,533**	**2,047,100**	**2,875,258**	**+828,158**
Construction				
Programmatic Construction	1,050,019	1,137,444	1,386,319	+248,875
Mission Enabling Construction	47,953	15,000	122,000	+107,000
Total, Construction	1,097,972	1,152,444	1,508,319	+355,875
Total, Infrastructure and Operations	**3,157,505**	**3,199,544**	**4,383,577**	**+1,184,033**
Secure Transportation Asset				
Operations and Equipment	176,617	185,000	266,390	+81,390
Program Direction	102,022	107,660	123,684	+16,024
Total, Secure Transportation Asset	**278,639**	**292,660**	**390,074**	**+97,414**

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Security				
Operations and Maintenance	690,638	750,000	815,895	+65,895
Construction	0	25,000	11,000	-14,000
Total, Defense Nuclear Security	690,638	775,000	826,895	+51,895
Information Technology and Cyber Security	221,175	300,000	375,511	+75,511
Legacy Contractor Pensions	162,292	91,200	101,668	+10,468
Subtotal, Weapons Activities	**11,113,080**	**12,457,097**	**15,602,000**	**+3,144,903**
Use of Prior Year Balances	(13,080)	0	0	0
Rescission of Prior Year Balances	0	0	0	0
Total, Weapons Activities	**11,100,000**	**12,457,097**	**15,602,000**	**+3,144,903**

Weapons Activities
Outyear Funding by Program (Comparable)

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Weapons Activities Appropriation				
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	771,664	676,427	501,744	242,424
W76 Life Extension Program	0	0	0	0
W76-2 Modification Program	0	0	0	0
W88 Alteration Program	207,157	163,308	148,823	78,700
W80-4 Life Extension Program	1,080,400	1,137,410	1,009,929	1,037,400
W87-1 Modernization Program	691,031	688,473	797,377	889,976
W93	80,000	175,000	440,000	1,105,000
Total, Stockpile Major Modernization	2,830,252	2,840,618	2,897,873	3,353,500
Stockpile Sustainment	1,084,381	1,109,529	1,166,912	1,165,470
Weapons Dismantlement and Disposition	51,000	51,000	51,000	51,380
Production Operations	596,834	611,461	607,486	611,898
Total, Stockpile Management	**4,562,467**	**4,612,608**	**4,723,271**	**5,182,248**

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Production Modernization				
Primary Capability Modernization				
Plutonium Modernization				
Los Alamos Plutonium Modernization				
Los Alamos Plutonium Operations	635,280	733,217	810,188	842,549
21-D-512, Plutonium Pit Production Project, LANL	350,000	500,000	450,000	200,000
Subtotal, Los Alamos Plutonium Modernization	**985,280**	**1,233,217**	**1,260,188**	**1,042,549**
Savannah River Plutonium Operations	178,983	191,568	226,694	366,000
21-D-511, SR Plutonium Processing Facility, SRS	445,000	624,000	606,000	520,000
Subtotal, Savannah River Plutonium Modernization	**623,983**	**815,568**	**832,694**	**886,000**
Enterprise Plutonium Support	88,913	67,969	67,330	77,004
Total, Plutonium Modernization	1,698,176	2,116,754	2,160,212	2,005,553
High Explosives & Energetics	64,400	67,910	75,190	80,000
Total, Primary Capability Modernization	1,762,576	2,184,664	2,235,402	2,085,553
Secondary Capability Modernization	463,073	472,108	488,668	495,356
Non-Nuclear Capability Modernization	161,563	115,482	97,234	92,446
Tritium and Domestic Uranium Enrichment	612,286	731,739	571,953	499,412
Total, Production Modernization	**2,999,498**	**3,503,993**	**3,393,257**	**3,172,767**
Stockpile Research, Technology, and Engineering				
Assessment Science	739,903	727,451	730,071	699,435
Engineering and Integrated Assessments	348,920	362,682	373,663	381,271
Inertial Confinement Fusion	491,497	503,761	590,411	602,810
Advanced Simulation and Computing	765,313	761,194	773,265	783,918
Weapon Technology and Manufacturing Maturation	313,885	335,027	380,297	399,820
Academic Programs	86,737	88,601	92,504	94,445
Total, Stockpile Research and Engineering	**2,746,255**	**2,778,716**	**2,940,211**	**2,961,699**

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Infrastructure and Operations				
Operating				
Operations of Facilities	1,020,000	1,024,000	1,074,000	1,145,000
Safety and Environmental Operations	162,061	158,987	160,524	168,067
Maintenance and Repair of Facilities	795,000	798,000	800,000	803,000
Recapitalization				
Infrastructure and Safety	509,000	487,000	489,000	499,000
Capability Based Investments	146,066	148,504	151,204	152,182
Planning for Programmatic Construction (Pre-CD-1)	0	0	15,465	185,710
Subtotal, Recapitalization	**655,066**	**635,504**	**655,669**	**836,892**
Total, Operating	**2,632,127**	**2,616,491**	**2,690,193**	**2,952,959**
Construction				
Programmatic Construction	1,304,625	948,067	1,024,643	800,809
Mission Enabling Construction	8,000	110,000	70,000	86,000
Total, Construction	**1,312,625**	**1,058,067**	**1,094,643**	**886,809**
Total, Infrastructure and Operations	**3,944,752**	**3,674,558**	**3,784,836**	**3,839,768**
Secure Transportation Asset				
Operations and Equipment	213,704	220,116	226,338	249,915
Program Direction	123,060	125,217	128,338	131,058
Total, Secure Transportation Asset	**336,764**	**345,333**	**354,676**	**380,973**

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Defense Nuclear Security				
Operations and Maintenance	874,622	871,307	939,920	932,800
Construction	41,900	8,810	0	0
Total, Defense Nuclear Security	**916,522**	**880,117**	**939,920**	**932,800**
Information Technology and Cyber Security	**387,308**	**394,045**	**403,374**	**415,165**
Legacy Contractor Pensions	**43,434**	**81,630**	**73,455**	**77,580**
Subtotal, Weapons Activities	**15,937,000**	**16,271,000**	**16,613,000**	**16,963,000**
Use of Prior Year Balances	0	0	0	0
Rescission of Prior Year Balances	0	0	0	0
Total, Weapons Activities	**15,937,000**	**16,271,000**	**16,613,000**	**16,963,000**

Research and Development

The Office of Management and Budget (OMB) Circular No A-11, "Preparation, Submission, and Execution of the Budget," requires the reporting of research and development (R&D) data consistent with this requirement, R&D activities funded by NNSA Weapons Activities programs are displayed below.

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request[a]	FY 2021 Request vs FY 2020 Enacted
Research and Development (R&D)				
Basic	0	0	0	0
Applied	4,845,537	5,283,714	5,560,050	276,336
Development	210,294	302,810	498,876	196,066
Subtotal, R&D	**5,055,831**	**5,586,524**	**6,058,926**	472,402
Equipment	216,941	251,320	294,176	42,856
Construction	86,401	108,718	295,730	187,012
Total, R&D	**5,359,173**	**5,946,562**	**6,648,832**	**702,270**

[a] The FY 2021 numbers in the table are the most current estimates of NNSA R&D and may not match the entries in the President's Budget Appendix. NNSA updated its R&D estimates after the Appendix went to print.

Directed Stockpile Work[a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	794,049	792,611	0	-792,611
W76 Life Extension Program	48,888	0	0	0
W76-2 Modification Program	65,000	10,000	0	-10,000
W88 Alt 370 (W88 Alteration Program)	304,285	304,186	0	-304,186
W80-4 Life Extension Program	654,766	898,551	0	-898,551
W87-1 Modification Program (formerly IW1)	53,000	112,011	0	-112,011
W93	0	0	0	0
Total, Life Extension Programs and Major Alterations	**1,919,988**	**2,117,359**	**0**	**-2,117,359**
Stockpile Systems				
B61 Stockpile Systems	64,547	71,232	0	-71,232
W76 Stockpile Systems	84,300	89,804	0	-89,804
W78 Stockpile Systems	81,329	81,299	0	-81,299
W80 Stockpile Systems	80,204	80,204	0	-80,204
B83 Stockpile Systems	35,082	51,543	0	-51,543
W87 Stockpile Systems	83,107	98,262	0	-98,262
W88 Stockpile Systems	170,913	157,815	0	-157,815
Total, Stockpile Systems	**599,482**	**630,159**	**0**	**-630,159**
Weapons Dismantlement and Disposition	**56,000**	**56,000**	**0**	**-56,000**
Stockpile Services				
Production Support	510,000	543,964		-543,964
Research and Development Support	36,150	39,339		-39,339
Research and Deveopment Certification and Safety	201,840	236,235	0	-236,235
Management, Technology, and Production	300,736	305,000	0	-305,000
Total, Stockpile Services	**1,048,726**	**1,124,538**	**0**	**-1,124,538**
Strategic Materials				
Uranium Sustainment	87,182	94,146	0	-94,146
Plutonium Sustainment				
Plutonium Sustainment Operations	286,282	691,284	0	-691,284
Plutonium Pit Production Project	75,000	21,156	0	-21,156
Total, Plutonium Sustainment	361,282	712,440	0	-712,440
Tritium Sustainment	290,275	269,000	0	-269,000
Lithium Sustainment	29,135	28,800	0	-28,800
Domestic Uranium Enrichment	50,000	70,000	0	-70,000
HEU Downblend	0	90,000	0	-90,000
Strategic Materials Sustainment	216,196	256,808	0	-256,808
Total, Strategic Materials	**1,034,070**	**1,521,194**	**0**	**-1,521,194**
Total, Directed Stockpile Work	**4,658,266**	**5,449,250**	**0**	**-5,449,250**

[a] Life Extension Programs and Major Alterations, Stockpile Systems, Weapons Dismantlement and Disposition, and some activities in Stockpile Services and Strategic Materials are being restructured into Stockpile Management in FY 2021. Parts of Stockpile Services are being restructured into two new programs: Production Modernization and Stockpile Research, Technology, and Engineering. Other Strategic Materials programs are being restructured into two programs: Production Modernization and Infrastructure and Operations.

Directed Stockpile Work
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	794,049	792,611	815,710	+23,099
W76 Life Extension Program	48,888	0	0	0
W76-2 Modification Program	65,000	10,000	0	-10,000
W88 Alteration Program	304,285	304,186	256,922	-47,264
W80-4 Life Extension Program	654,766	898,551	1,000,314	+101,763
W87-1 Modification Program	53,000	112,011	541,000	+428,989
W93	0	0	53,000	+53,000
Total, Life Extension Programs and Major Alterations	**1,919,988**	**2,117,359**	**2,666,946**	**+549,587**
Stockpile Systems				
B61 Stockpile Systems	64,547	71,232	103,873	+32,641
W76 Stockpile Systems	84,300	89,804	108,713	+18,909
W78 Stockpile Systems	81,329	81,299	90,093	+8,794
W80 Stockpile Systems	80,204	80,204	77,562	-2,642
B83 Stockpile Systems	35,082	51,543	30,795	-20,748
W87 Stockpile Systems	83,107	98,262	103,139	+4,877
W88 Stockpile Systems	170,913	157,815	148,691	-9,124
Total, Stockpile Systems	**599,482**	**630,159**	**662,866**	**+32,707**
Weapons Dismantlement and Disposition	**56,000**	**56,000**	**50,000**	**-6,000**
Stockpile Services				
Production Support	510,000	543,964	618,341	+74,377
Research and Development Support	36,150	39,339	46,501	+7,162
Research and Development Certification and Safety	201,840	236,235	283,796	+47,561
Management, Technology, and Production	300,736	305,000	335,491	+30,491
Total, Stockpile Services	**1,048,726**	**1,124,538**	**1,284,129**	**+159,591**

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Directed Stockpile Work				
Strategic Materials				
Uranium Sustainment	87,182	94,146	234,502	+140,356
Plutonium Sustainment	0	0	0	0
Plutonium Sustainment Operations	286,282	691,284	517,616	-173,668
Plutonium Pit Production Project	75,000	21,156	226,000	+204,844
Total, Plutonium Sustainment	361,282	712,440	743,616	+31,176
Tritium Sustainment	290,275	269,000	286,000	+17,000
Lithium Sustainment	29,135	28,800	39,400	+10,600
Domestic Uranium Enrichment	50,000	70,000	145,003	+75,003
HEU Downblend	0	90,000	0	-90,000
Strategic Materials Sustainment	216,196	256,808	258,165	+1,357
Total, Strategic Materials	**1,034,070**	**1,521,194**	**1,706,686**	**+185,492**
Total, Directed Stockpile Work	**4,658,266**	**5,449,250**	**6,370,626**	**+921,376**

Stockpile Management

Overview

The Stockpile Management program requirements are to maintain a safe, secure, and effective nuclear weapons stockpile; meet required stockpile sustainment activities to include maintenance, surveillance, assessment, development, and program planning; continue production activities for the B61-12 Life Extension Program (LEP) and W88 Alteration Program; continue work to deliver the W80-4 LEP and W87-1 Modification Program; begin Phase 1 assessment activities for the W93; provide safe and secure dismantlement of nuclear weapons and components in accordance with the Nuclear Weapons Stockpile Plan; and sustain manufacturing capabilities and capacities, including process improvements and investments focused on increased efficiency of production operations. The Stockpile Management program encompasses four major subprograms that directly support the nation's nuclear weapons stockpile.

The subprograms are:

1. Stockpile Major Modernization, which extends the lifetime of the nation's nuclear stockpile while addressing required updates, replacing aging or obsolete components to ensure continued service life, and enhancing security and safety features;
2. Stockpile Sustainment, which directly executes sustainment activities for all enduring weapons systems in the stockpile;
3. Weapons Dismantlement and Disposition (WDD), which dismantles retired weapons and dispositions retired components from the stockpile; and
4. Production Operations, which provides the manufacturing-based program that drives *individual site production* capabilities for LEPs, production for Limited Life Component Exchanges (LLCE), surveillance, and weapon assembly & disassembly. Production Operations provides maintenance/calibration services for manufacturing operations to meet Department of Defense (DOD) War Reserve requirements. Production Operations scope covers sustainment of all weapon systems capabilities that enable individual weapon production and are not specific to one material stream. Facility major modernization and construction activities are not part of this budget subprogram and are covered in other parts of the Weapons Activities account.

The 2018 Nuclear Posture Review (NPR) provides a comprehensive analysis of the role of nuclear weapons in U.S. national security policy and outlined the direction in which the United States must move to maintain a safe, secure, and effective deterrent. In coordination with DOD, NNSA has developed the requirements and tasks to implement the strategies outlined in the NPR, and strengthen the underlying nuclear security enterprise.

The Stockpile Management program:

1. Executes the Sustainment and Annual Assessment of the active stockpile by:
   - Conducting scheduled weapons maintenance, including the production and replacement of Limited Life Components (LLCs);
   - Conducting surveillance and evaluations to assess weapons reliability as well as detect and anticipate potential weapons issues; and
   - Supporting the assessment of the current state of the stockpile underpinning the safety, security, and effectiveness of the nation's nuclear deterrent.
2. Extends the life of existing weapons systems through authorized modifications and major alterations to address DOD deterrent requirements and to enhance safety, security, and effectiveness of the stockpile;
3. Provides an integrated program to safely dismantle and dispose of components from warheads that have been retired, while some limited number of components from the dismantled warheads are preserved for potential reuse in Life Extension and safety testing programs;
4. Enhances NNSA transportation safety and security by implementing new weapon shipping configurations;
5. Provides engineering and quality assurance processes to support component production;
6. Supports Model Based Enterprise initiatives which allow NNSA to seamlessly exchange classified three-dimensional product definitions via common Computer Aided Drafting and Design (CADD) architectures from weapon component sourcing to quality inspection; and
7. Provides unique skills, equipment, and logistics to enable nuclear weapons operations.

Stockpile Management
Funding (Non-Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	0	0	815,710	+815,710
W76 Life Extension Program	0	0	0	0
W76-2 Modification Program	0	0	0	0
W88 Alteration Program	0	0	256,922	+256,922
W80-4 Life Extension Progam	0	0	1,000,314	+1,000,314
W87-1 Modification Program	0	0	541,000	+541,000
W93	0	0	53,000	+53,000
Total, Stockpile Major Modernization	**0**	**0**	**2,666,946**	**+2,666,946**
Stockpile Sustainment	**0**	**0**	**998,357**	**+998,357**
Weapons Dismantlement and Disposition	**0**	**0**	**50,000**	**50,000**
Production Operations	**0**	**0**	**568,941**	**+568,941**
Total, Stockpile Management	**0**	**0**	**4,284,244**	**+4,284,244**

Stockpile Management
Funding (Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	794,049	792,611	815,710	+23,099
W76 Life Extension Program	48,888	0	0	0
W76-2 Modification Program	65,000	10,000	0	-10,000
W88 Alteration Program	304,285	304,186	256,922	-47,264
W80-4 Life Extension Progam	654,766	898,551	1,000,314	+101,763
W87-1 Modification Program	53,000	112,011	541,000	+428,989
W93	0	0	53,000	+53,000
Total, Stockpile Major Modernization	**1,919,988**	**2,117,359**	**2,666,946**	**+549,587**
Stockpile Sustainment	**917,802**	**962,728**	**998,357**	**+35,629**
Weapons Dismantlement and Disposition	**56,000**	**56,000**	**50,000**	**-6,000**
Production Operations	**510,000**	**543,964**	**568,941**	**+24,977**
Total, Stockpile Management	**3,403,790**	**3,680,051**	**4,284,244**	**+604,193**

Stockpile Management
Outyear Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Stockpile Management				
Stockpile Major Modernization				
B61 Life Extension Program	771,664	676,427	501,744	242,424
W88 Alteration Program	207,157	163,308	148,823	78,700
W80-4 Life Extension Progam	1,080,400	1,137,410	1,009,929	1,037,400
W87-1 Modification Program	691,031	688,473	797,377	889,976
W93	80,000	175,000	440,000	1,105,000
Total, Stockpile Major Modernization	**2,830,252**	**2,840,618**	**2,897,873**	**3,353,500**
Stockpile Sustainment	**1,084,381**	**1,109,529**	**1,166,912**	**1,165,470**
Weapons Dismantlement and Disposition	**51,000**	**51,000**	**51,000**	**51,380**
Production Operations	**596,834**	**611,461**	**607,486**	**611,898**
Total, Stockpile Management	**4,562,467**	**4,612,608**	**4,723,271**	**5,182,248**

Stockpile Management
Proposed Budget Structure Changes
(Dollars in Thousands)

	Proposed FY 2021 Budget Structure										
	Stockpile Management										
	Stockpile Sustainment								Weapons Dismantlement and Disposition	Production Operations	
	B61 Stockpile Systems	W76 Stockpile Systems	W78 Stockpile Systems	W80 Stockpile Systems	B83 Stockpile Systems	W87 Stockpile systems	W88 Stockpile Systems	Multi-Weapon Systems	Weapons Dismantlement and Disposition	Production Operations	Total
FY 2020 Budget Structure											
Weapons Activities											
Directed Stockpile Work											
Stockpile Systems											
B61 Stockpile Systems	103,873										**103,873**
W76 Stockpile Systems		108,713									**108,713**
W78 Stockpile Systems			90,093								**90,093**
W80 Stockpile Systems				77,562							**77,562**
B83 Stockpile Systems					30,795						**30,795**
W87 Stockpile Systems						103,139					**103,139**
W88 Stockpile Systems							148,691				**148,691**
Weapons Dismantlement and Disposition									50,000		**50,000**
Stockpile Services											
Production Support										568,941	**568,941**
Research and Development Support											
Research and Deveopment Certification and Safety											
Management, Technology, and Production								335,491			**335,491**
Strategic Materials											
Uranium Sustainment											
Plutonium Sustainment											
Tritium Sustainment											
Lithium Sustainment											
Domestic Uranium Enrichment											
HEU Downblend											
Strategic Materials Sustainment											
MRR											
Storage											
SPE											
Advanced Manufacturing Development											
Additive Manufacturing											
Component Manufacturing											
Process Technology Development											
Total	**103,873**	**108,713**	**90,093**	**77,562**	**30,795**	**103,139**	**148,691**	**335,491**	**50,000**	**568,941**	**1,617,298**

Stockpile Management
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Stockpile Management	
Stockpile Major Modernization: The change principally represents the planned ramp-up of the W80-4 Life Extension Program to execute Phase 6.3 activities, Conceptual Design Reviews, production of warhead simulators/test units, and hydrodynamic physics tests to support nuclear certification; the planned ramp-up of the W87-1 Modification Program across all areas to complete Phase 6.2 deliverables and enter Phase 6.2A; and the W93 planned Phase 1 concept assessment and refinement activities.	**+549,587**
Stockpile Sustainment: The increase represents funding to support development of new Joint Test Assembly (JTA) designs for the W76 and W78; W87-0[a] Ground Based Strategic Deterrent (GBSD) qualification and integration activities with the DOD; development of improved shipping configurations (Integrated Surety Architecture (ISA) activities); and preparation activities to sustain the B61-12 in the stockpile. This funding is partially offset by planned decreases in the W80, B83, and W88 for maintenance, surveillance, assessment, and design activities.	**+35,629**
Weapons Dismantlement and Disposition: The decrease represents a balanced approach for weapon and Canned Subassembly (CSA) dismantlements, component recycle requirements, and reduction of legacy component inventories.	**-6,000**
Production Operations: The increase represents the continued growth to underpin the LEP workload ensuring procedures and prerequisite process equipment are in place to meet LEP First Production Unit (FPU) requirements. The program will expand responsiveness of production lines to sustain workload capacity for LEPs and Alts. The funding will also provide the tooling needed to execute certifying weapons and components and the production schedule through product qualification.	**+24,977**
Total, Stockpile Management	**+604,193**

[a] The W87-0 is currently deployed on the MMIII. It will be qualified and deployed onto the GBSD along with the W87-1, which is the replacement system for the W78.

Overview

The Stockpile Major Modernization program was renamed from the Life Extension Programs and Major Alterations program in the Directed Stockpile Work (DSW) budget restructure and contains these individual programs:

B61 Life Extension Program

- Full rate production will continue on all B61-12 components with the exception of six electrical components affected by the capacitor issue that are undergoing additional testing and qualification activities.
- Complete qualification and validation of the six electrical components affected by the capacitor issue and begin delivering to Pantex Plant.

W88 Alteration Program

- Full rate production will continue on all W88 Alt 370 components with the exception of three components and one assembly affected by the capacitor issue that are undergoing additional testing and qualification activities.
- Complete qualification and validation of the three components and one assembly affected by the capacitor issue and begin delivering to Pantex Plant.

W80-4 Life Extension Program

- Continue Phase 6.3 Development for components.
- Finalize completion of Component Conceptual Design Reviews.
- Conduct joint testing with Air Force Long Range Stand-Off (LRSO) Program.

W87-1 Modification Program

- Complete system requirements, system feasibility, and system cost reviews.
- Issue production impact review and feasibility and design option study report and Weapon Design and Cost Report (WDCR).

W93

- Phase 1 Concept and Assessment refinement.
- Evaluate warhead architectures against potential range of desired attributes, draft military characteristics, and known constraints.
- Support the Department of Defense's program activities associated with the development and eventual production of a new Mk7 reentry body in which the W93 will be deployed.
- Issue results of Concept and Assessment study and provide recommendations for scope of feasibility study and design options for Phase 2.

Description

Stockpile Major Modernization is the stockpile management subprogram necessary to extend the expected life of stockpile systems for an additional 20 to 30 years. NNSA, in conjunction with DOD, executes a LEP following the Phase 6.X process guidelines, which provides a framework to conduct and manage refurbishment activities for existing weapons. Phase 6.1 (Concept Assessment) should provide sufficient information for the Nuclear Weapons Council (NWC) to authorize Phase 6.2 (Feasibility Study and Design Options). Follow-on phases include: Phase 6.2A (Design Definition and Cost Study), Phase 6.3 (Development Engineering), Phase 6.4 (Production Engineering), Phase 6.5 (First Production) and Phase 6.6 (Full-Scale Production). For the purposes of this justification, the term "refurbishment" refers to all nuclear weapon alterations and modifications, including LEPs, modernization, and revised military requirements.

B61 Life Extension Program

The B61-12 LEP refurbishes, reuses, or replaces all of the bomb's nuclear and non-nuclear components to extend the service life of the B61 by at least 20 years, and to improve the bomb's safety, effectiveness, and security. This life extension program addresses all age-related issues of the bomb, and enhance its reliability, field maintenance, safety, and use control. With these upgrades and the addition of a U.S. Air Force-supplied Boeing Tail Kit Assembly, the B61-12 LEP will consolidate and replace four B61 weapon designs: 3, 4, 7, and 10. When fielded, the B61-12 will balance greater accuracy provided by the modern tail kit with a substantial reduction in yield, with no overall change in military requirements or characteristics. In June 2016, NNSA authorized the program to transition into Phase 6.4. In 2019, delivery of the system-level First Production Unit (FPU) was formally rescheduled due to delays resulting from an issue with capacitors used in six major electrical components. NNSA is currently on schedule to provide the system-level FPU in FY 2022, and program completion is now FY 2026.

W88 Alteration Program

The W88 Alt 370 Program increases the W88 lifetime by modernizing the arming, fuzing and firing (AF&F) subsystem; improving surety; and incorporating a lightning arrestor connector. It also provides required logistical spares for sustaining the life of the system. As planned, the design of the arming and fuzing portion of the AF&F will be forward compatible with future U.S. Air Force fuze requirements and/or LEPs. The maintenance programs for neutron generator (NG) and gas transfer system (GTS) replacement will be funded under the W88 enduring stockpile system, but actual replacement will be performed concurrently with the Alt 370 conversion. In November 2014, the NWC authorized replacement of the Conventional High Explosive (CHE) and associated materials on the W88 coincident with Alt 370 activities, which is referred to as CHE Refresh. The CHE Refresh scope is included in the W88 Alt 370 Program and leverages existing tests to the maximum extent possible to minimize costs and reduce logistical impacts to the United States Navy (USN). In February 2017, NNSA authorized the program to transition into Phase 6.4, Production Engineering. In 2019, delivery of the reentry body assembly was formally rescheduled because of delays resulting from an issue with capacitors used in three major components. NNSA is currently on schedule to provide reentry body assembly FPU in Fiscal Year 2021. The program completion date is in negotiations with the USN.

W80-4 Life Extension Program

The W80-4 LEP extends the life of the legacy W80 warhead for use in the Air Force LRSO cruise missile. The LRSO is the replacement for the current, aging Air-Launched Cruise Missile (ALCM). The program will integrate the warhead with the replacement missile platform and address warhead component aging concerns as well as military requirements for reliability, service life, field maintenance, and surety. Key design requirements established for this LEP include using insensitive high explosives for the primary, enhancing surety, and developing the warhead/missile interface in parallel with the Air Force. In July 2015 the NWC authorized the program to transition into Phase 6.2, Feasibility Study and Option Down-Select. The program received Phase 6.2A (Design Definition and Cost Study) authorization on September 28, 2017, during which the design continued to be refined and the NNSA team continued to work closely with the LRSO missile development team and contractors. The primary 6.2A deliverable, the W80-4 LEP WDCR, was completed in FY 2019, and the W80-4 LEP Federal Program Office received NWC authorization to proceed to Phase 6.3 in 2019. The FPU is currently planned for FY 2025, and the program completion date is FY 2031.

W87-1 Modification Program
The Program will replace the W78 warhead and support fielding on the USAF Ground Based Strategic Deterrent (GBSD) missile system by 2030. The W78 is one of the oldest warheads in the stockpile and the W87-1 Modification Program provides improvement in warhead security, safety, and use control. In FY 2021 the program will end Phase 6.2 and enter Phase 6.2A. Phase 6.2A activities include continuing feasibility study of design options, conducting a feasibility study continuing technology maturation, developing security classification guidance, continuing program management and control implementation, and building resource loaded schedules. Other activities include conducting risk and requirements analysis, integrating with Air Force acquisition programs, conducting systems engineering activities, beginning development of the WDCR, conducting an independent cost review by NNSA's Office of Cost Estimating and Program Evaluation (CEPE), conducting inter-laboratory peer review of W87-1 6.2 study, and creating a draft Major Impact Report (MIR). The FPU currently is planned for FY 2030, and the program completion date is in negotiations with the USAF.

W93
The W93 modernization activity will use the joint NNSA-DOD phase 1-7 weapons acquisition process that is very similar to the Phase 6.X process. Work in support of the W93 will include Phase 1 Concept and Assessment refinement to evaluate warhead architectures against potential range of desired attributes, draft military characteristics, and known constraints. It will also inform the DOD's program activities to define the requirements for the associated Mk7 reentry body within which the W93 will be deployed. Deliverables also include documenting the results of the Concept and Assessment study and provide recommendations for scope of feasibility study and design options for Phase 2.

Highlights of the FY 2021 Budget Request
B61 Life Extension Program
- Execute steady state production on all components not affected by capacitor issue.
- Complete qualification of capacitor affected components and proceed into ramp rate component production.
- Execute Pantex Plant production readiness activities and prepare to build FPU.
- Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the USAF F-35 and B-21.

W88 Alteration Program
- Execute steady state production all components not affected by capacitor issue.
- Complete qualification of capacitor-affected components and proceed into ramp rate component production.
- Execute Phase 6.5 activities and complete FPU of the W88 Alt 370 in FY2021.

W80-4 Life Extension Program
- Execute Phase 6.3 activities for the W80-4 LEP in support of the Air Force LRSO program.

W87-1 Modification Program
- Complete W87-1 Modification Program Phase 6.2 activities, feasibility study and design options, and enter Phase 6.2A, design definition and cost study.
- Conduct inter-laboratory peer review of W87-1 6.2 study.
- Conduct system requirement and feasibility gate reviews.
- Begin development of WDCR.
- Conduct independent cost review by CEPE.

W93
- Planned Phase 1 activities begin in FY 2021.

FY 2022 - FY 2025 Key Milestones
B61-12 Life Extension Program
- Complete FPU of the B61-12 and proceed into ramp rate production.
- Execute Final Design Review and Acceptance Group (FDRAAG) and obtain 6.6 Authorization.
- Achieve and maintain steady state production rates at NNSA Plants and deliver B61-12 bombs to the USAF to support U.S. and NATO Initial Operational Capability (IOC) and Full Operational Capability (FOC) dates.
- Execute System Retrofit Evaluation System Testing (REST).

- Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the USAF F-35 and B-21 and obtain aircraft certifications.
- Deliver Last Production Unit (LPU) in FY2025.

W88 Alteration Program

- Release final Alt 370 addendum to the W88 weapon development report in FY 2022.
- Conduct FDRAAG and obtain NWC Phase 6.6 authorization.
- Deliver IOC quantity of W88 Alt 370's and maintain steady state production rates.
- Conduct REST flights and lab tests.
- Complete W88 Alteration system conversion by FY 2025.

W80-4 Life Extension Program

- Successfully complete Component Feasibility and Cost Gates for over 30 active Product Realization Teams (PRTs) and Component Requirements Reviews for over 25 active PRTs.
- Begin Technology Maturation and Risk Reduction (TMRR) phase interactions with two competing LRSO Cruise Missile Contractors, including TMRR kickoff meetings, Technical Integration Meetings (TIMs), and W80-4 Project Officer Group and Subgroup interactions.
- Deliver Fit Check Units to the Air Force to verify the mechanical interface between the W80-4 warhead and LRSO Cruise Missile.
- In coordination with the W80-4 Project Officer Group (POG), develop and mature the Missile-to-Warhead Interface Control Document (MW-ICD), Stockpile-to-Target-Sequence (STS), and Military Characteristics (MCs).

W87-1 Modification Program

- Complete Phase 6.2A and enter Phase 6.3, development engineering.
- Advance Technology Maturation.
- Continue program management and control implementation.
- Integrate with Air Force acquisition programs.
- Conduct inter-laboratory peer review.
- Complete initial MIR.
- Deliver WDCR.
- Complete Phase 6.2 report.

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- Conduct an assessment of weapon needs related to concepts and technological risks/readiness with potential cost ranges, while addressing system vulnerabilities, threats, and potential mitigations.
- Participate with the DOD in a customer requirements review.
- Establish interface agreements within NNSA to ensure materials, processes and certification procedures are in place to support candidate designs.
- Initiate cost estimating relationships to support eventual design cost report estimate and independent cost estimate.

FY 2019 Accomplishments

B61 Life Extension Program

- The B61-12 LEP achieved FPU on 93 of 112 weapon components including all nuclear components.
- Completed seven system qualification flight tests on B-2A, F-15E, and F-16 Mid-Life Upgrade (MLU) aircraft platforms.
- Completed system level mechanical, thermal and electrical testing to verify B61-12 meets military requirements.
- Completed and released updated designs for the capacitor-affected components to begin production manufacturing activities.

W76 Life Extension Program

- The W76-1 LEP completed warhead production in December 2018 and deliveries to the USN in April 2019, ahead of schedule and within planned budgets.
- Continue program close-out activities.

W76-2 Modification Program

- Completed Phase 6.3/6.4/6.5 activities for the W76-2 Modification Program with achievement of the warhead FPU, consistent with NWC direction.
- Completed W76-2 FPU in February 2019.
- Authorized by NWC for Phase 6.6 activities in February 2019.
- Completed Design Review and Acceptance Group in May 2019.
- Completed Major Assembly Release (MAR) in May 2019.
- Completed Final Weapon Development Report Appendix in May 2019.
- Produced and delivered IOC quantity per USN requirements in July 2019.

W88 Alteration Program

- Completed the Commander's Evaluation Test-2 (CET–2) and Demonstration and Shakedown Operations 29 (DASO 29) flight tests.
- Completed 20 system-level qualification tests.
- Achieved 18 component FPUs, for a total of 29 achieved across the life of the program.
- Continued fabrication of pre-production and production functional hardware at component, sub-assembly, and AF&F level for final qualification and next-assembly production.

W80-4 Life Extension Program

- Successfully completed Component Feasibility and Cost Gates for over 30 active PRTs, and Component Requirements Reviews for over 25 active PRTs.
- Completed over 25 Component Requirements Reviews.
- Began Technology Maturation and Risk Reduction (TMRR) phase interactions with two competing LRSO Cruise Missile Contractors, including TMRR kickoff meetings, Technical Integration Meetings (TIMs), and W80-4 POG and Subgroup interactions.
- Delivered Fit Check Units to the Air Force to verify the mechanical interface between the W80-4 warhead and LRSO Cruise Missile.
- In coordination with the W80-4 POG, developed and matured the MW-ICD, STS, and MCs.

W87-1 Modification Program

- Restarted the W78 warhead replacement program as the W87-1 Modification Program to meet NPR requirements.
- Restarted the Feasibility Study and Design Options work suspended in 2014 to replace the W78 warhead and completed the feasibility study of deploying the replacement warhead's NEP in a USN flight body.
- Established NNSA laboratory design agency and production agency program personnel, functions and processes required for Feasibility Study and Design Options work.
- Established Federal Program Office and required program personnel, documents, functions, and processes for Feasibility Study and Design Options work.
- Participated in the W87-1/Mk21A POG.
- Evaluated proposed/assessed warhead technologies and progressed maturity of select/key technologies.
- Completed W87-1 surety architecture risk/benefit analysis and received NWC approval of surety architecture.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
B61 Life Extension Program $792,611,000	**B61 Life Extension Program $815,710,000**	**B61 Life Extension Program +$23,099,000**
• Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the USAF F-35 and B-21. • Execute ramp-rate component production on all components unaffected by capacitor issue. • Execute production readiness and qualification activities for capacitor affected components. • Execute final joint qualification activities and final hydrodynamic test.	• Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the USAF F-35 and B-21. • Execute steady state component production on all components unaffected by capacitor issue. • Achieve First Production for capacitor affected components and begin shipments to Pantex. • Complete system validation testing for capacitor affect components.	• The increase represents the B61-12 additional budget necessary to execute the new scope to support the six capacitor affected components and activities to achieve steady state production for all components.
W76-2 Modification Program $10,000,000	**W76-2 Modification Program $0**	**W76-2 Modification Program -$10,000,000**
• Complete warhead FPU at Pantex. • Complete FOC warhead deliveries to the USN.	• No warhead production work scope in FY 2021.	• The decrease represents completion of FOC warhead production and deliveries, plus program close-out.
W88 Alteration Program $304,186,000	**W88 Alteration Program $256,922,000**	**W88 Alteration Program -$47,264,000**
• Complete First Production Capability Unit • Execute disassembles for conversions. • Execute reacceptance of pits and secondaries. • Execute full-scale production of all components not affected by the capacitor issue supporting original delivery schedules. • Execute final system qualification tests.	• Complete FPU for the reentry body assembly and ramp up to full-scale production. • Execute full-scale production of all components not affected by the capacitor issue supporting original delivery schedules. • Complete qualification activities for components affected by the capacitor issue and execute full-scale production. • All System Qualification tests, including those added due to the capacitor issue, will be complete.	• The decrease represents a decrease in design agency activities and the transition to full rate production from ramp-up activities.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
W80-4 Life Extension Program $898,551,000	**W80-4 Life Extension Program $1,000,314,000**	**W80-4 Life Extension Program +$101,763,000**
• Phase 6.3 and the Conceptual Design Stage will continue into FY 2020. Baseline Design Stage activities will begin after successful completion of Component Conceptual Design Reviews. Staffing levels continue to ramp up consistent with the increase in component developmental builds and testing activities. • All Component Conceptual Design Reviews will be completed. Developmental lots and associated testing/analysis will continue to increase with a focus on progressing Technology and Manufacturing Readiness Levels and transitioning towards Component Baseline Design Reviews in FY 2021. • Use of warhead simulators/test units will increase as the W80-4 LEP continues to integrate with two Cruise Missile contractors. Fit Check Units, Environmental Test Units, Static Ejection Test Warheads, and Separation Control Test Vehicle warheads will continue to be delivered to the Air Force. This equipment will be used to verify the interface between the missile and warhead and gather environmental data during ground, captive carry, and static ejection testing. Hydrodynamic physics tests will continue within simulated missile bodies to support nuclear certification.	• System Engineering & Integration: Phase 6.3 will continue. The System Baseline Design Review will be completed in FY 2021. Staffing levels continue to ramp-up, consistent with the increase in PPI and QE builds and testing activities. The Baseline Cost Report Update/Independent Cost Estimate for 6.4 Authorization will start in FY 2021. • Component Development & Production: All Component Baseline Design Reviews and Product Pre-Production Engineering Gates will be completed in FY 2021. Associated testing and analysis will continue to increase with a focus on progressing Technology and Manufacturing Readiness Levels and transitioning towards 6.4 Authorization: Production Engineering. • System Testing and Qualification: Warhead simulators/test unit deliveries will continue as the W80-4 LEP integrates with two Cruise Missile contractors. Fit Check Unites and Separation Control Test Vehicle warheads will continue to be delivered to the Air Force to verify interface between the missile and warhead, and gather environmental data during ground, captive carry, and static ejection testing. LEP system level mechanical, electrical, electromagnetic, and abnormal testing will continue. Hydrodynamic physics test continue to support component First Production; design changes primarily focused on producibility improvement.	• The change represents the planned ramp-up of production agency activities in conjunction with design activities as the program transitions towards Production Engineering.
W87-1 Modification Program $112,011,000	**W87-1 Modification Program $541,000,000**	**W87-1 Modification Program +$428,989,000**
• Evaluate proposed/assessed warhead technologies and progress maturity of select/key technologies.	• Complete the feasibility study of design options (Phase 6.2) and enter design definition and cost study phase (6.2A).	• The change represents the planned development ramp across the program in all areas to complete Phase 6.2 deliverables and enter Phase 6.2A;

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Continue feasibility study of design options. • Continue program management and control implementation. • Requirements analysis and customer requirements review. • Integration with Air Force acquisition programs • Systems engineering. • Early system test and qualification planning.	• Advance technology maturation. • Continue program management and control implementation. • Conduct system requirement and feasibility gate reviews. • Integrate with Air Force acquisition programs. • Conduct inter-laboratory peer review. • Conduct independent cost review by CEPE. • Complete initial MIR. • Initiate WDCR. • Complete Phase 6.2 report.	expansion of system requirement and architecture design of a W87-1 Modification Program that meets threshold military requirements and improves safety and security; and expansion of program management and control practices to manage cost, schedule, risk, system engineering, and configuration control.
W93 $0	**W93 $53,000,000**	**W93 +$53,000,000**
• Not applicable. This activity starts in FY 2021.	• Start-up of Phase1 activities.	• The Increase represents the start-up of Phase 1 (concept assessment and refinement) activities.

Stockpile Management
Stockpile Sustainment

Overview

The Stockpile Sustainment program was renamed from Stockpile Systems. It now includes Multi-Weapon Systems which was moved into the program from Manufacturing, Technology, and Production (MTP) under Stockpile Services in the DSW budget restructure, as well at the B61, W76, W78, W80, B83, W87, and W88 Stockpile Systems that were under the Stockpile Systems control level.

Stockpile Sustainment

Execution of all required sustainment activities to include maintenance, surveillance, assessment, development, and program planning for all Stockpile Systems. Additionally,

- B61 Stockpile Systems: Production for LLCEs; B61 transition costs for the B61-12s; and support of ISA requirements.
- W76 Stockpile System: Production for LLCEs and JTA3 design and development.
- W78 Stockpile Systems: JTA6R System Baseline Design Review (BDR) completion; Ground Test Unit (GTU) testing completion; and assembly of the first Development JTA6R for flight in FY 2024.
- W80 Stockpile Systems: Alt 369 production completion; production for LLCEs; and development and qualification activities to support of ISA requirements.
- B83 Stockpile Systems: Sustainment in support of the 2018 *Nuclear Posture Review* and NWC direction.
- W87 Stockpile Systems: Ground Based Strategic Deterrent (GBSD) integration/qualification (per AF/NNSA MOU); NG retrofits; GTS hedge production; and FSA production.
- W88 Stockpile Systems: Production for LLCEs in support of Alt 370; continued development and production of Alt 940.
- Multi-Weapon Systems: Execution of multi-weapon surveillance activities, multi-system weapon response, equipment procurements, and use control system studies to support LEPs, the enduring stockpile, and external deliverables.

Description

Stockpile Sustainment directly executes sustainment activities for the total (active and inactive) stockpile for the B61, W76, W78, W80, B83, W87, and W88 weapons. As required by 50 United States Code 2525, safety, security, and effectiveness assessments are performed to determine whether the systems can continue to be certified without the need for an underground nuclear test. Sustainment activities for each weapon system are identified by four major subprograms that support the enduring stockpile system, as well as LEPs and Alts:

Current U.S. nuclear weapons and associated delivery systems

Warheads—Strategic Ballistic Missile Platforms					
Type [a]	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
W78	Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	LANL/SNL	Surface to surface	Air Force
W87	Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	LLNL/SNL	Surface to surface	Air Force
W76-0/1/2	Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	LANL/SNL	Underwater to surface	Navy
W88	Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	LANL/SNL	Underwater to surface	Navy
Bombs—Aircraft Platforms					
Type [a]	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
B61-3/4/10	Non-strategic bomb	F-15, F-16, certified NATO aircraft	LANL/SNL	Air to surface	Air Force/ Select NATO forces
B61-7	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B61-11	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B83-1	Strategic bomb	B-2 bomber	LLNL/SNL	Air to surface	Air Force
Warheads—Cruise Missile Platforms					
Type [a]	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
W80-1	Air-launched cruise missile strategic weapon	B-52 bomber	LLNL/SNL	Air to surface	Air Force

LANL = Los Alamos National Laboratory
LLNL = Lawrence Livermore National Laboratory
NATO = North Atlantic Treaty Organization
SNL = Sandia National Laboratories

[a] The suffix associated with each warhead or bomb type (*e.g.*, "-0/1" for the W76) represents the modification associated with the respective weapon.

B61 Stockpile Systems
The B61 gravity bombs are the oldest weapons in the enduring stockpile. The B61 is deployed by the Air Force on various aircrafts. The B61 family includes five modifications with two distinct categories. The strategic category includes the B61 Modifications -7 and -11. The non-strategic category includes the B61 Modifications -3, -4, and -10, supporting our extended nuclear commitment.

W76 Stockpile Systems
The W76-0/1/2 are the warheads integrated into the Trident II D5 Strategic Weapon System. It is part of the Submarine-Launched Ballistic Missile (SLBM) force. The W76-0/Mk4, W76-1/Mk4A, and W76-2/Mk4A are completed by NNSA as a Reentry Body Assembly and delivered to DOD.

W78 Stockpile Systems
The Mk12A/W78 re-entry vehicle is deployed on the Minuteman III Intercontinental Ballistic Missile (ICBM).

W80 Stockpile Systems
The W80 warhead is used in the Air Launched Cruise Missile deployed by the Air Force.

B83 Stockpile Systems
The B83 is an aircraft-delivered, strategic gravity bomb deployed by the Air Force.

W87 Stockpile Systems
The Mk21/W87 re-entry vehicle is deployed on the Minuteman III ICBM.

W88 Stockpile Systems
The W88 is integrated into the Trident II D5 Strategic Weapon System. It is part of the SLBM force. The W88/Mk5 is completed by NNSA as a Re-entry Body Assembly and delivered to DOD.

Multi-Weapon Systems
Multi-Weapon Systems is a multi-weapon, multi-site product-based program that enhances NNSA's nuclear security enterprise (NSE) integration and efficiency. This program provides foundational support to the NNSA NSE by maintaining the personnel, processes, and technology necessary for manufacturing, production, assembly, disassembly, surveillance, maintenance, data management, weapons response, and military liaison for all current stockpile weapons and modernization efforts for the future stockpile.

Major activities within each area
(1) Weapon Maintenance: Includes production of LLCs including GTSs, NGs, and other designated components as required by National Requirements Documents and/or Directive Schedules, day-to-day stockpile maintenance and repair activities, production and delivery of components for each weapon type, refurbishment and replacement of aging components to sustain stockpile life, and rebuilds.
(2) Weapon Surveillance: Includes new material laboratory and flight tests, retrofit evaluation system laboratory and flight tests, stockpile laboratory tests, stockpile flight tests, quality evaluations, special testing, and component and material evaluation to support assessment of the safety, security, and effectiveness of the nuclear weapons stockpile. Data from these tests contributes to the Annual Assessment and memorandum to the President.
(3) Weapon Assessment: Includes activities associated with management of fielded weapon systems. Provides systems and component engineering support, support to planning, resolution, and documentation of significant finding investigations (SFIs) to include assessment of root cause, extent of conditions, and impact to system effectiveness or safety. Also includes activities associated with planning, developing, and updating the technical basis for the materials, components, and weapons and performing the weapon assessments. Finally, this includes activities associated with preparation, writing, and coordination of Annual Assessment Reports (AARs) and Weapon Reliability Reports, as well as activities needed to assess/resolve system-specific weapon response issues and to provide support to the Nuclear Explosive Safety Study Groups (NESSG) and the Nuclear Weapon System Surety Groups (NWSSG) as required.
(4) Development Studies/Capability Improvements: Includes activities associated with improvements in surveillance capabilities, technical basis improvements, weapon specific technology maturation for insertion or replacement, and system/surety studies.

(5) Weapon Program Planning/Support: Includes activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, issue resolution, and documentation.

Highlights of the FY 2021 Budget Request

- Complete development, qualification, production and delivery of all scheduled LLCs for the B61, W76, W78, W80, B83, W87, and W88. LLCs include GTSs, NGs, and alteration kits delivered to sustain the nuclear weapons stockpile.
- Conduct surveillance programs for all weapon systems using data collection from flight tests, laboratory tests, and component evaluations to assess stockpile reliability, performance and safety.
- Conduct Annual Assessment activities for all weapon systems including the in-depth testing and analysis of systems, subsystems, and components.
- Analyze, evaluate, and close high priority SFIs in accordance with the currently approved baseline closure plans.
- Continue full rate production activities for the new electronic neutron generator (ELNG) for the B61-11 program.
- Initiate transition activities of the B61 Mod 12 from the LEP to the stockpile.
- Continue full-scale development for the W76-1 JTA 3 flight test body, an engineering refresh of the existing W76-1 JTA1 flight test body.
- Continue to develop W78 JTA6R technology to support flight test missions, continue pre-production activities in support of JTA6R.
- Continue W78 repair activities at Pantex.
- Continue development and qualification activities to support ISA requirements on the W80 program. Complete Alt 369 production activities for the W80 program.
- Complete qualification activities and initiate production for Alt 360 on the W87 program.
- Continue integration of W87 with USAF GBSD and Mk21 Fuze.
- Continue W87 NG Retrofit activities including Stockpile Laboratory Test (SLT)/Stockpile Flight Test (SFT) rebuilds at Pantex.
- Continue procurement of W88 H1514C shipping and storage containers.
- Continue development and qualification activities toward implementing W88 Alt 940 surety improvements in conjunction with the Alt 370 through the ISA initiative.
- Continue stockpile sustainment activities providing products, components, and/or services to execute multi-weapon surveillance, weapons reliability reporting to DOD, weapon logistics and accountability, special materials, and stockpile planning.
- Continue to provide multi-system weapon response and external production resources, equipment procurement, and external deliverables.
- Continue implementation of ISA requirements across the stockpile, specifically with progress toward initial operational capability of an Enhanced Capability Shipping Configuration.
- Conduct use control system studies and equipment procurements to align with nuclear weapon FPUs and enduring stockpile refresh opportunities.

FY 2022 - FY 2025 Key Milestones

- Conduct weapon maintenance activities in accordance with directive documents and execute repair and replacement of aging components, to include GTSs and NGs, as required.
- Conduct weapon surveillance activities in accordance with directive documents, to include: disassembly and inspections, system-level laboratory tests, joint flight testing, component and material evaluations, and assessment.
- Conduct weapon assessment activities necessary to complete Weapon Reliability and Annual Assessment Reports, which include: laboratory testing and analysis, and significant finding investigations, as required.
- Conduct weapon program planning activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.
- Conduct development studies and capability improvements for weapon systems.
- Conduct studies in conjunction with DOD as necessary.
- Complete and deliver equipment in accordance with the Equipment Requirements Schedule Program Control Document (PCD).
- Complete and Deliver the Weapon Reliability Report (WRR) to NNSA.

FY 2019 Accomplishments

- Delivered all scheduled LLCs for the B61, W76, W78, W80, B83, W87, and W88.
- Conducted surveillance activities for all weapon systems using data collection from flight tests, laboratory tests, and component evaluations to assess stockpile reliability without nuclear testing which culminated in completion of all Annual Assessment Reports and generation of Laboratory Director Letters to the President.
- Completed the FPU of new B61 JTA configurations via successful conduct of the JTA Modernization project. Completed all three B61-11 high-fidelity military trainer refurbishments.
- Completed the B61-11 and B83 ELNG Qualification Evaluation Release (QER).
- Continued planning and early development for the W76 JTA 3 (JTA1 refresh). Completed W76-1 JTA3 System Requirements Review and associated Feasibility Gate Reviews.
- Completed W87 Alt 360 FPU.
- Continued W78 repairs.
- Continued development of the W78 JTA6R (JTA6 refresh).
- Completed the FY 2019 W80 Alt 369 deliveries to the Air Force.
- Established W80 PRT to support ISA implementation plans.
- Completed B83 component testing and final report for Cycle 114 CSA and completed nondestructive evaluation (NDE) and Disassembly & Inspection (D&I) for Cycle 115 CSA.
- Completed Customer Requirements Review and Preliminary Design Review for JTA6R development and started the Telemetry Preliminary Design Review on the W78 program.
- Met DOD requirements for W87 Small Ferroelectric Neutron Generator retrofits.
- Completed successful MC-level Final Design Review and FPU for the W87 Alt 360.
- Initiated W87 Joint Environmental Test Unit (JETU) PRT and related integration activities to support GBSD.
- Continued development of W88 Alt 940 ISA transportation surety solution.
- Completed development and initiated production for next W88 NG/GTS LLC cycle.
- Delivered the Weapon Reliability Report to the DOD.
- Completed all Weapons Evaluation Test Laboratory (WETL) lab test requirements for FY 2019.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
B61 Stockpile Systems $71,232,000	**B61 Stockpile Systems $103,873,000**	**B61 Stockpile Systems +$32,641,000**
• Continue to produce LLCs. Begin production of the ELNG for the B61-11. • Continue surveillance activities, including D&I, system-level laboratory tests, joint flight tests, component and material evaluations, and assessment. • Increase in Weapon Assessment activities necessary to support the transition costs for the B61-12, and provide data for WRRs and AARs, which include analyses from laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA requirements. Continue feasibility studies as required and in conjunction with DOD as necessary. • Increase activities associated with management of fielded weapon systems to support the transition costs for the B61-12. Provides systems and component engineering support for planning, resolution, and documentation.	• Continue to produce LLCs. Continue production of the ELNG for the B61-11. • Continue surveillance activities, including D&I, system-level laboratory tests, joint flight tests, component and material evaluations, and assessment. • Increase in Weapon Assessment activities necessary to support the transition costs for the B61-12, and provide data for WRRs and AARs, which include analyses from laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA requirements. Continue feasibility studies as required and in conjunction with DOD as necessary. • Increase activities associated with management of fielded weapon systems to support the transition costs for the B61-12. Provides systems and component engineering support for planning, resolution, and documentation.	• The increase represents activities in maintenance and surveillance for sustainment activities of the current B61, stockpile transition costs in support of the B61-12, and an increase in development studies for ISA activities. The ISA activities include scope that was transferred in accordance with our policy to move such scope to the benefitting program once the TRL/MRLs reach a threshold of maturity within the Component Manufacturing Development (CMD) program.
W76 Stockpile System $89,804,000	**W76 Stockpile System $108,713,000**	**W76 Stockpile Systems +$18,909,000**
• Continue producing LLCs, including an increase in NG/GTS production to support W76-1 and W76-2 requirements that are being assumed by the W76 Stockpile Systems program. • Continue to conduct W76-0 and W76-1 core surveillance activities to include D&I, system-level laboratory, and joint flight testing as more W76-1 and W76-2 requirements are being assumed by the stockpile systems program.	• Continue producing LLCs, including an increase in NG/GTS production to support W76-1 and W76-2 requirements that are being assumed by the W76 Stockpile Systems program. • Continue to conduct W76-1 and W76-2 core surveillance activities to include D&I, system-level laboratory, and joint flight testing as W76-1 and W76-2 requirements are being assumed by the stockpile systems program.	• The increase represents W76-1 and W76-2 maintenance (LLCE, repairs), surveillance and assessment requirements now being covered by the stockpile systems program, and continuation of W76-1 JTA3 development activities.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Continue to conduct weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. The W76 Stockpile Systems program has assumed all W76-0, W76-1 and W76-2 sustainment requirements. • Continue full program execution for development of W76-1 JTA3 to ensure on time FPU prior to JTA1 end of life. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• Continue to conduct weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. The W76 Stockpile Systems program has assumed all W76-1 sustainment requirements. • Continue full program execution for development of W76-1 JTA3 to ensure on time FPU prior to JTA1 end of life. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	
W78 Stockpile Systems $81,299,000	**W78 Stockpile Systems $90,093,000**	**W78 Stockpile Systems +$8,794,000**
• Conduct maintenance activities in accordance with PCDs and execute repair and replacement of aging components as required. • Continue to conduct surveillance activities in accordance with directive documents, to include D&Is, system- level laboratory tests, joint flight testing, component and material evaluations and assessment. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory testing and analysis, SFIs as required. • Conduct studies in conjunction with DOD as necessary. Continue to develop JTA6R technology to support flight test missions, • Continue to conduct activities associated with the management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Continue maintenance activities in accordance with PCDs and execute repair and replacement of aging components as required. • Continue to conduct surveillance activities in accordance with directive documents, to include D&Is, system- level laboratory tests, joint flight testing, component and material evaluations and assessment. Additional surveillance activities to quantify age related effects on the system. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory testing and analysis, SFIs as required. • Continue to conduct studies in conjunction with DOD as necessary. Continue JTA6R development technology to support flight test missions, and Components BDRs. • Continue activities associated with the management of fielded weapon systems. Provide	• The increase represents a ramp up in the development of the W78 JTA6R flight test body. Additional surveillance activities are necessary to understand the aging effects in the system.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	systems and component engineering support for planning, resolution, and documentation.	
W80 Stockpile Systems $80,204,000	**W80 Stockpile Systems $77,562,000**	**W80 Stockpile Systems -$2,642,000**
• Continue to produce LLCs. Continue Alt 369 production. • Continue surveillance activities, to include D&I, system-level laboratory and joint flight testing, Component Material Evaluation (CME), assessment, and platform compatibility and testing activities. • Continue weapon assessment activities necessary to complete WRRs and AARs, which include analyses of laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA/Multi-System Transportation Attachment Device (MTAD) requirements. Provide laboratory and management expertise to the POG and DOD Safety Studies. • Continue activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Continue to produce LLCs. Complete Alt 369 production. • Continue surveillance activities, to include D&I, system-level laboratory and joint flight testing, CME, assessment, and platform compatibility and testing activities. • Continue weapon assessment activities necessary to complete WRRs and AARs, which include analyses of laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA/MTAD requirements. Provide laboratory and management expertise to the POG and DOD Safety Studies. • Continue activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• The decrease represents a ramp-down in Weapons Maintenance activities due to the completion of Alt 369 activities.
B83 Stockpile Systems $51,543,000	**B83 Stockpile Systems $30,795,000**	**B83 Stockpile Systems -$20,748,000**
• Continue to support LLCE operations per NPR requirement. • Continue surveillance activities, including D&Is, system-level laboratory tests, joint flight tests, CMEs, and assessment per NPR requirement. • Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required. • Continue activities associated with management of fielded weapon systems. Provides systems and	• Continue to support LLCE operations per NPR requirement. • Continue surveillance activities, including D&Is, system-level laboratory tests, joint flight tests, CMEs, and assessment per NPR requirement. • Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required. • Continue activities associated with management of fielded weapon systems. Provides systems and	• The decrease represents sustainment of surveillance and assessment activities to support the NWC directed program of record to satisfy the 2018 NPR requirement, and the use of anticipated carryover due to the deferment of long-term sustainment alterations.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
component engineering support for planning, resolution, and documentation.	component engineering support for planning, resolution, and documentation.	
W87 Stockpile Systems $98,262,000	**W87 Stockpile Systems $103,139,000**	**W87 Stockpile Systems +$4,877,000**
• Continue NG production, firing set qualification and related production activities. Continue NG retrofits, maintenance, repair, and rebuild of W87 war heads. Continue activities for qualification of GTS Alt 360 related components and full-scale GTS production to support LLCE deliveries and hedge. Continue to support other component production activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, component and material evaluations, replacement hardware development procurement, and other surveillance production component, and other compatibility testing activities. • Continue to provide weapon assessment activities to include laboratory testing and analysis, POG and DOD requested studies, and SFIs, necessary to complete WRR and AAR. • Continue product realization activities for the W87 Alt 360. Continue GBSD feasibility studies as required in conjunction with the DOD. Decrease firing set development activities that would impact out year production and stockpile rebuilds. • Continue to conduct activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Maintain NG production, firing set qualification and related production activities. NG retrofits, maintenance, repair, and rebuild of W87 war heads. Continue activities for qualification of GTS Alt 360 related components and full-scale GTS production to support LLCE deliveries and hedge. Continue to support other component production activities. • Maintain surveillance activities to include D&I, system-level laboratory and joint flight testing, component and material evaluations, replacement hardware development procurement, and other surveillance production component, and other compatibility testing activities. • Continue to provide weapon assessment activities to include laboratory testing and analysis, POG and DOD requested studies, and SFIs, necessary to complete WRR and AAR. • Continue product realization activities for the W87 Alt 360. Continue GBSD feasibility studies as required in conjunction with the DOD. Decrease firing set development activities that would impact out year production and stockpile rebuilds. • Maintain activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• The increase represents transition to production activities for Alt 360 production and activities related to GBSD integration.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
W88 Stockpile Systems $157,815,000	**W88 Stockpile Systems $148,691,000**	**W88 Stockpile Systems -$9,124,000**
• Continue to execute production of weapon components required for repair, maintenance, and replacement. Initiate full-scale NG production with increased technical scope in FY 2019. Continue production and production qualification activities for the GTS LLCE cycle beginning in FY 2020. Rebuild warheads only to maintain authorization basis due to W88 Alteration Program preparation, and to fully execute Alt 940 production and deployment activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, CME, and platform compatibility and testing activities. Continue component surveillance activities, to include Canned Subassembly non-destructive evaluations. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs, to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. Execute Alt 370 and Alt 940 SS-21 authorization basis and fielding activities to support FPUs. • Continue critical Development/Integration and start system level qualification activities for surety enhancements, and replace legacy W88 System NG and remanufacture of GTS. Conduct appropriate studies in conjunction with DOD; provide laboratory and management expertise to the POG and DOD safety studies. Execute H1514C container production. • Continue and increase activities associated with management of fielded weapon systems. Provides systems and component engineering	• Continue to execute production of weapon components required for repair, maintenance, and replacement. Continue full-scale NG production. Continue production of the GTS to support the LLCE cycle. Rebuild warheads only to maintain authorization basis due to W88 Alteration Program preparation, and to fully execute Alt 940 production and deployment activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, CME, and platform compatibility and testing activities. Continue component surveillance activities, to include Canned Subassembly non-destructive evaluations. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs, to include laboratory/site testing and analysis, and SFIs. Execute Alt 370 and Alt 940 SS-21 authorization basis and fielding activities to support FPUs. • Continue system level qualification activities for surety enhancements, begin production of Alt 940. Conduct appropriate studies in conjunction with DOD; provide laboratory and management expertise to the POG and DOD safety studies. Execute H1514C container production. • Continue and increase activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• The decrease represents primarily reductions in Alt 940 design activities, offset by the purchasing of long lead items and readying for surety enhancement production activities with FPU planned for FY 2022.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
support for planning, resolution, and documentation.		
Multi-Weapon Systems $332,569,000	**Multi-Weapon Systems $335,491,000**	**Multi-Weapon Systems +$2,922,000**
• Continue Use Control studies and equipment procurements and equipment procurements supporting LEP FPUs, the enduring stockpile, and external deliverables. Increased Use Control training with DOD customers. • Execute surveillance activities in accordance with FY 2020 PCDs, and FY 2020 Integrated Weapon Evaluation Team (IWET) Plans. Includes efforts at Tonopah Test Range and development of surveillance testers including stronglink, environmental, and centrifuges required to support LEP testing requirements. • Add multi-system weapon response and external production resources to provide weapon response services and conduct nuclear safety studies for un-interrupted manufacturing/ assembly/disassembly operations at production plants. • Continue the multi-year effort to upgrade and integrate the weapons LAPS system. • Sustainment of critical manufacturing skills in support of LEP production. • Perform operations and maintenance of Product Realization Integrated Digital Enterprise (PRIDE) to collect, process, store, and transmit data across the NNSA Nuclear Security Enterprise. • Respond to DOD URs about issues with the stockpile. • Provide DOD training on weapons maintenance activities in the field.	• Continue Use Control studies and equipment procurements and equipment procurements supporting LEP FPUs, the enduring stockpile, and external deliverables. Increased Use Control training with DOD customers. • Maintain adequate storage capacity and provide safe, secure, and compliant storage of Special Nuclear Material (SNM) at the Pantex Plant, and conduct required SNM surveillance activities supporting the stockpile assessment. • Continue multi-system weapon response and external production resources to provide weapon response services and conduct nuclear safety studies for un-interrupted manufacturing/ assembly/disassembly operations at production plants. • Operate and maintain daily-used PRIDE information systems to include design, product as-built, surveillance, and dismantlement information in support of the Stockpile Management mission from design through dismantlement • Continue sustainment of critical manufacturing skills in support of LEP production. • Respond to DOD URs about issues with the stockpile. • Provide DOD training on weapons maintenance activities in the field. • Perform production and maintenance of test and handling gear, spare parts for DOD, and containers.	• The increase represents a ramp-up in Assessments and Studies for Joint Integrated Lifecycle Surety (JILS), an analysis and assessment capability, better aligned with Use Control technologies; maintain adequate storage capacity and surveillance capabilities; and growth in multi-weapon activities needed to support fielding the LEPs following FPU, surveillance activities, and the development of surveillance testers for weapons.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Perform production and maintenance of test and handling gear, spare parts for DOD, and containers. • Execute production of weapon components for use in multiple weapon systems, for example, batteries, stronglinks, switch tubes, polymers, and containers. • Conduct program management and oversight of weapon sustainment activities. • Continue re-establishing additional uranium processing capabilities.	• Execute production of weapon components for use in multiple weapon systems, for example, batteries, stronglinks, switch tubes, polymers, and containers. • Conduct program management and oversight of weapon sustainment activities.	

Overview

The Weapons Dismantlement and Disposition (WDD) program contains weapon dismantlements, safety studies on retired systems, material characterization, and the disposal of weapon parts. WDD remains the same for the DSW budget restructure.

Stockpile Management
Weapons Dismantlement and Disposition

Description

Weapons Dismantlement and Disposition (WDD) is a critical element of NNSA's integrated effort to transform the enterprise and the stockpile. Specific activities include weapons disassembly, recycling of material and hardware for LEPs, disposition of retired warhead system components, and ensuring components are available for safety testing. Other supporting activities specific to retired warheads include conducting hazard assessments, issuing safety analysis reports, conducting laboratory and production plant safety studies, and declassification and sanitization of component parts. WDD relies on several enabling programs to complete its mission, such as the Office of Stockpile Production Integration for shipping, receiving, and equipment maintenance; Infrastructure and Operations for infrastructure sustainment and containers; and the Office of Secure Transportation for the movement of weapons and weapon components.

WDD focuses on the safe and secure dismantlement of excess nuclear weapons and components. The WDD program has four major activities:

(1) Disassembly – WDD enables the dismantlement of weapons and canned subassemblies and is a significant supplier of material for future nuclear weapons production and Naval Reactors.

(2) Component Disposition – WDD ensures waste streams are identified to allow for the permanent disposition of weapon components.

(3) Retired Systems Management – WDD enables safety studies that ensure weapons in the stockpile awaiting dismantlement remain safe while in DOD custody.

(4) Component Characterization – WDD ensures that all potential hazards contained in weapon components are characterized to allow the weapons complex to safely work with individual weapon components.

Highlights of the FY 2021 Budget Request

- Execute a weapon dismantlement program consistent with the priorities of the LEPs, stockpile, and naval reactors.
- Execute annual activities as stated in the Production and Planning Directive
- Provide material and hardware for LEPs, internal, and external customers.
- Perform legacy component disposition activities.

FY 2022 - FY 2025 Key Milestones

- Execute the dismantlement of weapons and CSAs and remain a significant supplier of material for future nuclear weapons production and Naval Reactors.
- Execute annual activities as stated in the annual Dismantlement Program Plan.
- Provide material and hardware for LEPs.
- Provide material for external customers.

FY 2019 Accomplishments

- Pantex Plant kept the overall weapons dismantlement program on schedule.
- Y-12 exceeded CSA dismantlements by 8%.
- Reduced legacy part inventories throughout the enterprise in accordance with site-specific disposition plans.
- Exceeded component disposition goals for FY 2019.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Weapons Dismantlement and Disposition (WDD) **$56,000,000**	**Weapons Dismantlement and Disposition (WDD)** **$50,000,000**	**Weapons Dismantlement and Disposition (WDD)** **-$6,000,000**
• Continue weapon dismantlements to ensure trained labor, material and component requirements are met (e.g., W80-1 Alt 369, B61-12 LEP, and W76 LEP). • Dismantlement to benefit Production Technicians in terms of technical training and clearances for future LEPs. • Provide feedstock from CSAs to internal and external customers. • The laboratories will provide technical expertise and safety plans for weapons undergoing dismantlement. • Enterprise sites will continue legacy component disposition & CSA activities at a modified level.	• Continue safe and secure dismantlement of nuclear weapons and components in excess of national security requirements. • Recycle material and components from dismantled unites required for LEPs, the stockpile, and other customers. • Reduce Legacy component inventories and make space available for incoming LEP material.	• The decrease represents level work activities for weapon and CSA dismantlements, recycle requirements, and reduction of legacy component inventories due to use of FY 2020 carryover.

Stockpile Management
Production Operations

Overview

Productions Operations was renamed from Stockpile Services Production Support in the budget restructure and provides a manufacturing-based program that drives individual site production base capabilities for LEPs, weapon maintenance, surveillance, weapon assembly & disassembly, and weapon safety & reliability testing. Production Operations provides maintenance/calibration services for manufacturing operations to meet DOD War Reserve requirements. Production Operations scope covers sustainment of all weapon systems capabilities that enable individual weapon production and are not specific to one material stream. Facility major modernization and construction activities are not part of this budget subprogram and are covered in other parts of the Weapons Activities account.

Production Operations will:

Provide the manufacturing capabilities (e.g., engineering, manufacturing, quality assurance) and capacity for LEP production, enduring stockpile weapon assembly, weapon disassembly, weapon safety and surveillance testing, and reliability testing as required to meet directive schedules and meet DOD delivery schedules.

Support manufacturing investments for detonator and detonator cable assemblies (DCA) production, and NG Enterprise.

Expand engineering and quality assurance processes responsive to increased non-nuclear component production requirements.

Support Model Based Enterprise initiatives which allow NNSA to seamlessly exchange classified 3-dimensional product definition via common Computer Aided Drafting and Design (CADD) architecture from weapon component sourcing to quality inspection**.**

Stockpile Management
Production Operations

Description

Production Operations provides engineering and manufacturing labor, quality assurance, and programmatic equipment support for the manufacturing base that enables the individual site capability and capacity to sustain NNSA's nuclear security enterprise's production mission. The production mission is defined as weapon assembly, weapon disassembly, component production, surveillance, and weapon safety and reliability testing. Production Operations also enables the modernization of production capabilities to improve efficiency and ensure manufacturing operations meet future requirements. Production Operations requires close coordination with the Advanced Manufacturing Development program, which is charged with development and initial deployment of new manufacturing and production capabilities.

Production Operations major activities include the following:

- **Engineering Operations** – Internal plant-wide activities that establish product process flows and improvements, develop and maintain operating procedures, determine critical design parameter and manufacturing process capabilities, establish process controls, metrics and quality indices, and establish and maintain process safety controls/assessments;
- **Manufacturing Operations** – Activities that manage and provide oversight to manufacturing departments and all internal non-weapon-type specific manufacturing operations and processes, material controls, supervision, planning and scheduling, inventory control, packaging, shipping and procurement, internal production-related transportation, and internal production related safety activities. It also includes classified manufacturing operations that cannot be associated with a particular warhead;
- **Quality, Supervision, and Control** – Includes activities dealing with quality control, supervision of general in-line inspection and radiography, procedures development and execution, process control certification for War Reserve products, measurement standards and calibration techniques, calibration of equipment, tooling, gages and testers, and Quality Assurance (QA)-related equipment/processes for certification;
- **Tool, Gage, and Equipment Services – Activities that include preparation of specifications and designs for non-weapon-type** specific tooling including tools, gages, jigs and fixtures and test equipment, as well as design and development of tester software including tester control and product assurance. This category also includes work related to verification/qualification of hardware and software, procurement processes, and maintenance, both corrective and preventative, that directly support production-related equipment/process components;
- **Purchasing, Shipping, and Materials Management** – Planning, engineering, supplier management, and logistics activities associated with the materials supply chain; and
- **Electronic Product Flow** – Activities that include internal plant-wide purchase, design, development, installation, configuration, testing, training, and maintenance of classified and unclassified computer systems including hardware and software. These activities are directly linked to the performance of site-specific production functions, but are separate and distinct from general-use administrative and office-automated systems. Supported systems in both unclassified and classified environments enable manufacturing and quality assurance functions.

Highlights of the FY 2021 Budget Request

- Provide the manufacturing capabilities (e.g., engineering, manufacturing, quality assurance) and capacity for LEP production, enduring stockpile weapon assembly, weapon disassembly, weapon safety and surveillance testing, and reliability testing as required to meet directive schedules and meet DOD delivery schedules.
- Support manufacturing investments to sustain product lines for detonator and detonator cable assemblies (DCA) production, and product lines for the NG Enterprise.
- Expand engineering and quality assurance processes to support increased non-nuclear component production requirements.
- Support Model Based Enterprise initiatives which allow NNSA to seamlessly exchange classified 3-dimensional product definition via common Computer Aided Drafting and Design (CADD) architecture from weapon component sourcing to quality inspection.
- Support the mission assignments for LEPs/Alts through sustainment of full time production operations at increased levels of plant capability and capacity.

FY 2022 - FY 2025 Key Milestones

- Meet Detonator production build plan as defined in the approved Detonator Production and Surveillance Program Execution Plan supporting weapon system ship/delivery schedules.
- Enable on-time completion of Stockpile Management deliverables by ensuring Process Equipment Availability.
- Increase responsiveness of production sites to support workload capacity for LEPs and Alts would be realized.
- Grow base capabilities, both workforce and equipment, to ensure procedures and requisite process equipment meet LEP FPUs.
- Make additional equipment investments to increase detonator and DCA production capabilities.
- Expand neutron generator production to five product lines and increased maintenance and calibration services.

FY 2019 Accomplishments

- Calibration Services completed over 1,800 critical equipment calibrations on time in support of production activities.
- Detonator Cable Assembly production and test fire were completed in support of component FPU for W88 Alt 370.
- Sustained base capabilities for multi-system operations and maintenance support to meet all LLCE GTS Fills and GTS Surveillance NNSA deliverables.
- Completed Unloading Laser B System replacement installation/startup.
- Supported 414 LLNL Engineering Authorizations (EA), 382 NSE EAs, and 207 PRT meetings.
- Completed the Vacuum Arc Re-melt (VAR) Controller and Environmental Room Controls upgrades.
- ELNG PRT successfully completed FPU of B83; B61-11 successfully completed DOE Product Acceptance.
- Completed 901 Neutron Generator builds versus 884 planned builds.
- NNSA accepted over 40,000 SNL components.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Production Operations $543,964,000	**Production Operations $568,941,000**	**Production Operations +$24,977,000**
• Continue engineering operations for weapon operations including LEP, surveillance, dismantlement, and component production to meet directive schedules and meet DOD delivery schedules. • Equipment investments at LANL for detonator and DCA production to support increased product lines and improving yield rate. • Perform production capability infrastructure upgrades, including upgrading the Unloading Laser at SRS. • Upgrade site specific shop-floor IT hardware and software. • Continue the Manufacturing Modernization Product (MMP) in support of digital product acceptance, including implementing upgrades to the pit product line and developing the upgrades for the detonator product lines. • Perform routine maintenance and upgrades to the Automated Reservoir Management System at SRS. • Conduct upgrades to Neutron Generator Enterprise shop-floor controls. • Upgrades to increase efficiency supporting the increased LEP workload. • Increase intra-site logistical support required to support weapon and component moves related to production. • Continue engineering and quality assurance preparation for B61-12 non-nuclear component production.	• Continue engineering operations for weapon operations including LEP, surveillance, dismantlement, and component production to meet directive schedules and meet DOD delivery schedules. • Base production capability to meet Neutron Generator production build plan as defined in the approved NG Enterprise Integrated Program Plan (NIPP) responsive to five weapon system product line ship/delivery schedules. • Base production capability to meet Detonator production build plan as defined in the approved Detonator Production and Surveillance Program Execution Plan supporting seven product line weapon system ship/delivery schedules. Execute activities to enable on-time completion of deliverables by ensuring Process Equipment availability. • Provide labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload. • Continue engineering and quality assurance expansion for increased non-nuclear component production requirements. • Increase intra-site logistical support required to support weapon and component moves related to production. • Continue engineering and quality assurance preparation for B61-12 non-nuclear component production.	• The increase represents the continued growth to underpin the LEP workload ensuring procedures and prerequisite process equipment are in place to meet LEP FPU requirements. The program will expand responsiveness of production lines to sustain workload capacity for LEPs and Alts. The funding will also provide the tooling needed to execute certifying weapons and components, and the production schedule through product qualification.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Provide engineering and quality assurance support for internal containers that support production. • Provide increased labor for purchasing, shipping and supply chain management. • Continue Neutron Generator production that require increased maintenance and calibration services. • Continue providing labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload. • Provide quality assurance and procedural/engineering safety. • Perform product certification (independent evaluation of build records) for auditing purposes.	• Develop policy implementation strategies, tools, and techniques for use across programs and all sites in the NSE to reduce the risks of subversion. • Refine and deploy NEA awareness education across the NSE and site specific training at all sites. • Support Model Based Enterprise initiatives which allow NNSA to seamlessly exchange classified 3-dimensional product definition via common Computer Aided Drafting and Design (CADD) architecture from weapon component sourcing to quality inspection.	

Stockpile Management
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	67,586	67,586	61,011	56,164	-4,847
Minor Construction	N/A	N/A	16,176	16,176	16,532	16,895	+363
Total, Capital Operating Expenses	N/A	N/A	**83,762**	**83,762**	**77,543**	**73,059**	**-4,484**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	51,326	51,326	52,454	53,608	+1,154
Cold Hearth Electron Beam Melting (CHM), LLNL	8,000	0	5,000	5,000	3,000	0	-3,000
Multi-Mass Leak Detector, Y-12	7,813	1,500	3,200	3,200	1,557	1,556	-1
Parts Cleaning for Direct Lithium Material Mtg., Y-12[a]	9,860	7,800	2,060	2,060	0	0	0
LT249 High Temperature Oven Upgrades , Y-12	12,000	0	0	0	0	1,000	+1,000
Special Materials Facility Capacity Build up, Y-12	10,000	0	6,000	6,000	4,000	0	-4,000
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**67,586**	**67,586**	**61,011**	**56,164**	**-4,847**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	16,176	16,176	16,532	16,895	+363
Building 9201-1 Pangborn Upgrades, Y-12	5,000	0	0	0	0	0	0
Total, Minor Construction Projects	**N/A**	**N/A**	**16,176**	**16,176**	**16,532**	**16,895**	**+363**
Total, Capital Summary	**N/A**	**N/A**	**83,762**	**83,762**	**77,543**	**73,059**	**-4,484**

[a] Parts Cleaning for Direct Lithium Material Mtg., Y-12 FY20 to be funded by Production Modernization.

Outyears for Stockpile Management

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	59,787	61,992	57,223	58,481	N/A
Minor Construction	17,266	18,646	20,035	20,432	N/A
Total, Capital Operating Expenses	**77,053**	**80,638**	**77,258**	**78,913**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	54,787	55,992	57,223	58,481	N/A
LT249 High Temperature Oven Upgrades , Y-12	5,000	6,000	0	0	0
Total, Capital Equipment (including MIE)	**59,787**	**61,992**	**57,223**	**58,481**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	17,266	17,646	18,035	18,432	N/A
Building 9201-1 Pangborn Upgrades, Y-12	0	1,000	2,000	2,000	0
Total, Minor Construction Projects	**17,266**	**18,646**	**20,035**	**20,432**	**0**
Total, Capital Summary	**77,053**	**80,638**	**77,258**	**78,913**	**0**

Production Modernization

Overview

The Production Modernization program focuses on the production capabilities of nuclear weapons critical to weapon performance, including primaries, secondaries, radiation cases, and non-nuclear components. The program encompasses four major subprograms that sustain the Nation's nuclear weapons stockpile.

The subprograms are:

1. The Primary Capability Modernization program consolidates management of nuclear material processing capabilities in the National Nuclear Security Administration NNSA's Nuclear Security Enterprise (NSE). The program includes (1) Plutonium Modernization and (2) High Explosives and Energetics Modernization.
2. The Secondary Capability Modernization program is responsible for restoring and increasing manufacturing capabilities for the secondary stage to required levels in the NSE. This includes ensuring the availability of strategic materials and other sub-component streams necessary for the secondary stage, as well as modernizing the facilities and operations required to process these materials, fabricate them into parts, and assemble the final components. The program includes (1) Uranium Modernization; (2) Depleted Uranium Modernization; and (3) Lithium Modernization.
3. Tritium Modernization and Domestic Uranium Enrichment, consists of two parts: (1) Tritium Modernization produces, recovers, and recycles tritium to support national security and (2) the Domestic Uranium Enrichment (DUE) Program is responsible for establishing a reliable supply of enriched uranium to support U.S. national security and nonproliferation needs.
4. Non-Nuclear Capability Modernization consolidates management and oversight of strategic investments to modernize capabilities for design, qualification, and production of non-nuclear components for multiple weapon systems of non-nuclear parts.

The Production Modernization program:

1. Provides funding for efforts across the NSE to restore the Nation's capability to produce 80 pits per year (ppy).
2. Supports production modernization and qualification of explosive, pyrotechnic, and propellant materials for supplying the NSE across five Management and Operating (M&O) sites.
3. Provides funding to modernize uranium operations to ensure delivery of secondary components needed to maintain the stockpile, as well as provide support to the U.S. Navy, and nonproliferation programs.
4. Enables the restart and modernization of lapsed depleted uranium (DU) alloying and component manufacturing capabilities to ensure NNSA can meet short and long-term mission requirements.
5. Maintains the production of the Nation's enriched lithium supply in support of Defense Programs, the Department of Energy (DOE) Office of Science, the Department of Homeland Security, and other customers.
6. Operates the national capability for producing tritium and is adding capacity to meet added national security requirements.
7. Provides funding to modernize production of non-nuclear components for multiple weapon systems.

Production Modernization
Funding (Non-Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Production Modernization				
Primary Capability Modernization				
Plutonium Modernization				
Los Alamos Plutonium Modernization				
Los Alamos Plutonium Operations	**0**	**0**	**610,599**	**+610,599**
21-D-512 Plutonium Pit Production Project, LANL	**0**	**0**	**226,000**	**+226,000**
Subtotal, Los Alamos Plutonium Modernization	0	0	836,599	**+836,599**
Savannah River Plutonium Modernization				
Savannah River Plutonium Operations	**0**	**0**	**200,000**	**+200,000**
21-D-511 Savannah River Plutonium Processing Facility, SRS	**0**	**0**	**241,896**	**+241,896**
Subtotal, Savannah River Plutonium Modernization	0	0	441,896	+441,896
Enterprise Plutonium Support	**0**	**0**	**90,782**	**+90,782**
Total, Plutonium Modernization	0	0	1,369,277	+1,369,277
High Explosives & Energetics	**0**	**0**	**67,370**	**+67,370**
Total, Primary Capability Modernization	0	0	1,436,647	+1,436,647
Secondary Capability Modernization	**0**	**0**	**457,004**	**+457,004**
Non-Nuclear Capability Modernization	**0**	**0**	**107,137**	**+107,137**
Tritium and Domestic Uranium Enrichment	**0**	**0**	**457,112**	**+457,112**
Total, Production Modernization	**0**	**0**	**2,457,900**	**+2,457,900**

Production Modernization
Funding (Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Production Modernization				
Primary Capability Modernization				
Plutonium Modernization				
Los Alamos Plutonium Modernization				
Los Alamos Plutonium Operations	**271,564**	**286,975**	**610,599**	**+323,624**
21-D-512 Plutonium Pit Production Project, LANL	**5,000**	**21,156**	**226,000**	**+204,844**
Subtotal, Los Alamos Plutonium Modernization	276,564	308,131	836,599	+528,468
Savannah River Plutonium Modernization				
Savannah River Plutonium Operations	**76,410**	**410,458**	**200,000**	**-210,458**
21-D-511 Savannah River Plutonium Processing Facility, SRS	**0**	**0**	**241,896**	**+241,896**
Subtotal, Savannah River Plutonium Modernization	76,410	410,458	441,896	+31,438
Enterprise Plutonium Support	**53,710**	**79,216**	**90,782**	**+11,566**
Total, Plutonium Modernization	406,684	797,805	1,369,277	+571,472
High Explosives & Energetics	**8,750**	**13,768**	**67,370**	**+53,602**
Total, Primary Capability Modernization	415,434	811,573	1,436,647	+625,074
Secondary Capability Modernization	**249,989**	**293,545**	**457,004**	**+163,459**
Non-Nuclear Capability Modernization	**9,173**	**13,905**	**107,137**	**+93,232**
Tritium and Domestic Uranium Enrichment	**350,151**	**446,500**	**457,112**	**+10,612**
Total, Production Modernization	**1,024,747**	**1,565,523**	**2,457,900**	**+892,377**

Production Modernization
Outyear Funding (Comparable)

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Production Modernization				
Primary Capability Modernization	1,762,576	2,184,664	2,235,402	2,085,553
Plutonium Modernization	1,698,176	2,116,754	2,160,212	2,005,553
Los Alamos Plutonium Modernization	985,280	1,233,217	1,260,188	1,042,549
Los Alamos Plutonium Operations	**635,280**	**733,217**	**810,188**	**842,549**
21-D-512 Plutonium Pit Production Project, LANL	**350,000**	**500,000**	**450,000**	**200,000**
Savannah River Plutonium Modernization	623,983	815,568	832,694	886,000
Savannah River Plutonium Operations	**178,983**	**191,568**	**226,694**	**366,000**
21-D-511 Savannah River Plutonium Processing Facility, SRS	**445,000**	**624,000**	**606,000**	**520,000**
Enterprise Plutonium Support	**88,913**	**67,969**	**67,330**	**77,004**
High Explosives & Energetics	**64,400**	**67,910**	**75,190**	**80,000**
High Explosives & Energetics	64,400	67,910	75,190	80,000
HESE OPC's	0	0	0	0
Secondary Capability Modernization	**463,073**	**472,108**	**488,668**	**495,356**
Uranium Modernization	306,062	307,244	321,584	325,383
Process Technology Development	0	0	0	0
Y-12 Production Increase	50,000	51,050	52,122	53,217
Depleted Uranium Modernization	70,011	74,114	68,662	66,756
Lithium Modernization	37,000	39,700	46,300	50,000
Tritium and Domestic Uranium Enrichment	**612,286**	**731,739**	**571,953**	**499,412**
Tritium Modernization	369,036	416,995	319,173	345,350
Domestic Uranium Enrichment	243,250	314,744	252,780	154,062
HEU downblend	0	0	0	0
Non-Nuclear Capability Modernization	**161,563**	**115,482**	**97,234**	**92,446**
Total, Production Modernization	**2,999,498**	**3,503,993**	**3,393,257**	**3,172,767**

Production Modernization
Proposed Budget Structure Changes
(Dollars in Thousands)

	Proposed FY 2021 Budget Structure													
	Production Modernization													
	Primary Capability Modernization						Secondary Capability Modernization			Tritium and Domestic Uranium Enrichment			Capability Modernization	
	Los Alamos Plutonium Modernization	PU Pit Production Project	Savannah River PU Modernization	Savannah River PU Processing	Enterprise PU support	High Explosives and	Uranium Modernization	Depleted Uranium Modernization	Lithium Modernization	Tritium Modernization	Domestic Uranium Enrichment	HEU Downblend	Non-Nuclear Capability Modernization	Total
FY 2020 Budget Structure														
Weapons Activities														
Directed Stockpile Work														
Stockpile Services														
Production Support						49,400								**49,400**
Research & Development														
Research & Development														
Management, Technology,														
Strategic Materials														
Uranium Sustainment							135,587	98,915						**234,502**
Plutonium Sustainment	593,519	226,000	200,000	241,896										**593,519**
Tritium Sustainment										286,000				**286,000**
Lithium Sustainment									39,400					**39,400**
Domestic Uranium Enrichment											145,003			**145,003**
HEU Downblend														
Strategic Materials Sustainment														
MRR	17,080				63,660		90,291	7,000		26,109				**140,480**
Storage					27,122		16,854	5,000						**21,854**
SPE													5,409	**5,409**
Advanced Manufacturing														
Additive Manufacturing														
Component Manufacturing														
Process Technology							63,957							**63,957**
Infrastructure and Operations														
Capabilities Based Investments						17,970							15,900	**33,870**
Total	**610,599**	**226,000**	**200,000**	**241,896**	**90,782**	**67,370**	**306,689**	**110,915**	**39,400**	**312,109**	**145,003**	**0**	**21,309**	**1,613,394**

Production Modernization
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Production Modernization	
Primary Capability Modernization	**+53,602**
Increase includes initial funding for preliminary design of the Savannah River Plutonium Processing Facility. In addition, the increase also reflects additional investments for modernization of high explosives and energetics capabilities.	
Los Alamos Plutonium Operations	**+323,624**
This increase for development of critical skills for process development and qualification activities.	
	+204,844
21-D-512 Plutonium Pit Production Project, LANL	
This increase significant additional investments at Los Alamos National Laboratory for plutonium pit production, including equipment installation.	
	-210,458
Savannah River Plutonium Operations	
Decreased reflects the planned completion of CD-1. Funding will adequately support the establishment of a program office capability at SRS to support project design efforts, train and hire future staff, and support future operations.	
	+241,896
21-D-511 Savannah River Plutonium Processing Facility, SRS	
This increase includes initial funding for preliminary design of the Savannah River Plutonium Processing Facility.	
	+11,566
Enterprise Plutonium Support	
Funds activities that support pit production across the enterprise including certification activities at LLNL, production at KCNSC, and material management and storage activities NNSS	
Secondary Capability Modernization	**+163,459**
This increase reflects new depleted uranium scope to meet near-team mission requirements and support future weapon systems. This increase is also due to additional scope to supply the current stockpile with purified enriched uranium metal, as well as supporting the transition of new capabilities into new and enduring facilities.	
Tritium and Domestic Uranium Enrichment	**+10,612**
This increase funds additional fuel and irradiation fees for the increased numbers of TPBARs, including introduction of 900 TPBARs in WBN2. Increase supports continue ramp to full operations at TEF, by increasing number of operators, recapitalization, and maintenance activities. In addition to continue to fortify the TPBAR component supply chain. Also, reflects the transfer of HEU down-blending funding back into Domestic Uranium Enrichment line.	

	FY 2021 Request vs FY 2020 Enacted
Non-Nuclear Capability Modernization	**+93,232**
The increase reflects production at KCNSC that is necessary to modernize capabilities for design, qualification, and production of non-nuclear components for multiple weapon systems. The increase also reflects procurement of fabrication tools and equipment to enable continued manufacturing of trusted strategic radiation-hardened (TSRH) microsystems and begin refurbishment of SNL's Saturn X-Ray effects testing capabilities.	
Total, Production Modernization	**+892,377**

Overview

The Primary Capability Modernization program consolidates management of nuclear material processing capabilities in the NNSA nuclear security enterprise. The program includes (1) Plutonium Modernization and (2) High Explosives and Energetics Modernization.

Primary Capability Modernization
Plutonium Modernization

Description

The Plutonium Modernization Program provides funding for efforts across the NSE to restore the Nation's capability to produce 80 pits per year (ppy). The program has been restructured consistent with direction included in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019. As the new structure is implemented, NNSA will provide additional details regarding Plutonium Modernization activities to Congressional staff through quarterly pit production briefings, as required by the Fiscal Year (FY) 2020 Energy and Water Development and Related Agencies Appropriations Act. NNSA remains committed to achieving the pit production capability goals listed in prior National Defense Authorization Act (NDAA) language on the path to 80 pits per year, including the capability to produce the first war reserve pit during 2023 and the capability to produce 30 ppy during 2026.

Plutonium Modernization activities include the following:

- **Los Alamos Plutonium Modernization and Pit Production**: Activities include LANL Plutonium Operations which provides for the operational expenses needed to meet pit production requirements at Los Alamos, including activities to hire, train, qualify, and retain required pit production personnel, recapitalization of equipment needed to restore Plutonium Facility (PF)-4's ability to produce War Reserve (WR) quantities, production activities), tooling design and fabrication, and Plutonium Modernization's share of operational expenses for PF-4. This funding also supports manufacturing of precision plutonium devices for science-related evaluation. In FY 2021, LANL will continue Process Prove-In (PPI) product realization activities producing process prove-in pits, a key step towards producing the first WR pit during 2023. LANL Plutonium Operations also funds several efforts to support pit production, including: a radiological control program, facility and equipment maintenance, a criticality safety program, shipping and receiving, authorization basis, work control documentation, training and qualification, spare parts, waste management, storage capability, and facility configuration to maintain plutonium capabilities.

  Activities within Los Alamos Plutonium Modernization and Pit Production also include the LANL Plutonium Pit Production Project, 21-D-512. This project will manage capital acquisitions to increase production capability of PF-4 to produce 10 pits per year as well as associated general infrastructure investments at LANL to support pit production. FY 2021 funding will be used to develop conceptual design documentation needed for Critical Decision (CD)-1, mature design after achieving CD-1, and procure long-lead equipment.

- **Savannah River Plutonium Modernization and Pit Production**: FY 2021 funding supports the establishment of a program office capability at SRS to support project design efforts, train and hire future staff, and support future operations.

  Additionally, the Savannah River Plutonium Processing Facility (SRPPF) project, 21-D-511, repurposes the partially completed Mixed Oxide Fuel Fabrication Facility (MFFF) to reach a capability of 50 ppy consistent with the NNSA's recommended alternative for pit production. FY 2021 activities are focused on developing a project baseline post-CD-1 and supports maturing the design to support CD-2, as well as site and facility preparation, and long lead procurement. Design work includes facility Balance of Plant, gloveboxes, and equipment layout.

- **Enterprise Plutonium Support:** Provides funding for activities that support pit production across the Enterprise including Kansas City Nuclear Security Complex (KCNSC) production of non-nuclear components, certification activities at Lawrence Livermore National Laboratory (LLNL), management of the Product Realization Team (PRT), and material management activities at the Nevada National Security Site (NNSS) previously executed under the Strategic Materials Sustainment program.

Highlights of the FY 2021 Budget Request

- Support the production of 80 ppy.
- Perform planned certification tests to support production of the first War Reserve (WR) pit during 2023.
- Continue investments to recapitalize end-of-life equipment for pit production to reduce mission risk.
- Complete de-inventory of Chemistry and Metallurgy Research (CMR) and improve PF-4 vault facilities efficiency through inventory work off and optimization of footprint to support the transition to plutonium production and improve Material at Risk (MAR) posture.
- Provide storage/staging and inventory management capabilities at LANL and NNSS in support of the plutonium pit production mission.

FY 2022 - FY 2025 Key Milestones

- Build and certify plutonium pit production capabilities including production of process prove-in pits each year to sustain fabrication capability.
- Provide storage/staging and inventory management capabilities at LANL and NNSS.
- Provide plutonium metal feedstock for programmatic use and establish a pull inventory of feedstock to accommodate short-term surge supply needs to support pit production. Complete Special Recovery Line and Weapons Experimental Tritium Facility (WETF) recycle activities.
- Continue to de-inventory the PF-4 vault through the disposition of Defense Program (DP) legacy residues to provide the Category I nuclear material storage space required for the pit production mission.

FY 2019 Accomplishments

- Successfully produced five (5) development (DEV) pits.
- Installed equipment to produce the first WR pit during 2023 in PF-4.
- Completed initial SRPPF flow sheet, layout, equipment list, and preliminary security analysis.
- Completed debris removal of last confinement vessel to support significantly reducing material-at-risk (MAR) at LANL.
- Established reliable capability to manage Transuranic (TRU) waste at LANL by accelerating Waste Isolation Pilot Plant (WIPP) certifications and shipments providing improved TRU waste storage and MAR capacity health metrics at site.
- Completed characterization of all legacy material stored at NNSS (approximately 4,200 items over 3 years).
- Completed material movements and staging at NNSS in support of Pu Pit Production Mission.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Plutonium Modernization ($797,805,000)	**Plutonium Modernization ($1,369,277,000)**	**Plutonium Modernization (+$571,472,000)**
Los Alamos Plutonium Modernization ($308,131,000)	***Los Alamos Plutonium Modernization ($836,599,000)***	***Los Alamos Plutonium Modernization +($528,468,000))***
Los Alamos Plutonium Operations ($286,975,000)	***Los Alamos Plutonium Operations ($610,599,000)***	***Los Alamos Plutonium Operations (+$323,624,000)***
• Maintained base personnel while adding personnel to ramp up work and sustain pit-manufacturing capability. • Continued to recapitalize end-of-life equipment vital to the pit manufacturing mission. • Invested in personnel and equipment needed to support pit production. • Transitioned to Process Prove-in (PPI) activities for product realization • Continued engineering evaluation of development pits.	• Continue to maintain base personnel while adding additional personnel to ramp up work and sustain pit-manufacturing capability. • Continue to recapitalize end-of-life equipment vital to the pit manufacturing mission. • Invest in personnel and equipment needed to support pit production. • Produce pits for the Process Prove-in (PPI) phase of product realization. • Continue engineering evaluation of development pits. • Provide safe and secure storage and staging capabilities, management of nuclear materials and disposition planning (including analysis, forecasting and modeling) in support of plutonium missions at LANL. • Complete CMR de-inventory of legacy special nuclear material in accordance with the CMR Facility Exit Plan.	• Provide programmatic equipment investments and critical skills to meet pit production capacities. • Modernize end-of-life equipment vital to pit manufacturing. • Manage multi-site development and certification activities to produce War Reserve (WR) components. • Support increased staging capabilities at the Device Assembly Facility (DAF) to include shipping, receiving and repackaging operations in support of the NNSA NSE.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Plutonium Pit Production Project, LANL ($21,156,000)	***Plutonium Pit Production Project, LANL ($226,000,000)***	***Plutonium Pit Production Project, LANL (+$204,844,000)***
• Developed design documentation for the Plutonium Pit Production Project at LANL.	• Develop design documentation to complete Critical Decision (CD)-1 and support Critical Decision (CD)-2 development. • Pursue long-lead procurements. • Conduct facility and site preparation.	• Install equipment in PF-4 to increase production capacity above 10 pits per year at LANL and invest in infrastructure necessary to increase production capacity to achieve 30 ppy during 2026.
Savannah River Plutonium Modernization ($410,458,000)	***Savannah River Plutonium Modernization ($441,896,000)***	***Savannah River Plutonium Modernization (+$31,438,000)***
Savannah River Plutonium Operations ($410,458,000)	***Savannah River Plutonium Operations ($200,000,000)***	***Savannah River Plutonium Operations (-$210,896,000)***
• Finalized conceptual design and CD-1 documentation for the Savannah River Plutonium Processing Facility (SRPPF) at SRS.	• Establish and staff a program office at SRS to support project and future production activities. • $110,000,000 is for Other Project Costs (OPC) for the SRPPF project. • Complete conceptual design for CD-1.	• Program office begins to identify programmatic requirements and implement actions required for 50 ppy mission. • Complete documentation for CD-1 and begin preparation for CD-2.
21-D-511 Savannah River Plutonium Processing Facility, SRS (N/A)	***21-D-511 Savannah River Plutonium Processing Facility, SRS ($241,896,000)***	***21-D-511 Savannah River Plutonium Processing Facility, SRS (+$241,896,000)***
• *Not applicable.*	• Continue site preparatory work. • Begin long lead procurements, including gloveboxes. • Develop project baseline post CD-1. • Begin planning and design on high fidelity training facility design. • Mature design for CD-2.	• Further enhance design maturity to include equipment, facility layout, and balance of plant activities.
Enterprise Plutonium Support ($79,216,000)	***Enterprise Plutonium Support ($90,782,000)***	***Enterprise Plutonium Support (+$11,566,000)***
• Invested in personnel and equipment needed to support pit production. • Completed planned Engineering Evaluations and test, analysis, and studies for qualification/evaluation. • Completed PPI pedigree hardware	• LLNL certification activities associated with pit production. • KCNSC non-nuclear component production • Material management and storage activities at LANL and NNSS.	• Activities that support pit production across the Enterprise including certification activities at LLNL and production at KCNSC. • Material management and storage activities that support pit production.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Continued to recycle, recover and dispose of nuclear materials as necessary to support pit production. • Continued to manage storage capabilities and supply chain of nuclear material.	• Product Realization Team (PRT) management at LLNL.	• Execute increased staging capabilities at the Device Assembly Facility (DAF) to include shipping, receiving and repackaging operations in support of the NNSA NSE.

Primary Capability Modernization
High Explosives and Energetics Modernization

Description

The High Explosives (HE) and Energetics Modernization program focuses on modernization prioritization of production facilities and qualification of explosive, pyrotechnic, and propellant materials for supplying the Nuclear Security Enterprise (NSE) across five M&O sites (Pantex Plant, Sandia National Laboratories (SNL), LANL, LLNL, and NNSS). The HE and energetics program is the network of activities inside the NSE's HE and energetics business processes, infrastructure, production, research and development, and supply chain.

Each site maintains multiple dispersed facilities engaged in both Research, Development, Test, and Evaluation (RDT&E) and production operations. For example, main charges at Pantex, detonators at LANL, spin rocket motors at SNL, new HE formulations at LLNL, and large scale test operations at NNSS.

The High Explosives and Energetics Modernization program will manage the capital investment of the HE and energetic infrastructure and equipment to modernize manufacturing, having atrophied over the history of weapons production. Historically, this effort has been accomplished through funding of Other Project Costs (OPCs) within line item construction projects in accordance with DOE O 413.3. The High Explosives Science and Engineering Facility (HESE) and the High Explosive Synthesis, Formulation, and Production Facility (HESFP) at Pantex will hedge against current HE production and testing capability gaps. The Energetics Materials Characterization (EMC) at LANL will be dedicated to supporting HE science and engineering, detonator design and fabrication, and support of LANL firing sites. An Analysis of Alternatives will evaluate the best approach to modernize these HE capabilities at LANL and provide a safe working environment for employees.

High Explosives and Energetics modernization activities will also include the following:

(1) Manage the HE and energetics supply chain risk portfolio to ensure a healthy infrastructure exists to maintain, manufacture, and deploy Mark Quality HE and energetics in support of weapons production.
(2) Provide guidance for energetics surveillance, weapon response, transportation, containers, and explosive/electrical environments.
(3) Define and monitor the qualification standards of HE and energetic material.
(4) Support the future of HE and energetics development, production, component design and manufacturing, testing, and qualification.

Highlights of the FY 2021 Budget Request

- Complete specification for Triaminotrinitrobenzene (TATB)/polymer-bonded explosives (PBX)-9502. Production of TATB in the US ceased in 1993. The current specification is being re-written to include modern analytical methods for qualifying the material.
- Provide a stable supply of all energetic materials to enable system and component level development and production.
- Develop a numerical toolset to simulate and predict PBX-9501 system response with sufficient fidelity for nuclear explosives operations in credible abnormal environment scenarios.
- Complete HE system surveillance and facilitate the collection of data in an enterprise level material data base.

FY 2022 - FY 2025 Key Milestones

- FY 2022: Obtain CD-2/3 approval for the High Explosive Synthesis, Formulation, and Production (HESFP) Facility.
- FY 2023: Obtain CD-2/3 approval for the Energetics Material Characterization (EMC) capability.
- FY 2024: Produce first war reserve (WR) production lot of PBX-9502 for the W80-4 using newly synthesized TATB. This WR PBX-9502 culminates a multi-year effort with Holston Army Ammunition Plant to reconstitute the production of Insensitive HE for main charge production.
- FY 2025: Obtain CD-4 approval for the HE Science and Engineering facility.

FY 2019 Accomplishments

- Coordinated with Department of Defense (DoD) for use of the DX (highest national priority) rating through the Defense Priorities and Allocations System for procurements as they pertain to the authorized DoD DX-rated systems.

- Completed Critical Decision 0 (CD-0) for the High Explosive Synthesis, Formulation, and Production Facility at Pantex.
- Began planning for additional HE infrastructure investments, including gaining CD-0 approved for the Energetic Materials Characterization and starting Analysis of Alternatives (AoA) in FY 2020.
- Qualified War Reserve conventional high explosive (CHE) and insensitive high explosives (IHE) main charges in the High Explosive Pressing Facility at Pantex.
- Produced the first lot of a plastic-bonded explosive, with newly produced TATB and binder and legacy raw materials to meet performance specifications from Holston Army Ammunition Plant (HSAAP) since 2005.
- Made significant progress towards reestablishing synthesis formulation of key IHE material components to be used in future Life Extension Programs (LEPs).
- Reestablished the synthesis of War Reserve materials at Pantex for SNL neutron generator production.
- Produced kilogram-quantities of IHE at HSAAP with a novel process, demonstrating the ability to manufacture life of program quantities for future systems.
- Reconstituted DOE/NNSA's capability to make detonator materials, applying advanced data analytics and synchrotron x-ray data from the Advanced Photon Source to identify performance changes with age and develop lifetime models for detonators.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
High Explosives and Energetics Modernization ($13,768,000)	**High Explosives and Energetics Modernization ($67,370,000)**	**High Explosives and Energetics Modernization (+$53,602,000)**
• Recapitalized manufacturing capabilities at Pantex. • Completed independent cost analyses for the HESE and HESFP line item construction projects in accordance with DOE O 413.3. • Established the Energetic Materials Product Realization Team at SNL. • Ensured the safe operations of HE at Los Alamos by consolidating facilities and ending operations in inadequate facilities. • Initiated the CD-0 process for EMC at LANL.	• Consolidate the supply chain and procurements of high explosives and energetics. • Facilitate modernization of the high explosive and energetics infrastructure across the NSE. • Establish a modern and robust production and manufacturing capability. • Enhance Mark Quality production for next generation explosive components and materials at SNL. • Provide guidance for energetics surveillance, weapon response, transportation, containers, and explosive/electrical environments.	• In FY 2021, the High Explosives and Energetics program is expanded beyond providing Other Program Cost (OPC) dollars for line item construction projects to include the capability to produce as well as the production and supply of qualified energetic materials to meet stockpile requirements under a single program

Production Modernization
Secondary Capability Modernization

Overview

The Secondary Capability Modernization program is responsible for restoring and increasing manufacturing capabilities for the secondary stage of nuclear weapons in the NSE. This includes ensuring the availability of strategic materials and other sub-component material streams that are managed by NNSA, as well as modernizing the facilities and operations required to process these materials, fabricate, and assemble the final components. The program includes (1) Uranium Modernization; (2) Depleted Uranium Modernization and (3) Lithium Modernization.

Secondary Capability Modernization
Uranium Modernization

Description

The Uranium Modernization program provides funding to modernize enriched uranium operations to ensure delivery of secondary components needed to maintain the stockpile, and support Naval Reactors and Nonproliferation programs.

Building 9212 at Y-12, much of which is more than 70 years old, contains the most hazardous enriched uranium operations and does not meet modern nuclear safety and security standards. The Uranium Modernization program implements elements of NNSA' s Uranium Mission Strategy associated with decreasing mission dependency on Building 9212 by 2025. This requires sustained resources across a multi-year period to systematically plan and execute all phases of this effort. Uranium Modernization specifically supports the transition of Building 9212 capabilities into existing facilities and the Uranium Processing Facility, as well as implementation of a coordinated transition strategy to end production operations in Building 9212 and begin post-operations deactivation and transition activities.

The program modernizes existing enriched uranium capabilities through the development and deployment of new technologies into existing facilities to reduce cost and improve manufacturing processes for nuclear weapon materials. These new technologies improve existing Building 9212 capabilities by shortening production schedules, reducing risks, and enhancing personnel safety. The installation and operation of these systems in existing facilities will allow for the current aqueous-based chemical recovery and high-hazard metal conversion processes to be shut down. This effort entails continuing to supporting the three current major items of equipment (MIE) and associated technology development efforts:

- Electrorefining – an electrochemical metal purification system designed to provide a replacement capability for the current metal purification process. This capability, located in Building 9215, along with the calciner process in Building 9212 (see below), will replace the current high hazard wet chemistry process located in Building 9212.
- Calciner – a dry thermal treatment process to convert low-equity enriched uranium liquids to a dry stable form for storage. This capability will process remaining material in Building 9212 before operations there are shut down. The calciner, located in Building 9212, along with the electrorefining capability in Building 9215 (see above), will enable the shut-down of the current high hazard wet chemistry process in Building 9212.
- Direct Chip Melt – the recovery of enriched uranium machine tool chips/turnings by collecting and remelting them in furnaces. This capability, located in Building 9215, will replace current high hazard practices of transferring chips to Building 9212, and then cleaning, briquetting, and storing them there.

Uranium Modernization enables material de-inventory activities to increase safety, establish target working inventory levels for the production facilities, and better optimize composition of the inventory. Program funding also supports investments to extend the operational life of Y-12's Buildings 9215, 9204-2E and 9995. These two efforts will allow for safe and secure operations, including those relocated from Building 9212, in existing facilities through the 2040s.

The program also better optimizes the utilization of Y-12's Building 9212 resources to supply the current stockpile with purified enriched uranium metal through 2023, while supporting the transition of new capabilities (e.g., Microwave Casting, Electrorefining, and Direct Chip Melt) into the new and enduring facilities. The program also provides a comprehensive storage capability to support a steady supply stream of material through peak production periods.

Highlights of the FY 2021 Budget Request

- Continue activities that will allow NNSA to phase out mission dependency on Building 9212 by supporting the transition of enriched uranium capabilities into existing and new-build facilities and deactivating out-of-service systems in Building 9212. Projects include:
  - Continue the installation of a calciner in Building 9212 to process low equity uranium solutions and an electrorefining capability in Building 9215 to purify uranium metal.
  - Procure and install direct chip melt furnaces in Building 9215.
  - Reestablish a uranium oxide to metal conversion capability.
- Continue material de-inventory efforts to reduce safety and security risks; achieve and maintain target working inventory levels, and optimize the material composition of the uranium inventory.

- Develop, sustain, and increase the reliability of uranium analytical and manufacturing capabilities to reduce risks.
- Extend the operational life of enduring enriched uranium facilities.
- Continue purified metal to metal production and the processing and disposition of legacy materials to phase out mission dependency on Building 9212.
- Improve HEU feedstock quality before and during transition to the new and enduring facilities.

FY 2022 - FY 2025 Key Milestones

- Complete installation and start-up of the electro-refiner process line by 2023 to replace metal purification production activities currently being performed in Building 9212.
- Complete installation and start-up of the calciner in 2023 to phase out mission dependency on Building 9212.
- Deactivate the wet chemistry process in Building 9212, reducing operational and safety risk in the facility.
- Complete installation and start-up of bottom loading direct chip melt furnaces in Building 9215 in 2024 to replace the current inefficient and high hazard process being performed in Building 9212.
- Procure additional bottom loading direct chip melt furnaces by 2025 to expand capacity to process chips
- Begin qualification of the viability of casting enriched uranium parts using microwave technology, which is more efficient and will also improve the quality of the enriched uranium metal supply.
- Achieve Target Working Inventory, the minimum amount needed, within Area 5 by 2022 to phase out mission dependency on Building 9212 and enhance the safety of existing facilities that will be operational through the 2040s.
- Optimize quantity and quality of purified metal production.
- Update HEUMF capabilities to meet emerging requirements for the Mobile Guardian Transport and to accommodate needs of the Uranium Processing Facility.

FY 2019 Accomplishments

- Removed a quantity of material from production areas and into storage.
- Achieved Target Working Inventory, a reduction in material to the minimum amount needed, in Building 9204-2E.
- Completed the Critical Decision (CD) 2/3 package, which establishes the cost and schedule baseline, for the Electrorefining project.
- Relocated radiography operations from Building 9212 to Building 9204-2E – the first operation to be relocated from Building 9212.
- Deactivated 20 out-of-service systems to prepare for transitioning operations out of facilities, including Building 9212.
- Cast the first classified test parts using microwave technology in full scale prototypes of the furnaces that will be used in the Uranium Processing Facility.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Uranium Modernization ($194,245,000)	**Uranium Modernization ($306,689,000)**	**Uranium Modernization (+$112,444,000)**
• Achieve Critical Decision (CD) 2/3, establishing the cost and schedule baseline and beginning installation of the Building 9212 Calciner to process low equity uranium solutions. • Complete installation of the first Direct Chip Melt furnace in Building 9215, reducing dependency on the Building 9212 chip handling process. • Optimize casting processes using microwave technology. • Remove additional material from production areas and into storage. • Deactivate additional systems to prepare for transitioning operations out of facilities, including Building 9212.	• Continue activities that will allow NNSA to phase out mission dependency on Building 9212 by supporting the transition of enriched uranium capabilities into existing and new-build facilities and deactivating out-of-service systems in Building 9212. • Continue the installation of a calciner in Building 9212 to process low equity uranium solutions and an electro-refining capability in Building 9215 to purify uranium metal. • Procure and install direct chip melt furnaces in Building 9215. • Reestablish a uranium oxide to metal conversion capability. • Continue material de-inventory efforts to reduce safety and security risks; achieve and maintain target working inventory levels, and optimize the material composition of the uranium inventory. • Develop, sustain, and increase the reliability of uranium analytical and manufacturing capabilities to reduce mission risks. • Extend the operational life of enduring enriched uranium facilities. • Continue purified metal production and the processing and disposition of legacy materials to phase out mission dependency on Building 9212. • Improve HEU feedstock quality before and during transition to the new and enduring facilities.	• Increase in funding supplies the current stockpile with purified enriched uranium metal, as well as supporting the transition of new capabilities into the new and enduring facilities. • Increase in funding supports a robust storage capability to support a steady supply stream of material through peak production periods. • Increase in funding supports sub-component material streams for imminent mission requirements.

Secondary Capability Modernization
Depleted Uranium Modernization

Description

Depleted Uranium (DU) Modernization is a new program that includes new scope, as well as the depleted uranium portions of the previous Uranium Sustainment program and other programs. DU Modernization Program enables the restart of lapsed capabilities to ensure NNSA can meet imminent mission requirements. These capabilities lapsed in the early 2000s due to the reuse of materials, low demand signals, and prioritization of other activities. These capabilities include feedstock procurement, restarting and maintaining alloying and manufacturing capabilities, and investing in key new technologies. Much of this work was previously done under multiple programs, including the Uranium Sustainment Program. However, a dedicated program is essential to sustain and improve current DU processing and execute a comprehensive modernization strategy to ensure NNSA can meet the steady-state production demands of the future. The capability to produce, process, and handle depleted uranium supports a number of key missions within the nuclear security enterprise, from providing components for life extension programs (LEPs) to the down-blending of HEU to low-enriched uranium.

DU Modernization supports re-establishing a reliable supply of purified DU metal by installing and operating the capability to convert DUF_6 to DUF_4 and sustaining the capability to convert DUF_4 to metal. The program also supports restarting and maintaining existing DU operations and DU alloying capabilities to meet current and future mission needs. Y-12 will need to restart the Vacuum Induction Melt (VIM) - Vacuum Arc Melt (VAR) - VAR production process, modernize the capability for wrought and machining, train operators, develop procedures, and assist with process qualification activities at LANL and LLNL.

In order to make these processes more cost-effective and efficient, the program is also investing in key new technologies to modernize production and meet future demands. For example, Direct Casting would improve the existing alloy production process by significantly reducing the risks of current equipment failure, reducing material waste, and improving process efficiency. The Depleted Uranium Modernization Program is also pursuing other technologies to provide additional opportunities for material reuse and recycling to reduce mission risk. These new technologies could improve both the alloying process as well as the production of DU and DU alloyed components.

Highlights of the FY 2021 Budget Request

- Re-establishing a reliable supply of high purity DU metal feedstock to meet mission requirements.
- Restarting lapsed alloying and manufacturing capabilities to support future weapon systems.
- Developing new technologies for alloy and component production to reduce waste and costs.
- Investing in DU storage capabilities and material modeling to ensure long-term availability of strategic materials.

FY 2022 - FY 2025 Key Milestones

- Complete installation of DUF_6 to DUF_4 conversion line and begin production.
- Re-start conversion of DUF_4 to metal capability at commercial vendor.
- Produce a DU-niobium ingot using the lapsed alloying process.
- Reach TRL 7 for direct casting to produce DU and binary parts.
- Increase storage capacities to provide a steady supply stream of material during peak production periods.
- Test and develop Cold Hearth Melting for producing a DU-niobium alloy.

FY 2019 Accomplishments

- Issued NNSA DU Modernization Strategy.
- Installed a development VAR furnace offsite to improve process development.
- Completed planning to re-establish the high purity depleted uranium feedstock capability.
- Completed refurbishment and restart of key wrought processes at Y-12.
- Restarted the first VIM furnace at Y-12.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Depleted Uranium Modernization ($0)	**Depleted Uranium Modernization ($110,915,000)**	**Depleted Uranium Modernization (+$110,915,000)**
• Depleted Uranium Modernization is a new control. Some of the activities under the old structure were: ○ Cast first single and triple pencil castings in the Vacuum-induction melting (VIM) furnace at Y-12 as a part of the VIM-VAR-VAR restart process. ○ Completed evaluation of DU storage options. ○ Modeled throughput capacity of high-risk equipment at Y-12. ○ Supported the design of the fourth conversion line at the DOE-Environmental Management (EM) Portsmouth site. ○ Invested in direct cast development at Y-12, LANL, and LLNL.	• Reestablishing a reliable supply of high purity DU metal feedstock to meet mission requirements. • Restarting lapsed alloying and manufacturing capabilities to support future weapon systems. • Supporting technologies for alloy and component production to reduce waste and costs. • Investing in DU storage capabilities and material modeling to ensure long-term availability of strategic materials.	• Execute significant new scope to meet imminent mission requirements and support future weapon systems. • Support advanced technology development, including supporting full-scale prototypes to reduce risk to technology insertion into production. • Support uplift in field execution of restart activities, including the Production VAR. • Support the execution of a DUF_6 to DUF_4 conversion line at Portsmouth to meet the demand for high purity DU.

Secondary Capability Modernization
Lithium Modernization

Description
The Lithium Modernization program maintains the production of the nation's enriched lithium supply in support of Defense Programs, the DOE Office of Science, the Department of Homeland Security, and other customers. In addition, the program manages technology development that will improve the efficiency and reliability of the existing lithium capability and the Lithium Processing Facility (LPF).

Lithium materials for the nuclear weapons stockpile and other customers are currently processed in Y-12's Building 9204-2, a Manhattan Project-era building that has housed lithium processing since the 1950s. The historical processes are very corrosive in nature and have caused accelerated degradation to the facility. Additionally, the facility and its processes are oversized for today's mission, do not meet current codes/standards, and is well beyond its designed operational life.

Lithium Modernization processes lithium materials to meet requirements. The program also plans and executes recapitalization projects and risk reduction activities to ensure that the current lithium processing capability is sustained until the LPF is operational in the 2030s. Additionally, the program is developing the transition to operations plan that bridges operations from Building 9204-2 to LPF.

The program also supports the maturation of technologies and the development of process improvements that make lithium processing more efficient, safer to workers, and less impactful to surrounding infrastructure. For example, an Automated Lithium Electrolysis Cell will allow lithium metal processing at a reduced risk to workers.

Lithium Modernization activities include the following:
(1) Producing and maintaining the lithium material inventory to meet mission requirements and customer deliverables.
(2) Purifying and converting lithium materials to lithium hydride and/or lithium deuteride (LiH/LiD).
(3) Recapitalizing process equipment and performing risk reduction activities to sustain process capabilities.
(4) Developing, maturing, and deploying lithium purification and production technologies in support of the LPF.

Highlights of the FY 2021 Budget Request
- Produce and maintain the lithium material supply to meet Defense Programs (DP) mission and customer deliverables, including the maintenance of a configuration controlled lithium supply and demand model.
- Continue to pursue options to reestablish conversion and purification capabilities.
- Maintain and recapitalize program equipment to reduce risk of single-point failures.
- Mature and deploy lithium technology alternatives to improve processing efficiencies in support of the Lithium Strategy and LPF design.

FY 2022 - FY 2025 Key Milestones
- Monitor, compute, and communicate dismantlement needs with Weapons Dismantlement and Disposition and other program managers to ensure an adequate LiH/LiD supply.
- Process lithium materials into additional lithium hydride supply.
- Maintain base lithium processing capabilities and recapitalize lithium processing equipment (acquire, install, configure and authorize for operation).
- Mature lithium technologies that could be inserted in current base capabilities and the future LPF.

FY 2019 Accomplishments
- Completed all Lithium material deliverables on schedule.
- Updated and validated Lithium supply and demand model.
- Completed building 9204-2 safety and repair upgrades.
- Completed restart of select lithium salvage operations.
- Continued restart of select lithium material conversion process equipment.
- Completed Lithium Homogenization Technical Readiness Assessment (TRL-5).
- Completed Lithium Thermal Decomposition and Distillation Technical Readiness Assessment (TRL-5).

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Lithium Modernization ($29,300,000)	**Lithium Modernization ($39,400,000)**	**Lithium Modernization (+$10,100,000)**
• Began first full year of Wet Chemistry and Material Conversion operations in support of requirements. • Continued to process LiH and LiD in support of deliverables. • Continued the recapitalization of process equipment to sustain process capabilities. • Continued the maturation of technologies for near term use and for inclusion into the LPF. • Supported the capital acquisition of the LPF. • Completed Lithium Technology Readiness Assessment. • Restarted and qualify LiH/LiD reactor and cell within current processing facility.	• Continue Wet Chemistry and Material Conversion operations in support of requirements. • Continue to process LiH and LiD in support of deliverables. • Plan and begin execution of additional recapitalization of process equipment to sustain process capabilities. • Plan and execute activities to reduce risk to the facility and process equipment. • Plan rapid response processes for most likely operational failure modes. • Continue the maturation of technologies for near term use. • Continue to support LPF capital acquisition.	• Increased powder production to support the B61-12 LEP, including first year of full operation of the electrolytic cell. • Increase in funding for planning for additional recapitalization/upgrades of process equipment and risk reduction activities in support of the Lithium Strategy.

Production Modernization
Tritium and Domestic Uranium Enrichment

Overview

The Tritium Modernization and Domestic Uranium Enrichment program is responsible for producing tritium and supplying unobligated low enriched uranium to support national security needs.

The program includes (1) Tritium Modernization and (2) Domestic Uranium Enrichment.

The Tritium Modernization program operates the national capability for producing, recovering, and recycling tritium and is building the additional capacity to meet national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating Tritium-Producing Burnable Absorber Rods (TPBARs) in the Watts Bar Unit 1 (WBN1) nuclear power reactor operated by the Tennessee Valley Authority (TVA). Tritium recovery and recycling is completed at the Savannah River Site (SRS), where tritium is recovered from gas transfer systems, purified, and returned to the pipeline for future use.

The Domestic Uranium Enrichment (DUE) program is responsible for ensuring a reliable supply of enriched uranium to support U.S. national security and nonproliferation needs. The DUE program provides unobligated low enriched uranium (LEU) for tritium production by managing existing LEU stocks and down-blending highly-enriched uranium (HEU) declared excess to national security needs. LEU inventories identified by the DUE program will sustain tritium production through 2041, at which point the U.S. will require a new domestic uranium enrichment capability to meet tritium production and other national security needs. The DUE program preserves and advances uranium enrichment technology for potential future deployment to meet U.S. national security needs.

Tritium and Domestic Uranium Enrichment
Tritium Modernization

Description

The Tritium Modernization program operates the national capability for producing tritium and is adding capacity to meet added national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating TPBARs in the Watts Bar Nuclear Plan Unit 1 (WBN1) nuclear power reactor operated by the Tennessee Valley Authority (TVA), during normal 18-month operating cycles. The tritium inventory is needed to support Limited Life Component exchanges for tritium reservoirs that are deployed in the stockpile. Long-term tritium production schedules, based on detailed computational models and annual inventory reconciliations, are carefully calibrated to provide the required and reserve amounts. Production planning takes into consideration the material that is constantly being recovered and recycled from deployed reservoirs, including those from weapon dismantlements.

Highlights of the FY 2021 Budget Request

- Continue irradiation of 1,792 TPBARs in WBN1 and commence irradiation of 960 TPBARs in WBN2.
- Procure a high-capacity TPBAR shipping cask and prepare a competitive procurement for future transportation service.
- Conduct four extractions at the Tritium Extraction Facility (TEF), beginning the ramp-up to full operations mode.
- Maintain a purified tritium supply and disposition helium-3 by-product.
- Execute process system sustainment (recapitalization) activities.
- Execute research and development (R&D) activities supporting extraction, recycle and recovery, risk reduction and mitigation, and technology maturation efforts.

FY 2022 - FY 2025 Key Milestones

- Conduct successively increasing TPBAR irradiation cycles at Tennessee Valley Authority (TVA), to begin producing 2,800 grams of tritium per reactor cycle by FY 2025.
- Use unobligated reactor fuel obtained by TVA from Energy Northwest under the Depleted Uranium Enrichment Project.
- Provide technical production support and surveillance for tritium production operations at TVA by the TPBAR design authority, Pacific Northwest National Laboratory (PNNL), to ensure technical oversight in support of TVA and NRC requirements.
- Obtain NRC approval for an improved reactor safety analysis to reduce ongoing reactor fuel requirements.
- Ramp-up to eight extractions per year at the TEF. The program is taking action to reach full extraction operations at the TEF during this time period. Perform infrastructure improvements projects for safety and control systems.
- Meet DoD directive for loading reservoirs.

FY 2019 Accomplishments

- Completed irradiation of 1,104 TPBARs in Cycle 15 in the WBN1 reactor and commenced irradiation of 1,584 TPBARs in Cycle 16.
- Completed four TPBAR shipments of 300 TPBARs each from the Watts Bar site to the extraction facility.
- Conducted two extractions of 300 TPBARs each at the TEF.
- Recovered and recycled tritium to meet NNSA requirements and managed helium-3 byproduct to not impact Gas Transfer System (GTS) mission.
- Completed replacement of two aging hydride beds to mitigate risk of failure.
- Received Tritium Gas Process Research and Development Transition Plan outlining proposed path forward for R&D projects.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Tritium Modernization ($286,500,000)	**Tritium Modernization ($312,109,000)**	**Tritium Modernization (+$25,609,000)**
• Address technical issues for increasing TPBAR production and NRC licensing actions. Support WBN core design and core performance analysis. • Complete fabrication of 1,792 TPBARs for WBN1 Cycle 17, and fabricate 1,104 TPBARs for WBN2 Cycle 4. • Complete Cycle 16 irradiation of 1,584 TPBARs and load 1,792 TPBARs at WBN1 for Cycle 17. • Complete preparations for tritium production startup in WBN2. Conduct two TPBAR shipments to the TEF, and one lead-use assembly (LUA) shipment to PNNL. Ship low-level hardware waste to NNSS. • Evaluate the high capacity shipping cask conceptual design and authorize fabrication of the first cask, and prepare procurement for transportation services. • Conduct four extractions at the TEF and continue preparations to staff full operations with cleared and trained staff. • Conduct post irradiation examination of pellet test samples from INL's Advanced Test Reactor (ATR); conduct tritium experiments, analysis, and modeling to reduce production risks; and monitor industry developments of future technologies. • Recover, recycle, and purify tritium and disposition helium-3 byproduct.	• Address technical issues for increasing TPBAR production and NRC licensing actions. Support WBN core design and core performance analysis. • Start fabrication of 1,792 TPBARs for WBN1 Cycle 18. Fabricate approximately 1,584 TPBARs for WBN2 Cycle 5. • Continue Cycle 17 irradiation of 1,792 TPBARs and load 900 TPBARs at WBN2 for Cycle 04. • Conduct three TPBAR shipments to the TEF, continue fabrication of high capacity shipping cask, and finalize procurement for transportation services. • Conduct four extractions at the TEF, and procure additional waste casks. • Conduct post-irradiation examination of pellet test samples from INL's ATR; conduct tritium experiments, analysis, and modeling to reduce production risks; and monitor industry developments of future technologies. • Recover, recycle, and purify tritium and disposition helium-3 byproduct. • Execute process system sustainment activities. • Execute R&D activities to reduce and mitigate risk to extraction and recycle and recovery activities.	• Increase funds additional fuel and irradiation fees for the increased numbers of TPBARs, including introduction of 900 TPBARs in WBN2. • Increase will continue ramp to full operations at TEF, by increasing number of operators, recapitalization, and maintenance activities. • Increase will continue to fortify the TPBAR component supply chain. • Implement Spent Fuel Pool critical investments to support increased numbers of TPBARs. • Increase for staff supporting material recycle and recovery scope. • Execute Tritium Processing R&D scope transferred from Component Manufacturing Development (CMD) Program into Tritium Modernization.

Tritium and Domestic Uranium Enrichment
Domestic Uranium Enrichment

Description

The Domestic Uranium Enrichment (DUE) Program is responsible for ensuring a reliable supply of enriched uranium to support U.S. national security and nonproliferation needs. Since the closure of the Paducah Gaseous Diffusion Plant in 2013, the United States has lacked the capability to produce enriched uranium free of peaceful use obligations, i.e. unobligated. DOE/NNSA requires unobligated enriched uranium to fuel reactors that produce tritium for nuclear weapons and to power the nuclear Navy. In addition, DOE/NNSA requires enriched uranium to fuel research and medical isotope reactors as part of its nonproliferation mission, but can use obligated material for these applications. The DUE Program is implementing a three-pronged strategy to supply current enriched uranium needs and re-establish a domestic uranium enrichment capability for long-term enriched uranium needs. First, NNSA is down-blending HEU declared excess to national security needs to extend the need date for unobligated LEU fuel for tritium production to 2041. Second, DUE is preserving and advancing uranium enrichment expertise and technology to meet current and future U.S. government needs. Third, DUE is moving forward with the acquisition process to re-establish a domestic uranium enrichment capability that will support future U.S. national security needs for enriched uranium.

Domestic Uranium Enrichment activities include the following:

(1) Managing Departmental uranium inventories to support tritium production, including down-blending of excess HEU.
(2) Preserving and advancing uranium enrichment expertise and technology.
(3) Executing the acquisition process for a new DUE capability.

Highlights of the FY 2021 Budget Request

- Manage down-blending of highly enriched uranium (HEU) from the uranium inventory to provide low enriched uranium (LEU) fuel for tritium production.
- Preserve and advance uranium enrichment expertise and technology for current and future U.S. Government needs.
- Continue the acquisition process towards Approval of Alternative Selection and Cost Range (Critical Decision 1) for a domestic uranium enrichment capability.
- Begin design activities for an enrichment technology pilot plant if a technology solution is selected as a result of the ongoing DUE Analysis of Alternatives.

FY 2022 - FY 2025 Key Milestones

- Achieve Critical Decision 1 (Approve Alternative Selection and Cost Range) in FY 2024 for re-establishing a domestic uranium enrichment capability.
- Begin deployment of an enrichment technology pilot plant if a technology solution is selected as a result of the ongoing DUE Analysis of Alternatives.
- Down-blend all identified HEU by FY 2025 to extend the need date for LEU fuel for tritium production to 2041.

FY 2019 Accomplishments

- Initiated down-blending campaign to extend the need date for LEU fuel for tritium production to 2041.
- Continued to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. Government needs.
- Initiated cascade testing of small centrifuge design at Oak Ridge National Laboratory.
- Continued the acquisition process towards Approval of Alternative Selection and Cost Range CD-1 for a domestic uranium enrichment capability.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Domestic Enrichment Uranium ($70,000,000)	**Domestic Enrichment Uranium ($145,003,000)**	**Domestic Enrichment Uranium (+$75,003,000)**
• Continue to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs. • Complete initial cascade testing of small centrifuge design at Oak Ridge National Laboratory. • Complete the DUE Analysis of Alternatives. • Continue the acquisition process to approve the alternative selection and cost range (CD-1) for a domestic uranium enrichment capability, including initiation of conceptual design activities if appropriate. • Begin contracting activities for an enrichment technology pilot plant, if appropriate.	• Continue down-blending campaign to extend the need date for LEU fuel for tritium production to 2041. • Work to identify additional sources of unobligated enriched uranium to support the tritium production mission. • Continue to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs. • Continue the acquisition process to approve the alternative selection and cost range (CD-1) for a domestic uranium enrichment capability, including conceptual design activities if appropriate. • Continue contracting and begin design activities for an enrichment technology pilot plant, if appropriate.	• Transfers HEU down-blending funding back into Domestic Uranium Enrichment line.
HEU Downblend ($90,000,000)	**HEU Downblend ($0)**	**HEU Downblend (-$90,000,000)**
• Continue down-blending campaign to extend the need date for LEU fuel for tritium production to 2041. • Identify additional sources of unobligated enriched uranium to support the tritium production mission.	• Transfers HEU down-blending funding back into Domestic Uranium Enrichment line.	• Transfers HEU down-blending funding back into Domestic Uranium Enrichment line.

Production Modernization
Non-Nuclear Capability Modernization

Description

The Non-Nuclear Capability Modernization program provides funding to modernize production of non-nuclear components for multiple weapon systems. Non-nuclear components and subsystems make up more than half the cost of each life extension program. This program consolidates management and oversight of strategic investments in technology, equipment, infrastructure, tools, and materials. Specifically, the program focuses on improving and/or increasing the capability and capacity of the Enterprise to manufacture stockpile components in component categories that include (but are not limited to):

- Cable Assemblies
- Neutron Generators
- Polymers
- Electronic Assemblies
- Gas Transfer System Production
- Mechanisms
- Microelectronics Packaging
- Power Sources
- Radiation Hardened Microelectronics
- Testers
- Lightning Arrest Connectors

Non-Nuclear Capability Modernization activities include the following:

(1) Procurement of equipment to meet non-nuclear component manufacturing capacity requirements
(2) Sustainment of NNSA's capability to produce trusted microelectronics.
(3) Recapitalization of critical capabilities for the design and qualification of nuclear weapon electrical systems.
(4) Modernization of capabilities supporting Power Sources program deliverables.
(5) Reduction of component manufacturing costs through introduction of new processes and technologies.
(6) Development of a pre-qualified inventory of commercial parts to avoid delays in COTS qualification.
(7) Development of new materials and technologies to replace those at risk due to obsolescence, discontinuation, scarceness, unavailability, or usability issues.

Highlights of the FY 2021 Budget Request

- Expand KCNSC manufacturing capacity to meet growing LEP production requirements.
- Procure fabrication tools and equipment to enable continued manufacturing of trusted strategic radiation-hardened (TSRH) microsystems for the nuclear weapon stockpile at MESA.
- Begin refurbishment of SNL's Saturn X-Ray effects testing capabilities, which are critical to ensuring that non-nuclear components can survive the complex and extreme environments of the Stockpile to Target Sequence.
- Start build-out of SNL's Agile Facility dry room to provide temporary space for power source development and production.
- Fund several Design for Manufacturing (DfM) initiatives that will reduce manufacturing costs by accelerating development cycle times.
- Initiate exploratory characterization of COTS and perform testing to expand the list of commercial parts available for designer use.
- Implement an enterprise wide effort for early identification of at-risk-materials and development of solutions to avoid mission supply chain interruptions.

FY 2022 - FY 2025 Key Milestones

- Complete procurement and installation of equipment to increase Kansas City non-nuclear component manufacturing capacity by FY 2024.
- Complete SNL's Agile Facility dry room build out by FY 2022.
- Identify alternative materials, vendors, or production processes for chemicals or materials that are needed for non-nuclear components but are no longer available due to obsolescence, discontinuation, scarceness, or usability issues by FY 2024.
- Complete SNL Saturn Accelerator Refurbishment by FY 2024.
- Complete planning to modernize and consolidate the neutron generator enterprise due to aging facilities and inefficient production in eight separate locations by FY 2025.

FY 2019 Accomplishments

- Sustained NNSA's capability to produce trusted microelectronics.
- Recapitalized critical capabilities for the design and qualification of nuclear weapon electrical systems.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Non-Nuclear Capability Modernization ($13,905,000)	**Non-Nuclear Capability Modernization ($107,137,000)**	**Non-Nuclear Capability Modernization (+$93,232,000)**
• Recapitalized radiation hardened microelectronic fabrication equipment. • Began conceptual design of SNL's Power Sources Capabilities project. • Completed planning and design of a power sources development and production capability project. • Completed strategic infrastructure planning activities.	• Modernize environmental testing, power source development, and trusted radiation-hardened microelectronics capabilities at SNL. • Reduce manufacturing costs across the enterprise by up to 10%. • Expand manufacturing capability at Kansas City National Security Campus to address increased capacity needs due to increased LEP requirements. • Enhance pre-qualification activities to increase availability of commercial parts. • Begin enterprise-wide efforts to identify and resolve materials-at-risk issues.	• Increase accounts for production at KCNSC that is necessary to modernize capabilities for design, qualification, and production of non-nuclear components for multiple weapon systems. • Procure fabrication tools and equipment to enable continued manufacturing of trusted strategic radiation-hardened (TSRH) microsystems with increase in funding. • Begin refurbishment of SNL's Saturn X-Ray effects testing capabilities with the increase in funding

Production Modernization
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	122,767	122,767	179,960	210,465	+30,505
Minor Construction	N/A	N/A	11,203	11,203	21,676	43,990	+22,314
Total, Capital Operating Expenses	N/A	N/A	**133,970**	**133,970**	**201,636**	**254,455**	**+52,819**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	66,841	66,841	68,312	69,814	+1,502
TRU Waste Glovebox Project, LANL	8,784	0	0	0	0	0	0
Foundry Upgrades Phase 3 (Foundry Parts Staging), LANL	14,636	0	0	0	2,390	4,381	+1,991
Hot Inspection Phase 2, LANL	6,335	0	2,602	2,602	2,000	1,000	-1,000
T-Base #1 Upgrades, LANL	14,268	0	0	0	1,870	2,833	+963
Hot Inspection Phase III, LANL	17,992	0	0	0	0	0	0
Subassembly Installation, LANL	28,893	0	0	0	0	6,742	+6,742
Cleaning Line Installation, LANL	18,547	0	0	0	0	3,824	+3,824
Cold Assembly Phase I, LANL	8,574	0	0	0	0	1,868	+1,868
Immersion Density, LANL	5,884	3,423	0	0	0	1,586	+1,586
Machining XB (90%), LANL	6,201	0	0	0	0	0	0
Pyro Staging , LANL	18,000	0	0	0	0	0	0
LW Expansion Phase II, LANL	5,603	0	0	0	0	0	0
AQ-Chloride Recovery Upgrades Phase 1, LANL	28,629	3,000	0	0	0	1,246	+1,246
Metal Recovery System, LANL	26,464	0	0	0	0	0	0
Disassembly Lathe , LANL	10,752	0	0	0	0	0	0
Metal Prep Line Phase I-A, LANL	49,727	0	0	0	0	0	0
Heat Treat (90%), LANL	9,269	0	0	0	0	1,568	+1,568
CNC Lathe (90%), LANL	18,501	0	0	0	0	0	0
Daytime Radiography (90%), LANL	18,000	0	0	0	0	0	0
Cold Assembly Phase 2, LANL	24,075	0	0	0	0	0	0
Machining (Parts Staging), LANL	20,078	0	0	0	3,350	2,531	-819
Foundry Immersion Density, LANL	7,298	0	0	0	2,436	1,394	-1,042
Coordinate Measurement Machine #2, LANL	23,301	14,435	0	0	0	6,798	+6,798
Install new drill & press operation and glovebox, LANL	6,954	0	0	0	691	807	+116

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Install Foundry, glovebox3 with fire resistant pit Capability, LANL	12,756	0	0	0	2,833	4,084	+1,251
Install new turnings consolidation glovebox, LANL	9,452	0	0	0	991	1,157	+166
Install Entry Hood transfer box for Pyro Line, LANL	5,397	0	0	0	850	2,684	+1,834
Microprobe - TA-55, LANL	5,000	0	3,000	3,000	2,000	0	-2,000
Basement Radiography Upgrades, LANL	5,819	0	0	0	1,400	4,419	+3,019
Install new transfer box at drop box -305 location, LANL	5,924	0	0	0	691	807	+116
AQ-Chloride Dropbox Replacement , LANL	4,500	0	0	0	0	850	+850
AQ-Nitrate Upgrades, LANL	8,012	0	0	0	0	1,049	+1,049
Install gas mass spectrometer, LANL	3,593	0	0	0	0	0	0
Chilled Water and Compressed Air, LANL	9,442	0	0	0	0	3,966	+3,966
Electron-Beam Welder #2, LANL	19,094	0	0	0	0	0	0
Second Downdraft Room, LANL	22,669	0	0	0	0	2,833	+2,833
Cold Assembly Containment, LANL	6,723	0	0	0	0	0	0
Electrical System Distribution Upgrades, LANL	6,867	0	0	0	0	1,416	+1,416
Foundry Upgrades Phase 2 (GB#3), LANL	9,573	0	0	0	0	1,700	+1,700
TIMS #3 into RLUOB, LANL	5,712	0	0	0	0	0	0
LW Expansion Phase 1, LANL	5,316	0	0	0	0	0	0
Room 126 MR&R Upgrade, LANL	18,326	0	0	0	7,608	8,639	+1,031
Shipping & Receiving (Exterior), LANL	10,065	0	0	0	0	2,833	+2,833
Third Turning Center, LANL	25,131	0	0	0	0	0	0
Test & Calibration, LANL	41,627	0	0	0	0	0	0
PF-4 nuclear material vault storage upgrade, LANL	6,500	0	0	0	1,000	3,000	+2,000
PF-4 Motor Control Center 611 & 612 Revitalization, LANL	7,400	0	0	0	1,000	3,400	+2,400
Oxide Roast Glovebox, LANL	6,000	0	750	750	850	1,300	+450
New Surface Preparation glovebox, LANL	5,001	0	563	563	638	975	+337
Dimensional Inspection Box, LANL	5,000	0	103	103	1,097	975	-122
Foundry In-line Staging Glovebox, LANL	6,501	0	813	813	921	1,408	+487
New Pressure Test Glovebox, LANL	5,001	0	0	0	563	638	+75
Manufacturing Modernization Project (MMP)	32,768	10,681	3,800	3,800	2,145	4,836	+2,691
Replace Three 5-Axis Mills, 12-121, PX	16,110	0	0	0	3,000	3,500	+500
Tritium Extraction Facility Spare Furnace, SRS	24,000	0	0	0	0	0	0
Calciner, Y-12	104,566	32,737	14,085	14,085	29,828	23,767	-6,061
Machine Chip Processing Furnace 1, Y-12	16,695	8,001	4,994	4,994	3,500	200	-3,300
Machine Chip Processing Furnace 2, Y-12	1,284	1,284	0	0	0	0	0

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Electrorefining, Y-12	101,000	41,791	17,716	17,716	22,845	10,421	-12,424
Parts Cleaning for Direct Lithium Material Mtg., Y-12[a]	4,050	0	0	0	4,050	0	-4,050
Rolling Mill Controller, Y-12	8,597	0	0	0	315	2,501	+2,186
Service Hood System, Y-12	7,000	0	3,000	3,000	4,000	0	-4,000
Bldg. 9998 Vacuum Induction Melt (VIM) Furnace, Y-12	11,670	0	0	0	2,286	6,715	+4,429
Bldg. 9215 UCl3 STAR, Y-12	7,500	0	0	0	0	1,500	+1,500
Special Materials Facility Initial Capability, Y-12	15,000	6,000	4,500	4,500	4,500	0	-4,500
Bldg. 9204-2E Break/Sample Capability, Y-12	6,500	0	0	0	0	2,500	+2,500
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**122,767**	**122,767**	**179,960**	**210,465**	**+30,505**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	7,399	7,399	7,562	7,729	+167
Establish IT Production Infrastructure @ TA-55, LANL	6,500	0	0	0	1,000	1,500	+500
12-64 Bays 11, 12 & 15 Replacement Facilities, PX	5,283	0	0	0	0	0	0
12-44, Cell 8, PX	8,000	0	0	0	1,150	3,873	+2,723
Install Mini-TCAP in TEF, SR	14,500	0	0	0	0	0	0
Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation, SNL	12,000	0	0	0	1,100	10,900	+9,800
Phase 2 9225-3, Y-12	9,000	0	0	0	0	9,000	+9,000
9212 Decon/ Sort & Seg Facility, Y-12	9,656	0	3,804	3,804	4,364	1,488	-2,876
Bldg. 9995 Uranium Area Project Room 159, Y-12	6,500	0	0	0	6,500	0	-6,500
9225-3 Process Support, Y-12	9,500	0	0	0	0	9,500	+9,500
Total, Minor Construction Projects	**N/A**	**N/A**	**11,203**	**11,203**	**21,676**	**43,990**	**+22,314**
Total, Capital Summary	**N/A**	**N/A**	**133,970**	**133,970**	**201,636**	**254,455**	**+52,819**

[a] Parts Cleaning for Direct Lithium Material Mtg., Y-12 Prior year funding in Stockpile Management

Outyears for Production Modernization
Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	189,230	188,724	239,260	284,071	N/A
Minor Construction	14,176	14,056	10,751	12,432	N/A
Total, Capital Operating Expenses	**203,406**	**202,780**	**250,011**	**296,503**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	71,349	72,919	74,524	76,164	0
TRU Waste Glovebox Project, LANL	0	0	1,238	7,546	0
Foundry Upgrades Phase 3 (Foundry Parts Staging), LANL	2,171	3,217	2,477	0	0
Hot Inspection Phase 2, LANL	733	0	0	0	0
T-Base #1 Upgrades, LANL	4,084	3,005	2,476	0	0
Hot Inspection Phase III, LANL	5,834	1,566	2,468	8,124	0
Subassembly Installation, LANL	2,280	4,285	6,501	9,085	0
Cleaning Line Installation, LANL	1,917	3,021	4,787	4,998	0
Cold Assembly Phase I, LANL	1,442	3,096	2,168	0	0
Immersion Density, LANL	875	0	0	0	0
Machining XB (90%), LANL	0	1,413	4,788	0	0
Pyro Staging , LANL	0	0	18,000	0	0
LW Expansion Phase II, LANL	1,432	1,198	1,898	1,075	0
AQ-Chloride Recovery Upgrades Phase 1, LANL	2,917	4,207	5,262	11,997	0
Metal Recovery System, LANL	2,700	3,150	4,962	15,652	0
Disassembly Lathe , LANL	1,022	1,192	1,878	6,660	0
Metal Prep Line Phase I-A, LANL	0	0	0	49,727	0
Heat Treat (90%), LANL	1,750	2,434	3,517	0	0
CNC Lathe (90%), LANL	0	2,313	16,188	0	0
Daytime Radiography (90%), LANL	0	2,250	15,750	0	0
Cold Assembly Phase 2, LANL	3,501	3,150	4,963	12,461	0
Machining (Parts Staging), LANL	3,540	5,609	4,570	478	0
Foundry Immersion Density, LANL	1,789	1,215	464	0	0
Coordinate Measurement Machine #2, LANL	1,167	901	0	0	0

	(Dollars in Thousands)				
	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Install new drill & press operation and glovebox, LANL	1,271	2,014	2,171	0	0
Install Foundry, glovebox3 with fire resistant pit Capability, LANL	2,704	3,135	0	0	0
Install new turnings consolidation glovebox, LANL	1,823	2,889	2,592	0	0
Install Entry Hood transfer box for Pyro Line, LANL	1,863	0	0	0	0
Install new transfer box at drop box -305 location, LANL	1,271	2,014	1,141	0	0
AQ-Chloride Dropbox Replacement , LANL	1,750	1,900	0	0	0
AQ-Nitrate Upgrades, LANL	1,079	4,026	1,858	0	0
Install gas mass spectrometer, LANL	0	0	0	3,593	0
Chilled Water and Compressed Air, LANL	2,772	2,704	0	0	0
Electron-Beam Welder #2, LANL	2,917	6,010	3,714	6,453	0
Second Downdraft Room, LANL	3,058	4,818	7,635	4,325	0
Cold Assembly Containment, LANL	1,109	783	1,234	3,597	0
Electrical System Distribution Upgrades, LANL	1,459	1,502	2,012	478	0
Foundry Upgrades Phase 2 (GB#3), LANL	2,334	2,404	3,135	0	0
TIMS #3 into RLUOB, LANL	0	0	0	5,712	0
LW Expansion Phase 1, LANL	0	4,387	929	0	0
Room 126 MR&R Upgrade, LANL	2,079	0	0	0	0
Shipping & Receiving (Exterior), LANL	2,334	1,803	3,095	0	0
Third Turning Center, LANL	2,699	3,150	4,963	14,319	0
Test & Calibration, LANL	0	0	0	41,627	0
PF-4 nuclear material vault storage upgrade, LANL	2,500	0	0	0	0
PF-4 Motor Control Center 611 & 612 Revitalization, LANL	3,000	0	0	0	0
Oxide Roast Glovebox, LANL	2,000	1,100	0	0	0
New Surface Preparation glovebox, LANL	1,500	1,325	0	0	0
Dimensional Inspection Box, LANL	1,500	1,325	0	0	0
Foundry In-line Staging Glovebox, LANL	2,167	1,192	0	0	0
New Pressure Test Glovebox, LANL	975	2,000	825	0	0
Manufacturing Modernization Project (MMP)	4,633	5,596	1,077	0	0
Replace Three 5-Axis Mills, 12-121, PX	1,500	8,110	0	0	0
Tritium Extraction Facility Spare Furnace, SRS	0	0	24,000	0	0
Calciner, Y-12	3,856	293	0	0	0
Electrorefining, Y-12	8,227	0	0	0	0
Rolling Mill Controller, Y-12	5,781	0	0	0	0
Service Hood System, Y-12	0	0	0	0	0
Bldg. 9998 Vacuum Induction Melt (VIM) Furnace, Y-12	1,566	1,103	0	0	0

	(Dollars in Thousands)				
	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Bldg. 9215 UCl3 STAR, Y-12	3,000	3,000	0	0	0
Bldg. 9204-2E Break/Sample Capability, Y-12	4,000	0	0	0	0
Total, Capital Equipment (including MIE)	**189,230**	**188,724**	**239,260**	**284,071**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	7,899	8,073	8,251	8,432	N/A
Establish IT Production Infrastructure @ TA-55, LANL	2,000	2,000	0	0	0
12-64 Bays 11, 12 & 15 Replacement Facilities, PX	1,300	3,983	0	0	0
12-44, Cell 8, PX	2,977	0	0	0	0
Install Mini-TCAP in TEF, SR	0	0	2,500	4,000	8000
Total, Minor Construction Projects	**14,176**	**14,056**	**10,751**	**12,432**	**8,000**
Total, Capital Summary	**203,406**	**202,780**	**250,011**	**296,503**	**8,000**

Production Modernization
Construction Project Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
21-D-512, Plutonium Pit Production Project, LANL						
Total Estimated Cost (TEC)	TBD	0	0	0	196,000	+196,000
Other Project Cost (OPC)	TBD	0	5,000	21,156	30,000	+8,844
Total Project Cost, 21-D-512, Plutonium Pit Production Project, LANL	**TBD**	**0**	**5,000**	**21,156**	**226,000**	**204,844**
21-D-511, Savannah River Plutonium Processing Facility, SRS						
Total Estimated Cost (TEC)	TBD	0	0	0	241,896	+241,896
Other Project Cost (OPC)	TBD	10,000	70,000	246,000	110,000	-136,000
Total Project Cost, 21-D-511, Savannah River Plutonium Processing Facility, SRS	**TBD**	**0**	**0**	**246,000**	**351,896**	**+105,896**
Total All Construction Projects						
Total Estimated Cost (TEC)	TBD	0	5,000	21,156	467,896	+437,896
Other Project Cost (OPC)	TBD	10,000	70,000	246,000	110,000	-127,156
Total Project Cost (TPC) All Construction Projects	**TBD**	**0**	**5,000**	**21,156**	**577,896**	**+310,740**

21-D-512 Los Alamos Plutonium Pit Production Project (LAP4)
Los Alamos National Laboratory (LANL)
Los Alamos, New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary:
The FY 2021 Request for the LAP4 is $226,000,000. Out year funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

Significant Changes:
Other Project Cost (OPC) funding for the Plutonium Sustainment Program was first appropriated in FY 2019 to fund continued preliminary planning. Critical Decision (CD)-0, Approve Mission Need for the "Plutonium Modular Approach," was approved on November 25, 2015. The approved Mission Need established the requirement for a responsive infrastructure to meet plutonium pit production requirements.

The project is supported by a Plutonium Pit Production Analysis of Alternatives (AoA) completed in October 2017 and the Plutonium Pit Production Engineering Assessment (EA) completed in April 2018. Both efforts informed the NNSA's selection of a preferred alternative on May 10, 2018 to continue to invest in Los Alamos National Laboratory for the capability to produce 30 pits per year (ppy) in 2026, and to repurpose existing facilities at Savannah River Site to produce a capability of 80 ppy (both sites) during 2030.

Pit production equipment installation at LANL has been executed through the Plutonium Modernization program (formerly the Plutonium Sustainment program) activities for several years. Production capability and capacity for the first war reserve (WR) pit and subsequent planned pit production is being accomplished under the Plutonium Modernization Program. Capacity to get to 30 pits per year (ppy) at LANL is to be established with the initiation of this Line Item Project. The recently achieved clarity in pit production planning efforts at LANL provides a strong basis to establish a consolidated approach to both install additional equipment to produce 30 ppy in FY 2026 in Plutonium Facility (PF)-4 and provide other supporting infrastructure at LANL.

The FY 2021 Budget Request includes funding in the Plutonium Modernization Program, for the planned Los Alamos Plutonium Pit Production Project, in the amount of $226,000,000. Consistent with DOE Order 413.3B Change 5, *Program and Project Management for the Acquisition of Capital* Assets, program funds may be used prior to CD-1 and prior to the request for Design funds. The high-end of the current Total Project Cost (TPC) range is TBD. The range will be developed as part of the CD-1 deliverable. As the CD-1 design proceeds, the project team is considering options for long lead procurements and will define LAP4 subprojects to more effectively manage the work.

A Federal Project Director is assigned for the overall project, and has reviewed and approved this CPDS.

Critical Milestone History

Los Alamos Plutonium Pit Production Project (21-D-512)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2021	11/25/2015	4Q FY2020	1Q FY2021	4Q FY2022	4Q FY2022	4Q FY2022	2Q FY2024	4QFY2028

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline

Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History

Los Alamos Plutonium Pit Production Project (21-D-512)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2021	116,900	79,100	196,000	30,000	0	30,000	226,000*

***** TPC reflects estimated cost for FY2021 only. Future submissions will be updated following CD-1

2. Project Scope and Justification

Scope

The project scope includes the further repurposing of spaces within the existing LANL Plutonium Facility 4 (PF-4), beyond the scope of repurposing in the CMRR project, including removal of previously installed equipment and support systems as necessary to accommodate new pit production equipment. Scope includes design, construction, and installation of processing equipment, support systems, utilities infrastructure, physical infrastructure and security features to reach the capability to produce 30 ppy. The PF-4 is an operating Nuclear Facility Category 2, Security Category 1 facility, and will require pit production capability and capacity to be accomplished in the vicinity of ongoing operations, including pit production at existing capacities.

Sustained and reliable pit production at LANL additionally requires a commensurate increase in infrastructure and support facilities to accommodate the increased activity in a nuclear facility with a diversified mission portfolio. Resources necessary to operate and maintain a sustained and substantial production capacity drives the need for additional office space, parking, training and security infrastructure. Increased ingress and egress of production personnel is essential. Office space in the immediate vicinity for engineering, safety, managerial and administrative staff is critical to reduce risk of interruptions in continued operations. Parking is necessary to accommodate these personnel. Overall, PF-4 mission growth requires the transition to extra-hour shifts to accommodate existing and planned operations, capital projects execution (LAP4 and others) and facility upgrades to ensure ongoing facility operations. Additionally, training and support facilities are required to prepare a workforce for this critical mission.

The LAP4 project includes but is not limited to the following activities:

- Demolition and decontamination of enclosures and programmatic equipment in preparation for installation of pit production equipment
- Pit production enclosures and programmatic equipment procurement and installation to support pit production goals.
- Entry control facilities for worker and vehicular access to the plutonium Property Protection area (PPA)
- On/near-site Cold Lab and Classroom Training facilities, Cafeteria, Administrative / Office Space, and Parking space for plutonium operations, management, engineering, science, safety and quality support staff
- Office, administrative, training and support Security Complex for 24/7 operations, security category I plutonium facilities workforce

Justification

The National Nuclear Security Administration's (NNSA) ability to produce pits in the required quantities established by the Nuclear Weapons Council (NWC) is an essential component of the nuclear deterrent. The 2018 Nuclear Posture Review (NPR) and recent statute require NNSA to ensure that the nuclear weapons infrastructure is able to reach the capability to produce plutonium pits at 80 pits per year in 2030. This project, along with the SRPPF project, ensures that the Nation has an "effective, responsive, and resilient nuclear weapons infrastructure" that can "adapt flexibly to shifting requirements" with respect to its plutonium pit production capabilities, consistent with the 2018 NPR.

An Analysis of Alternatives (AoA) was conducted after CD-0, in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. Multiple alternatives were analyzed and the AoA identified two preferred alternatives with different construction approaches at two separate locations:

- Additional capability and capacity to accomplish 30 ppy pit production requirements at Los Alamos National Laboratory (LANL), and
- Refurbishment and repurposing of facilities at the Savannah River Site to accomplish the capability and capacity to reach an additional 50 ppy.

The NNSA Office of Cost Estimating and Program Evaluation conducted a review of the AoA and recommended that further refinement of the preferred alternatives be completed before selecting an alternative that meets requirements. NNSA contracted with an independent architecture and engineering (A&E) firm to complete an Engineering Assessment of the two preferred alternatives and two additional alternatives to provide the basis for a future decision.

The NNSA Administrator selected a preferred alternative on May 10, 2018 to continue pit production investments to reach the 30 ppy capability at LANL by 2026, and to repurpose facilities at the Savannah River Site for the production of plutonium pits in excess of 30 pits per year. The Chairwoman of the Nuclear Weapons Council provided written certification to Congress regarding the NNSA's recommended alternative.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets.* Funds appropriated under the Plutonium Modernization Program and described in this data sheet may be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction for LAP4.

Key Performance Parameters (KPPs)

The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
Plutonium Pit Production Capability	Install the equipment in PF-4 to provide the capability to produce 30 pits per year in 2026.	
Plutonium Pit Production Capability	Provide the supporting infrastructure to support the production of 30 pits per year in 2026.	

[a] Preliminary Key Performance Parameters will be developed as part of the CD-1 approval.

3. Project Cost and Schedule

Financial Schedule

The financial tables reflect the top of the cost range established after the engineering assessment, following CD-0.

Los Alamos Plutonium Pit Production Project (21-D-512)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	116,900	116,900	50,000
Total Design	**TBD**	**TBD**	**TBD**
Construction			
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	79,100	79,100	40,000
Total Construction	**TBD**	**TBD**	**TBD**
Total Estimated Costs (TEC)			
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	196,000	196,000	90,000
Total TEC	**TBD**	**TBD**	**TBD**
Other Project Costs (OPC)			
FY 2019	5,000	5,000	5,000
FY 2020	21,156[a]	21,156	12,500
FY 2021	30,000	30,000	30,000
Total OPC	**TBD**	**TBD**	**TBD**
Total Project Costs (TPC)			
FY 2019	5,000	5,000	5,000
FY 2020	21,156	21,156	12,500
FY 2021	226,000	226,000	120,000
FY 2022	350,000	350,000	186,000
FY 2023	500,000	500,000	260,000
FY 2024	450,000	450,000	247,500
FY 2025	200.000	200,000	110,000
Grand Total	**TBD**	**TBD**	**TBD**

[a] As directed in the 2020 House Energy and Water Development and Related Agencies Appropriations Bill HR2960, this data sheet reflects LAP4 as a standalone project with the re-inclusion of PF-4 Equipment Installation Phase 2 (PEI2) and RLUOB Hazard Category 3 (RC3) into CMRR (04-D-125).

4. Details of Project Cost Estimate

Overall Project (21-D-512)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total Design	TBD	N/A	N/A
Construction			
Site Preparation	TBD	N/A	N/A
Equipment	TBD	N/A	N/A
Construction	TBD	N/A	N/A
Other, as needed	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total Construction	TBD	N/A	N/A
Other TEC (if any)			
Cold Startup	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total, Other TEC	TBD	N/A	N/A
Total Estimated Cost	**TBD**	**N/A**	**N/A**
Contingency, TEC	TBD	N/A	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	TBD	N/A	N/A
Conceptual Planning	TBD	N/A	N/A
Conceptual Design	TBD	N/A	N/A
Start-up	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total, OPC	TBD	N/A	N/A
Contingency, OPC	TBD	N/A	N/A
Total Project Cost	**TBD**	**N/A**	**N/A**
Total Contingency (TEC+OPC)	**TBD**	**N/A**	**N/A**

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	5,000	21,156	0	0	0	0	0	20
FY 2021	TEC	N/A	N/A	196,000	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	30,000	N/A	N/A	N/A	N/A	N/A
	TPC	5,000	21,156	226,000	350,000	500,000	450,000	200,000	TBD

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	FY 2028
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	FY 2078

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	TBD	N/A	TBD[a]

7. D&D Information

The LANL PF-4 has executed numerous and various mission since construction in the 1970s. Ongoing missions will be consolidated to accommodate the growth in new missions, pit production being prominent among them. Discontinued missions will require extensive demolition and decontamination, notably to provide for the installation of new pit production equipment.

8. Acquisition Approach

Pit production at Los Alamos will be accomplished with the installation of systems of gloveboxes and equipment. Equipment installation to provide the capability to produce 10 pits per year will be accomplished using program funding in the Plutonium Modernization Program. The installation of equipment to produce more than 10 pits per year will be accomplished through the execution of capital line-item project work. Line item projects within PF-4 will be necessarily executed via LANL issued design contracts, and construction implemented with cleared and accomplished LANL craft resources. Subcontract installation of equipment is not feasible within PF-4, with consideration of concurrent operational activities and the requisite security and safety restraints. The performance baselines for each subproject will be established upon completion of 90% design maturity, to allow development of credible cost estimates in accordance with DOE Order 413.3B and NNSA policy.

For infrastructure, non-nuclear design and construction will be executed via LANL-issued design-bid-build and design-build construction contracts. The performance baselines for each subproject will be established using a graded approach for design maturities appropriate for the various facility types, and to allow development of credible cost estimates in accordance with DOE Order 413.3B and NNSA policy.

[a] Life cycle costs associated with this project will be developed as part of CD-1. Both *the Plutonium Pit Production Analysis of Alternatives* (AoA) and *Plutonium Pit Production Engineering Assessment* (EA) did not evaluate life cycle costs of reaching 30 ppy at LANL separately from reaching the full 80 ppy production rate for various LANL options.

21-D-511 Savannah River Plutonium Processing Facility (SRPPF)
Savannah River Site (SRS), South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary:
The FY 2021 Request for Savannah River Plutonium Modernization and Pit Production is $441,896,000 of which $351,896,000 is for line item construction and $90,000,000 is for Plutonium Modernization work to support the production of 50 pits per year at Savannah River. The funding tables in the rest of this data sheet only refer to the construction part of the Savannah River Plutonium Modernization and Pit Production Program ($351.9 million) in FY 2021. Out-year funding amounts will be developed and refined in future budget requests as the National Nuclear Security Administration (NNSA) baselines the project in accordance with DOE Order 413.3B.

Significant Changes:
This project was initiated in FY 2019 utilizing Other Project Costs (OPC) funding in the Plutonium Sustainment Program. Critical Decision (CD) 0, Approve Mission Need, for the "Plutonium Modular Approach" was approved on November 25, 2015 with a preliminary Total Project Cost (TPC) range of $1.3B to $3.0B with a project completion schedule range of December 2025 to December 2027. The most recent cost and schedule estimates were developed during the *Plutonium Pit Production Engineering Assessment* (EA) in 2018 with an estimated construction high end of the cost range at $4.59B and a CD-4 schedule range of July 2026 to January 2030. **These estimates were developed solely for the comparison of options in the EA and will be updated at CD-1 since the current design has matured significantly since the pre-conceptual design used in the EA.** The approved Mission Need established the requirement for a responsive infrastructure in meeting the plutonium pit production requirements. The Mission Need Statement was revised in March 2019 for the now titled "Savannah River Plutonium Processing Facility (SRPPF)".

A technical Analysis of Alternatives (AoA) completed in October 2017 identified two preferred alternatives to meet the pit production requirements by refurbishing and repurposing facilities at the SRS and constructing additional facilities at Los Alamos National Laboratory (LANL). From November 2017 to April 2018, an Engineering Assessment (EA) was performed as a follow-on activity to the AoA to provide additional information regarding cost, feasibility, risk, and schedule associated with one alternative at SRS and three alternatives at Los Alamos National Laboratories (LANL).

On May 10, 2018 the Department selected the preferred alternative that was endorsed by the Nuclear Weapons Council to repurpose Building 226-F (previously the main building of Mixed Oxide Fuel Fabrication Facility (MOX)) to produce a capability of 50 pits per year (ppy) during 2030. Construction of additional facilities at LANL to create the capability to produce 30 ppy is being funded separately. CD-1 planning was initiated in October 2018 and conceptual design activities are continuing towards a CD-1 approval by the end of the 2Q FY 2021. In March 2019, the NNSA Deputy Administrator for Defense Programs issued a SRPPF Mission Need Statement and issued Rev 2 of the Program Requirements Document providing key programmatic expectations and requirements.

The FY 2021 Request for Savannah River Plutonium Modernization and Pit Production is $441,896,000 which includes $241,896,000 for construction design, $110,000,000 for Other Project Costs (OPC) funding in the Savannah River Plutonium Operations Program for the planned project, Savannah River Plutonium Processing Facility, and $90,000,000 for Plutonium Modernization work to support the capability to produce 50 pits per year at Savannah River. Consistent with DOE Order 413.3B Change 5, *Program and Project Management for the Acquisition of Capital* Assets, program funds may be used prior to CD-1 and prior to the request for Design funds. The project has identified a multi-subproject construction execution approach that includes but is not limited to; Demolition & Removal, Training Center, Utilities/Site infrastructure, Long Lead Procurements, various support buildings, and Safeguards & Security Infrastructure. The acquisition approach will be refined as design matures. The scope, schedule and cost information for each sub-project will be defined in future submissions of this datasheet.

A level IV Federal Project Director was assigned in May 2019 for the SRPPF project and has reviewed and approved this CPDS.

Critical Milestone History

Savannah River Plutonium Processing Facility (21-D-511)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4[a]
FY 2021	11/25/2015	4Q FY2020	2Q FY2021	TBD	TBD	TBD	N/A	4Q FY2026 – 4Q FY2031

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History

Savannah River Plutonium Processing Facility (21-D-511)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC[b]
FY 2021	$241,896	$0	$241,896	$110,000	TBD	$110,000	$4,590,000

2. Project Scope and Justification

Scope

The project scope includes repurposing Building 226-F, including removal of previously installed equipment and support systems as necessary to accommodate the new pit production mission. Scope includes turnover of all necessary design and quality documentation from the previous mission, any required modifications to 226-F and the design, construction and installation of processing equipment, process support systems and buildings, utilities and security features for a capability to produce 50 ppy. The project will also include transfer, stewardship, and incorporation of select MOX project Government property into the SRPPF project, conversion of the 226-2F warehouse building into a high-fidelity training facility, and design and construction of support facilities. Given the special nuclear material (SNM) expected during operations in the SRPPF, Building 226-F will be a Hazard Category 2, Security Category I facility.

Justification

NNSA's ability to produce pits in the required quantities established by the Nuclear Weapons Council is an essential component of the nuclear deterrent. The 2018 Nuclear Posture Review (NPR) provides a requirement for the NNSA to ensure that the nuclear weapons infrastructure is able to provide the enduring capability to produce 80 pits by 2030. As noted in the NPR, this project ensures that the Nation has an "effective, responsive, and resilient nuclear weapons infrastructure" that can "adapt flexibly to shifting requirements" with respect to its plutonium pit production capabilities.

[a] CD-4 range is based on the *Plutonium Pit Production Engineering Assessment* schedule estimate; CD-4 dates will be updated after CD-1 submittal.

[b] TEC and OPC amounts reflect estimated costs for FY2021 only, the TPC amount reflects the high end of the cost range developed during the *Plutonium Pit Production Engineering Assessment* (EA) in 2018. Future submissions of the project cost history will be updated following CD-1 approval.

An Independent Analysis of Alternatives (AoA) was conducted after CD-0, in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. Multiple alternatives were analyzed and the AoA identified two preferred alternatives with different construction approaches at two separate locations:

- Refurbishment and repurposing of facilities at the Savannah River Site; and,
- Additional footprint to accommodate pit production requirements at Los Alamos National Laboratory (LANL)

The NNSA Office of Cost Estimating and Program Evaluation conducted a review of the AoA in October 2017 and recommended that further refinement of the preferred alternatives be completed before selecting an alternative that meets requirements. NNSA contracted with an independent architecture and engineering (A&E) firm to complete the follow-on Engineering Assessment to evaluate two preferred alternatives and two additional alternatives to better inform the selection of an alternative and support conceptual design which was completed in April 20, 2018 along with a workforce analysis. .

The NNSA Administrator selected a recommended alternative on May 10, 2018 to repurpose building 226-F, a partially constructed facility at the Savannah River Site, for pit production to meet Department of Defense plutonium pit requirements by 2030. The Chairwoman of the Nuclear Weapons Council provided written certification to Congress regarding the NNSA's recommended alternative.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets.* Funds appropriated under the Plutonium Sustainment Program and described in this data sheet may be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction for SRPPF.

Key Performance Parameters (KPPs)

The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance. Preliminary KPPs are being developed as part of CD-1 documentation, the KPP below will be revised after CD-1 approval.

Performance Measure[a]	Threshold	Objective
Plutonium pit production capability	Repurpose Building 226-F to provide the capability to produce 50 pits per year	

3. Financial Schedule

The financial tables reflect the top of the cost range established during the *Plutonium Pit Production Engineering Assessment* .These will be revised after CD-1 approval.

[a] Preliminary Key Performance Parameters will be developed as part of the CD-1 approval.

Savannah River Plutonium Processing Facility (21-D-511)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2021	241,896	TBD	0
Total Design	TBD	TBD	TBD
Construction			
FY 2021	0	TBD	0
Total Construction	TBD	TBD	TBD
Total Estimated Costs (TEC)			
FY 2021	241,896	TBD	TBD
Total TEC	**TBD**	**TBD**	**TBD**
Other Project Costs (OPC)			
FY 2018	10,000	TBD	10,000
FY 2019	70,000	TBD	35,700
FY 2020	246,000	TBD	TBD
FY 2021	110,000	TBD	TBD
Total OPC	TBD	TBD	TBD
Total Project Costs (TPC)[a]			
FY 2018	10,000	TBD	10,000
FY 2019	70,000	TBD	35,700
FY 2020	246,000	TBD	TBD
FY 2021	351,896	TBD	TBD
FY 2022	495,000	TBD	TBD
FY 2023	674,000	TBD	TBD
FY 2024	656,000	TBD	TBD
FY 2025	570,000	TBD	TBD
FY 2026	480,000	TBD	TBD

[a] TPC funding in FY 2022 – FY 2029 reflects the proposed funding profile for this project developed in the 2018 *Plutonium Pit Production Engineering Assessment* (EA) with the FY 2028 number adjusted to reflect the difference between the EA profile and funding in FY 2021 and prior years.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2027	551,000	TBD	TBD
FY 2028	460,104	TBD	TBD
FY 2029	26,000	TBD	TBD
Grand Total	**4,590,000**	**TBD**	**TBD**

4. Details of Project Cost Estimate

Project cost estimate details will be submitted following CD-1. The table below reflects the estimate from the most recently approved Critical Decision, CD-0.

Overall Project (21-D-511)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Design			
Design	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total Design	TBD	N/A	N/A
Construction			
Site Preparation	TBD	N/A	N/A
Equipment	TBD	N/A	N/A
Construction	TBD	N/A	N/A
Other, as needed	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total Construction	TBD	N/A	N/A
Other TEC (if any)			
Cold Startup	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total, Other TEC	TBD	N/A	N/A
Total Estimated Cost	**TBD**	**N/A**	**N/A**
Contingency, TEC	TBD	N/A	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	N/A	N/A
Conceptual Planning	TBD	N/A	N/A
Conceptual Design	TBD	N/A	N/A
Start-up	TBD	N/A	N/A
Contingency	TBD	N/A	N/A
Total, OPC	TBD	N/A	N/A
Contingency, OPC	TBD	N/A	N/A
Total Project Cost	**$4,590,000**	**N/A**	**N/A**
Total Contingency (TEC+OPC)	**TBD**	**N/A**	**N/A**

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2021	TEC	0	0	0	241,896	TBD	TBD	TBD	TBD	TBD
	OPC	10,000	70,000	246,000	110,000	TBD	TBD	TBD	TBD	TBD
	TPC	10,000	70,000	246,000	351,896	TBD	TBD	TBD	TBD	TBD

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4Q FY2026 – 4Q FY2031
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	4Q2080

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs[a]	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	520	N/A	27,800

7. D&D Information

The SRPPF plutonium processing capability will be constructed within the existing partially completed 226-F building. This will require demolition and removal of previously installed MOX equipment and support systems and facilities as necessary to accommodate the new plutonium production mission.

8. Acquisition Approach

The Savannah River (SR) M&O was selected May 10, 2018 by the NNSA to lead the SRPPF Conceptual Design and CD-1 development activities while leveraging the LANL M&O plutonium processing knowledge and ongoing project and operation activities. The SR M&O entered into an affiliate sub-contract relationship with Fluor Inc., located in Greenville S.C., to provide design support of the balance of plant systems. The SR M&O is responsible for the nuclear safety and ES&H system conceptual design development while relying on the Physical Security Center of Excellence from Sandia National Laboratories for the security design inputs. The SR M&O will be the Facility Design Authority (FDA) for the facility, the production equipment, and the balance of plant support systems through CD-1. LANL will support the FDA by providing design specifications for specialty process equipment based on current system design. Lawrence Livermore National Laboratory (LLNL) will serve as the Weapons Design Agency for the first pit type to be produced at SRS. As the project integrator, SR M&O will develop all the management, design, and construction and start-up documents and be responsible for maturing and integrating the design in support of the CD-1 Package submittal including the Conceptual Design and associated cost and schedule range.

[a] Life Cycle Costs and Annual Costs are based on data provided in the *Plutonium Pit Production Engineering Assessment (EA)*; these numbers will be updated after CD-1 approval.

Science [a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Science				
Advanced Certification	57,710	57,710	0	-57,710
Primary Assessment Technologies	89,313	95,169	0	-95,169
Dynamic Materials Properties	120,000	128,000	0	-128,000
Advanced Radiography	32,544	32,710	0	-32,710
Secondary Assessment Technologies	77,553	77,553	0	-77,553
Academic Alliances and Partnerships	53,364	56,000	0	-56,000
Enhanced Capabilities for Subcritical Experiments	50,000	145,160	0	-145,160
Total, Science	**480,484**	**592,302**	**0**	**-592,302**

Science
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Science				
Advanced Certification	57,710	57,710	60,649	+2,939
Primary Assessment Technologies	89,313	95,169	112,827	+17,658
Dynamic Materials Properties	120,000	128,000	170,767	+42,767
Advanced Radiography	32,544	32,710	35,989	+3,279
Secondary Assessment Technologies	77,553	77,553	85,104	+7,551
Academic Alliances and Partnerships	53,364	56,000	52,612	-3,388
Enhanced Capabilities for Subcritical Experiments	50,000	145,160	215,579	+70,419
Total, Science	**480,484**	**592,302**	**733,527**	**+141,225**

[a] Science is now labeled as Assessment Science and is being restructured into the Stockpile Research, Technology, and Engineering program starting in FY 2021.

Engineering [a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Engineering				
Enhanced Surety	39,717	43,000	0	-43,000
Weapons Systems Engineering Assessment Technology	23,029	0	0	0
Delivery Environments (formerly Weapon Systems Engeering Assessment Technology)	0	35,945	0	-35,945
Nuclear Survivability	48,230	53,932	0	-53,932
Studies and Assessments	0	5,607	0	-5,607
Enhanced Surveillance	45,147	55,000	0	-55,000
Stockpile Responsiveness	34,000	70,000	0	-70,000
Total, Engineering	**190,123**	**263,484**	**0**	**-263,484**

Engineering
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Engineering				
Enhanced Surety	39,717	43,000	54,365	+11,365
Weapons Systems Engineering Assessment Technology	23,029	0	0	0
Delivery Environments (formerly Weapon Systems Engeering Assessment Technology)	0	35,945	39,235	+3,290
Nuclear Survivability	48,230	53,932	59,500	+5,568
Studies and Assessments	0	5,607	0	-5,607
Enhanced Surveillance	45,147	55,000	62,260	+7,260
Stockpile Responsiveness	34,000	70,000	70,000	0
Total, Engineering	**190,123**	**263,484**	**285,360**	**+21,876**

[a] Engineering is now labeled as Engineering and Integrated Assessments and is being restructured into the Stockpile Research, Technology, and Engineering program starting in FY 2021.

Inertial Confinement Fusion and High Yield Program [a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Inertial Confinement Fusion Ignition and High Yield Program				
Ignition and Other Stockpile Programs	101,140	106,000	0	-106,000
Diagnostics, Cryogenics and Experimental Support	77,915	75,000	0	-75,000
Pulsed Power Inertial Confinement Fusion	6,596	8,571	0	-8,571
Joint Program in High Energy Density Laboratory Plasmas	8,492	8,492	0	-8,492
Facility Operations and Target Production	350,791	366,937	0	-366,937
Total, Inertial Confinement Fusion Ignition and High Yield Program	**544,934**	**565,000**	**0**	**-565,000**

Inertial Confinement Fusion and High Yield Program
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Inertial Confinement Fusion Ignition and High Yield Program				
Ignition and Other Stockpile Programs	101,140	106,000	102,040	-3,960
Diagnostics, Cryogenics and Experimental Support	77,915	75,000	67,197	-7,803
Pulsed Power Inertial Confinement Fusion	6,596	8,571	8,785	+214
Joint Program in High Energy Density Laboratory Plasmas	8,492	8,492	12,300	+3,808
Facility Operations and Target Production	350,791	366,937	376,703	+9,766
Total, Inertial Confinement Fusion Ignition and High Yield Program	**544,934**	**565,000**	**567,025**	**+2,025**

[a] Inertial Confinement Fusion and High Yield Program is being restructured into the Stockpile Research, Technology, and Engineering program starting in FY 2021.

Advanced Simulation and Computing [a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Advanced Simulation and Computing				
Integrated Codes	149,214	149,714	0	-149,714
Physics and Engineering Models	66,650	69,650	0	-69,650
Verification and Validation	55,114	58,114	0	-58,114
Advanced Technology Development and Mitigation	89,072	174,825	0	-174,825
Computational Systems and Software Environment	146,645	156,828	0	-156,828
Facility Operations and User Support	163,424	180,718	0	-180,718
Construction	47,000	50,000	0	-50,000
Total, Advanced Simulation and Computing	**717,119**	**839,849**	**0**	**-839,849**

Advanced Simulation and Computing
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Advanced Simulation and Computing				
Integrated Codes	149,214	149,714	159,956	+10,242
Physics and Engineering Models	66,650	69,650	77,967	+8,317
Verification and Validation	55,114	58,114	61,676	+3,562
Advanced Technology Development and Mitigation	89,072	174,825	40,000	-134,825
Computational Systems and Software Environment	146,645	156,828	237,953	+81,125
Facility Operations and User Support	163,424	180,718	176,462	-4,256
Construction	47,000	50,000	29,200	-20,800
Total, Advanced Simulation and Computing	**717,119**	**839,849**	**783,214**	**-56,635**

[a] Advanced Simulation and Computing is being restructured into the Stockpile Research, Technology, and Engineering program starting in FY 2021. Construction is now funded under Programmatic Construction within Infrastructure and Operations.

Advanced Manufacturing Development [a]
Funding (Non-Comparable, New Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Advanced Manufacturing Development				
Additive Manufacturing	12,000	18,500	0	-18,500
Component Manufacturing Development	38,644	48,410	0	-48,410
Process Technology Development	30,914	70,000	0	-70,000
Total, Advanced Manufacturing Development	**81,558**	**136,910**	**0**	**-136,910**

Advanced Manufacturing Development
Funding (Comparable, Old Structure)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Advanced Manufacturing Development				
Additive Manufacturing	12,000	18,500	18,869	+369
Component Manufacturing Development	38,644	48,410	93,039	+44,629
Process Technology Development	30,914	70,000	63,957	-6,043
Total, Advanced Manufacturing Development	**81,558**	**136,910**	**175,865**	**+38,955**

[a] Additive Manufacturing and Component Manufacturing Development are being restructured into the Stockpile Research, Technology, and Engineering program starting in FY 2021. Process Technology Development activities are being restructured into Production Modernization.

Stockpile Research, Technology, and Engineering

Overview

The Stockpile Research, Technology, and Engineering (SRT&E) program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without additional nuclear explosive testing.

The subprograms are:

1. Assessment Science
2. Engineering and Integrated Assessments
3. Inertial Confinement Fusion
4. Advanced Simulation and Computing
5. Weapons Technology and Manufacturing Maturation
6. Academic Programs

The Stockpile Research, Technology, and Engineering program:

1. Provides the scientific foundation for science-based stockpile decisions, as well as the capabilities, tools, and components needed to enable assessment and certification; balances the most pressing investments the Nuclear Security Enterprise needs to meet DoD warhead needs and schedules and the critical long-term R&D needed for a robust and responsive future stockpile.
2. Pursues CD-4 in FY 2025 for the Advanced Sources and Detectors Major Item of Equipment for the Enhanced Capabilities for Subcritical Experiments (ECSE) program, to meet the W80-4 design validation experiment as well as W87-1 program requirements for system certification with a subcritical experiment in 2026.
3. Delivers the Crossroads high-performance computing system for annual assessment, modernization programs, and safety & surety assessments; and prioritizes delivery of an exascale-class computing environment in FY 2022 in preparation for the El Capitan system delivery in FY 2023.
4. Delivers modern technologies necessary to enhance secure manufacturing capabilities and to provide timely support to critical needs of the stockpile such as increasing technology and manufacturing readiness levels (TRLs and MRLs) with reduced systems costs.
5. Develops the next generation of highly-trained technical workers able to support the NNSA core mission and to ensure there is a strong community of technical peers, external to the NNSA National Laboratories, capable of providing peer review and scientific competition to strengthen the basic fields of research relevant to the NNSA.
6. Promotes the next generation of stockpile stewardship by (a) fostering an environment of innovation that can respond to an evolving threat environment, (b) applying the capabilities to enable a more modern and efficient production complex, and (c) imbuing the next generation of personnel within the National Security Enterprise with the knowledge, capabilities, and state-of-the-art scientific and computing capabilities to achieve transformation of the Defense Program mission.

Stockpile Research, Technology, and Engineering
Funding (Non-Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Research, Technology, and Engineering				
Assessment Science	0	0	773,111	+773,111
Engineering and Integrated Assessments	0	0	337,404	+337,404
Inertial Confinement Fusion	0	0	554,725	+554,725
Advanced Simulation and Computing	0	0	732,014	+732,014
Weapon Technology and Manufacturing Maturation	0	0	297,965	+297,965
Academic Programs	0	0	86,912	+86,912
Total, Stockpile Research and Engineering	**0**	**0**	**2,782,131**	**+2,782,131**

Stockpile Research, Technology, and Engineering
Funding (Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Stockpile Research, Technology, and Engineering				
Assessment Science	469,328	594,834	773,111	+178,277
Engineering and Integrated Assessments	251,410	325,134	337,404	+12,270
Inertial Confinement Fusion	536,442	556,508	554,725	-1,783
Advanced Simulation and Computing	659,119	767,849	732,014	-35,835
Weapon Technology and Manufacturing Maturation	185,139	222,302	297,965	+75,663
Academic Programs	72,856	86,492	86,912	+420
Total, Stockpile Research, Technology, and Engineering	**2,174,294**	**2,553,119**	**2,782,131**	**+229,012**

Stockpile Research, Technology, and Engineering
Outyear Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Stockpile Research, Technology, and Engineering				
Assessment Science	739,903	727,451	730,071	699,435
Engineering and Integrated Assessments	348,920	362,682	373,663	381,271
Inertial Confinement Fusion	491,497	503,761	590,411	602,810
Advanced Simulation and Computing	765,313	761,194	773,265	783,918
Weapon Technology and Manufacturing Maturation	313,885	335,027	380,297	399,820
Academic Programs	86,737	88,601	92,504	94,445
Total, Stockpile Research, Technology, and Engineering	**2,746,255**	**2,778,716**	**2,940,211**	**2,961,699**

Stockpile Research, Technology, and Engineering
Proposed Budget Structure Changes
(Dollars in Thousands)

	Proposed FY 2021 Budget Structure																					
	Stockpile Research, Technology, and Engineering																					
	Assessment Science						Engineering and Integrated Assessments							Weapons Techology and Manufacturing Maturation			Academic Programs						
	Primary Assessment Technologies	Dynamic Materials Properties	Advanced Diagnostics	Secondary Assessment Technologies	Enhanced Capabilities for Subcritical Experiements	Hydrodynamic and Subcritical Experiment Execution Support	Archiving and Support	Delivery Environments	Weapons Survivability	Studies and Assessments	Aging and Lifetimes	Stockpile Responsiveness	Advanced Certification and Qualification	Surety Technologies	Weapon Technology Development	Advanced Manufacturing Development	Stewardship Science Academic Alliance (SSAA)	Minority Serving Institution Partnership (MSIPP)	Tribal Education Partnership Program (TEPP)	Joint Program in High Energy Density laboratory Plasmas (JHEDLP)	Computational Science Graduate Fellowships (CSGF)	Predictive Science Academic Alliance Program (PSAAP)	Total
FY 2020 Budget Structure																						
Weapons Activities																						
Stockpile Services																						
Research and Development Support							23,455								23,046							**46,501**
Research and Deveopment Certification and Safety						152,845	22,305								108,646							**283,796**
Science																						
Advanced Certification													60,649									**60,649**
Primary Assessment Technologies	112,827																					**112,827**
Dynamic Materials Properties	39,786	130,981																				**170,767**
Advanced Radiography			35,989																			**35,989**
Secondary Assessment Technologies				85,104																		**85,104**
Academic Alliances and Partnerships																	26,212	23,400	3,000			**52,612**
Enhanced Capabilities for Subcritical Experiments					215,579																	**215,579**
Engineering																						
Enhanced Surety														54,365								**54,365**
Weapons Systems Engineering Assessment Tech																						
Delievery Environments (formerly WSEAT)								39,235														**39,235**
Nuclear Survivability									59,500													**59,500**
Enhanced Surveillance											62,260											**62,260**
Stockpile Responsiveness												70,000										**70,000**
Subtotal, Page	152,613	130,981	35,989	85,104	215,579	152,845	45,760	39,235	59,500	0	62,260	70,000	60,649	54,365	131,692	0	26,212	23,400	3,000	0	0	0 **1,349,184**

	Proposed FY 2021 Budget Structure																		
	Stockpile Research, Technology, and Engineering																		
	Inertial Confinement Fusion			Advanced Simulation and Computing						Weapons Techology and Manufacturing Maturation			Academic Programs						
	HED & Ignition Science for Stockpile Applications	ICF Diagnostics and Instrumentation	Facility Operations	Integrated Codes	Physics & Engineering Models	Verification & Validation	Advanced Technology Development & Mitigation	Computational Systems & Software Environments	Facility Ops & User Support	Surety Technologies	Weapon Technology Development	Advanced Manufacturing Development	Stewardship Science Academic Alliance (SSAA)	Minotiry Serving Institution Partnership (MSIPP)	Tribal Education Partnership Program (TEPP)	Joint Program in High Energy Density laboratory Plasmas (JHEDLP)	Computational Science Graduate Fellowships (CSGF)	Predictive Science Academic Alliance Program (PSAAP)	Total
FY 2020 Budget Structure																			
Weapons Activities																			
Inertial Confinement Fusion Ignition and High Yield																			
Ignition																			
Support of Other Stockpile Programs																			
Ignition and Other Stockpile Programs	102,040																		**102,040**
Diagnostics, Cryogenics, and Experimental Support		67,197																	**67,197**
Pulsed Power ICF	8,785																		**8,785**
Joint Program in High Energy Density Laboratory Plasmas															500	11,800			**12,300**
Facility Operations and Target Production			376703																**376,703**
Advanced Simulation and Computing																			
Integrated Codes				137,956													2,000	20,000	**159,956**
Physics & Engineering Models					77,967														**77,967**
Verification & Validation						61,676													**61,676**
Advanced Technology Development & Mitigation							40,000												**40,000**
Computational Systems & Software Environment								237,953											**237,953**
Facility Operations and User Support									176,462										**176,462**
Advanced Manufacturing Development																			
Additive Manufacturing												18,869							**18,869**
Component Manufacturing Development												93,039							**93,039**
Infrastructure and Operations																			
Capabilities Based Investments																			
Subtotal, Page	110,825	67,197	376,703	137,956	77,967	61,676	40,000	237,953	176,462	0	0	111,908	0	0	500	11,800	2,000	20,000	**1,432,947**
Grand Total	**110,825**	**67,197**	**376,703**	**137,956**	**77,967**	**61,676**	**40,000**	**237,953**	**176,462**	**54,365**	**131,692**	**111,908**	**26,212**	**23,400**	**3,500**	**11,800**	**2,000**	**20,000**	**2,782,131**

Stockpile Research, Technology, and Engineering
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Stockpile Research, Technology, and Engineering	
Assessment Science: Increase to address cost growth for planned FY 2025 completion of installation of the Advanced Sources and Detectors Major Item of Equipment for the Enhanced Capabilities for Subcritical Experiments (ECSE) program to meet W80-4 confirmation needs and W87-1 program certification requirements. Execution of experiments for plutonium aging assessment using platforms such as the Joint Actinide Shock Physics Experimental Research (JASPER) gas gun and focused material studies in support of plutonium sustainment. Support Direct Cast Uranium qualification and investigations of aged Canned Sub-Assemblies (CSAs) to aid in Life Extension Program (LEP) and production modernization.	**+178,277**
Engineering and Integrated Assessments: Increase provides the development of engineering options for future weapons systems, including some advanced options applicable to the W87-1, as well as ensuring continued capabilities to ensure the survivability of weapons in normal, abnormal, and hostile environments. It also provides the engineering foundation for engineering analysis in combined environments for increased safety and performance; continues investments in advanced diagnostics for non-destructive surveillance increasing knowledge and reducing sustainment costs; studies aging effects and determines lifetimes of stockpile components; accelerates the nuclear weapons lifecycle; and explores new certification and qualification approaches for new and reused weapon components to reduce costs and time to field.	**+12,270**
Inertial Confinement Fusion: Implement key findings of the Inertial Confinement Fusion (ICF) 2020 reviews, focus ignition science campaigns on driving down barriers to accessing weapons-relevant regimes, support full operations at the National Ignition Facility (NIF), the Z Pulsed Power machine, and the Omega Laser Facility to enable the execution of the highest priority weapons-relevant experiments.	**-1,783**
Advanced Simulation and Computing: Decrease represents suspension of new development of all next-generation simulation capabilities while mature next generation code development and computing technologies are transitioned into the base program and older code and software tool packages are replaced.	**-35,835**
Weapons Technology and Manufacturing Maturation: Increase supports the maturation of technologies, materials, and manufacturing processes for future weapon systems to reduce costs and time to field, including Direct Cast and Special Materials. The technology and production options are being developed on a timeline to ensure they are sufficiently mature to be viable options for LEPs, with a goal of significantly reducing the time and cost of weapons and complex modernization. It advances research and development of additively-manufactured (AM) feedstock and deposition processes and qualification of AM parts and components. The increase also funds the next High Operational Tempo shot (HOTSHOT) flight demonstration, that uses a test rocket to enable the rapid development, testing, and qualification of new components and technologies and supports development of new, safer initiation technologies and options to enable modularity/agility.	**+75,663**

	FY 2021 Request vs FY 2020 Enacted
Academic Programs: No significant change.	**+420**
Total, Stockpile Research, Technology, and Engineering	**+229,012**

Stockpile Research, Technology, and Engineering
Assessment Science

Overview

The Assessment Science program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile in the absence of nuclear explosive testing. Capabilities developed and maintained in the Assessment Science program support the entire Nuclear Weapons Complex providing: (1) the scientific underpinnings required to conduct annual assessments of weapon performance and certification of LEPs, (2) the scientific insight necessary to inform our understanding of the impacts of surveillance findings to assure that the nuclear stockpile remains safe, secure, and effective, and (3) the core technical expertise required to be responsive to technical developments and geopolitical drivers. Assessment Science also facilitates the assessment of current weapon and weapon component lifetimes, development and qualification of modern materials and manufacturing processes, concepts for component reuse, and modern safety concepts for sustainment.

Assessment Science performs experiments to obtain the materials and nuclear data required to validate and to understand the physics of nuclear weapons performance; these include hydrodynamic and subcritical experiments used to obtain data on the dynamic behavior of plutonium and surrogate materials in integrated geometries. Science program experiments and data analyses also facilitate safety, security, and evaluations of sustainment concepts without the need for additional nuclear explosive testing. These activities serve to develop, exercise, and maintain the expertise and competence of the nuclear weapon design, engineering, and assessment community that resides at the National Nuclear Security Administration (NNSA) laboratories and production complex. This compendium of weapons-relevant data is acquired using unique, small- and large-scale experimental facilities throughout the Department of Energy (DOE) Nuclear Security Enterprise.

Many of the signature efforts enabling Science-Based Stockpile Stewardship 6 at NNSA reside in this program. For example:

- Dynamic high- and low-Z material experiments (JASPER, Z Pulsed Power Facility (Z))
- Hydrodynamic and subcritical experiments (Dual-Axis Radiographic Hydrodynamic Test (DARHT), U1a Complex)
- Enhanced Capabilities for Subcritical Experiments (U1a)
- High Energy Density (HED) experiments (NIF, Z, Omega Laser Facility)
- Hostile environment experiments (Z, NIF)

While the research, development, platform deployment, and experimental execution support associated with these efforts resides in Assessment Science, the operational funds for the facilities are included in other program budgets such as Inertial Confinement Fusion and Infrastructure and Operations.

The Assessment Science program has strong programmatic coupling with the Advanced Simulation and Computing (ASC), Inertial Confinement Fusion (ICF), Engineering and Integrated Assessments, Weapon Technology and Manufacturing Maturation, and Stockpile Management programs. These program linkages and a number of crucial cross-cutting, scientific milestones (or pegposts) are captured in the Stewardship Capability Delivery Schedule (SCDS), a long-range communication, integration, and alignment tool that spans science-based stockpile stewardship activities within NNSA.

The Assessment Science Program is comprised of six subprograms:

1. **Primary Assessment Technologies** provides capabilities essential for annual assessment of stockpile primaries, certification of future sustainment programs, improvements in primary safety and security, and resolution of Significant Finding Investigations (SFIs).
2. **Dynamic Materials Properties** develops and maintains the experimental capabilities needed to inform modern, physics-based models that describe and predict the behavior of weapon materials in environments of extreme conditions of pressure, temperature, and strain rates to understand how fundamental material behavior impacts nuclear weapon performance.
3. **Advanced Diagnostics** establishes tools for delivering stockpile data by developing x-ray radiography and other diagnostics for hydrodynamic, subcritical, and other experiments that subject materials to strong shocks and high strain rates.

4. **Secondary Assessment Technologies** provides capabilities that increase confidence in the assessment of stockpile secondaries, enabling a broad range of sustainment options and resolution of SFIs.
5. **Enhanced Capabilities for Subcritical Experiments** establishes a key test capability and closes a capability gap to evaluate the response of plutonium due to aging, modern manufacturing techniques, modern materials, evolving design philosophies changes, and enable design certification of nuclear systems without the need for a nuclear test.
6. **Hydrodynamic and Subcritical Execution Support** provides the facilities and services required to maintain a robust testing capability to supply critical data to weapon physicists and design engineers, allowing assessment of potential impacts from design changes, material substitutions, or component changes associated with LEPs, alterations (Alts), or modifications (Mods) on weapon performance and safety.

Assessment Science
Primary Assessment Technologies

Description

Primary Assessment Technologies (PAT) provides capabilities essential for annual assessment of stockpile primaries, certification of future sustainment programs, improvements in primary safety and security, and resolution of SFIs. Primary assessment efforts are focused on improving stockpile stewardship science predictive ability by developing common models to quantify uncertainties in predictions to better quantify performance and confidence in qualification. The predictive models will also include the impact caused by design variance issues, aging effects (time progression decay), and/or variability of manufacturing processes on primary performance. As part of the effort to characterize primary performance, sub-critical experiments will incorporate these factors (variance in engineering design, aging effects, and variability in manufacturing processes) to better quantify isolated effects in focused experiments and coupled/correlated effects in integrated experiments. The principal focus areas of PAT include improving predictive capabilities for modeling boost. A specific task for PAT is preliminary examination of pit reuse options to meet requirements. PAT also provides science capabilities needed for intelligence community assessments of foreign-state nuclear weapon activities that concomitantly provide critical weapon skills, training, and experimental opportunities and challenges for designers and engineers.

Between 2021 and 2025, there are two SCDS pegposts PAT will be either directly responsible for or indirectly supporting. PAT will be supporting the 2021 *Hostile Survivability Baseline* pegpost by measuring properties after samples have been conditioned and assessing the impact to primary performance. PAT will also be the lead for the 2025 *Advanced Understanding of Primary Performance* pegpost that will lead to better quantification of performance metrics and their uncertainties. This will incorporate improved boost models, plutonium aging data, and the impact of manufacturing variances.

Activities include: (1) design and analysis of hydrodynamic experiments, (2) experiments supporting burn studies for boost science, (3) plutonium aging impacts on primary performance, (4) nuclear science measurements (e.g., fission cross-sections, fission yield, etc.), (5) work on manufacturing technologies to engineer and fabricate plutonium parts for Sub Critical Experiments (SCE), and (6) surface science experiments to assess corrosion phenomena.

Highlights of the FY 2021 Budget

- Supports the design, assembly, and analysis of multiple Subcritical Explosion Experiments (SCEs) necessary to understand the aging of Plutonium relevant to all current and future systems, as well as impacts of modifications and changes in materials.
- Supports the development and use of platforms (Z machine, NIF, pRad – Proton Radiography Facility) to better understand boost, mix, and ejecta by informing the models and simulation efforts for the primary portion of the nuclear explosive package (NEP). These experiments are critical to validating our weapons physics models, and they enable increased confidence in weapons performance through reduced uncertainties
- Support the re-establishment of plutonium capability at the Los Alamos Neutron Science Center (LANSCE) proton Radiography Facility (pRad), which provides critical dynamic performance data for materials and components (new alloys, new manufacturing and processing, and aging studies). The capability at LANSCE will allow cost-effective and faster turn-around experiments to better focus the more expensive dynamic experiments at Nevada National Security Site (NNSS).

FY 2022 – FY 2025 Key Milestones

- Conduct experiments and analyses to reduce the remaining uncertainties associated with boost. This will facilitate assessments of weapon performance in regimes that differ from those tested due to aging, changes in manufacturing processes, or changes in design.
- Conduct experiments and analyses to reduce nuclear physics parameter uncertainties.
- Provide the science base that facilitates maturation and certification of future sustainment options associated with primaries.
- Complete several small-scale, focused experiments on ejecta physics using the pRad; experiments that will ultimately inform ejecta physics models used in ASC integrated weapons simulations.
- Conduct HED experiments to measure properties of burning plasmas relevant for weapon operation in a controlled manner to allow for better understanding of weapons physics.

- Expand weapon science capabilities to strengthen intelligence community assessments of specific foreign state nuclear weapon activities, and develop modern capabilities for the science-based Stockpile Stewardship Program (SSP) that are also suitable for use by the counterterrorism and counter-proliferation program mission.
- Develop a comprehensive understanding (e.g., kinetics, surface morphology) of the corrosion process on actinide materials that would affect the weapons estimated lifetime and performance.

FY 2019 Accomplishments

- Marble HED campaign successfully returned data to inform boost physics models. The Marble HED campaign was an initiative to examine interdependent reactions at early stages of the weapon to understand performance.
- Gnome pRad experiment provided large suite of data on implosion and ejecta to inform weapons models both in abstraction and for B61 and W87-1. The Gnome pRad experiment is representative of weapons materials under explosive compression to simulate behavior of primary implosion.
- Nuclear data collection on Chi Nu (^{238}U Prompt Fission Neutron Spectrum) and Time Projection Chamber (^{235}U fission cross section) platforms to inform neutron reactivity assessments.
- Enhanced Z Facility capabilities of x-ray time-resolved measurements and detector system along with a new containment system in preparation for Special Nuclear Materials (SNM) phased experiments for early stages of weapons dynamics.
- Completed baselines design of the Outer Pressure Containment Vessel (OPCV) and preliminary design of the Inner Plutonium Confinement Vessel (IPCV) at LANSCE in preparation for focused Pu experiments (preliminary SCE). This will re-establish “Pu at pRad”, the ability to run fully contained plutonium experiments at the proton radiography facility.
- Continued collaboration on Montrose platform for targets, diagnostics, and modeling/simulation with successful initial proof-of-concept run. The Montrose platform examines the early stages of the primary materials to elucidate the primary yield in a modern designed weapon.
- Progress on deliverables for Weapon Survivability Level 1 milestone (FY 2020 SCDS milestone/pegpost).

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Primary Assessment Technologies $95,169,000	**Primary Assessment Technologies $152,613,000**	**Primary Assessment Technologies +$57,444,000**
• Re-instituted ability to conduct plutonium (Pu) experiments at pRad for material and component characterization under dynamic conditions. • Focused on plutonium aging science to establish the dependence of thermodynamic properties on plutonium aging processes. To this end, samples from a common material set will undergo calorimetry, resonant ultrasound, and diffraction experiments. • Provided data on fission Time Projection. • Chamber (TPC) ^{239}Pu/hydrogen (H) ratio cross-section measurement conducted at LANSCE – Los Alamos Neutron Science Center. • Advanced capability for a combined mix and strength model to improve modern codes that predict the performance of weapon primaries. • Conducted experiments in support of boost science to improve the current understanding of primary performance. • Engineered and fabricate plutonium parts for upcoming SCEs in collaboration with Plutonium Sustainment. • Conducted material aging experiments in support of the B61 LEP, annual assessments, and to support pit reuse options for sustainment programs.	• Design and assemble experimental devices for the Nimble SCE series at U1a to advance our understanding of ejecta physics to inform material and manufacturing choices relevant to future LEPs. • Conduct analysis on the completed Red Sage-Nightshade SCE series to validate new physics-based models of ejecta. • Conduct experiments (2nd Flex shot, Los Alamos National Laboratory (LANL)- Sandia National Laboratories (SNL) collaboration) in support of boost science to improve the current understanding of primary performance via platforms for testing weapons design alterations. • Pu at pRad: Begin hardware fabrication for IPCV final design for Pu experiments; deploy new ejecta physics diagnostics; Field High Pressure Hydrodynamics (HiPHy) implosion experiments, all to run more cost-effective, focused hydro experiments on Pu, rather than as SCE. • Improve models for boost metrics through application of Deep Machine Learning, advanced radiographic analysis methods, and modeling vaporization in codes, all in an effort to better model boost.	• Increase supports migration of Subcritical Experiments (SCE) from Dynamic Materials Properties (DMP) to PAT to gain efficiencies and make the SCE program easier to execute. • Growth supports plutonium aging assessments in SCEs and analysis in weapons performance. • Growth supports increased annual cadence of SCEs, and preparation for SCEs utilizing ECSE capability necessary for certification and primary physics understanding in the absence of nuclear explosive testing. • Growth supports implementation of enhanced capabilities for Pu studies such as Pu at pRad to reduce costs and better focus the more expensive Pu experiments at Nevada. • Increase supports nuclear physics measurement needs: understanding inelastic scattering, utilizing critical benchmark experiments and improving (n, 2n) cross-sections, all in an effort to reduce uncertainty for initial conditions for boost.

Assessment Science
Dynamic Materials Properties

Description

The Dynamic Materials Properties (DMP) subprogram develops and maintains the experimental capabilities needed to inform modern, physics-based models that describe and predict the behavior of weapon materials in environments of extreme conditions of pressure, temperature, and strain rates to understand how fundamental material behavior (core DMP) impacts nuclear weapon performance but does not fully evaluate weapons performance as this scope of research carried out within Primary Assessment Technologies (PAT) or Secondary Assessment Technologies (SAT). The consideration of pit and secondary component reuse and replacement also requires studies of degradation of materials with age (to include aged plutonium samples) under dynamic conditions to understand potential performance changes. This program provides the experimental data and assessment of SNM, metals, insensitive high explosives (IHE), polymers, and foams under dynamic conditions required for annual assessment and certification of the stockpile as well as for future sustainment options. Aspects of this subprogram link to other programs/subprograms (including coordination of efforts) within DOE/NNSA including Physics and Engineering Models (PEM), Component Manufacturing and Development, Additive Manufacturing, High Explosives and Energetics, DOE/Office of Science, and the DoD (DoD/DOE Joint Munitions Program).

Research pursued in DMP supports: (1) the annual assessment process, (2) baselining of materials properties for the future determination of aging effects (e.g. Pu aging), and (3) consideration of materials replacement and future options for sustainment programs. The characterization of new materials and processes for stockpile applications is an emerging focus for stockpile modernization and responsiveness to enable the use of modern manufacturing techniques. New experimental capabilities are developed to provide the required data for annual assessment and potential future sustainment options. Additionally, DMP will lead an SCDS pegpost in FY 2023 on Enabling Pit Production and support the FY 2022 SCDS pegpost on Aging and Lifetimes. DMP will continue support of the national plutonium aging strategy.

The following capabilities are being developed to facilitate certification of pit reuse with insensitive high explosives (IHE) for upcoming sustainment programs: (1) heating and cooling capabilities on dynamic testing platforms, (2) high-pressure Z experiments on plutonium and other relevant materials, and (3) experiments on aged samples at the JASPER gas gun facility, and other experimental platforms. Additionally, for long-term certification needs, alternatives to characterizing high Z materials and high explosives *in situ* within appropriate physical regimes are being explored.

Scope Realignment

- Shift of subcritical experiments scope and funding to PAT to gain efficiencies and make the SCE program more executable.
- Migration of scope and funding of Pu aging, Pu manufacturing properties, and Platform Design/Execution from PAT to gain efficiencies and make DMP subprogram more executable.
- Greater emphasis in work at x-ray light sources (at DOE Office of Science Facilities) with direct program impact to leverage Office of Science facilities to gather more data and relieve pressure on Defense Program facilities.

Highlights of the FY 2021 Budget

- Continue prioritizing properties of aged Pu and replacement materials to increase confidence in stockpile performance and LEPs.
- Emphasize Tri-lab (LANL, LLNL, SNL) Strength efforts (unifying the analytic models and multiple data sets for incorporation into simulations) in metals to provide more robust multi-phase equations of state to increase reliability of models.
- Enhance capabilities on high pressure platforms to expand pressure, temperature, and strain rate regimes for high interest materials.
- Development of new molecules and methodologies for scale-up of candidate IHE to provide better performing and more efficiently produced HE.
- Utilize x-ray light sources to develop new methodologies of examining high interest materials (e.g. metals, HE, additively manufactured materials) under extreme conditions, leading to performance models with reduced uncertainties.

FY 2022 – FY 2025 Key Milestones

- Deliver high-pressure plutonium data using the JASPER facility at NNSA to support Pu aging.
- Develop advanced platforms for high-pressure materials measurements on the Z-machine to explore broader pressure-temperature domains.
- Execute diagnostics on high pressure platforms for equation-of-state, strength, and damage to better characterize materials/properties and reduce uncertainties.
- Support sustainment options by executing experiments providing key data at NNSA experimental facilities: JASPER, Technical Area-55 (TA-55), LANSCE, the Z Facility, high-explosive (HE) firing sites, and other laboratory-scale science facilities.
- Support the testing and qualification of uranium, high explosives, and other non-nuclear materials for remanufacturing options.
- Evaluate the dynamic response of materials produced by new manufacturing methods for potential stockpile applications.

FY 2019 Accomplishments

- Delivered plutonium data from NIF, JASPER, Z, and small-scale experiments at TA-55 to validate the plutonium equation-of-state (EOS) and plutonium aging models directly relevant to stockpile assessments, stockpile certification, and future stockpile options including the B61-12 LEP.
- Delivered additional high explosives data from experiments at the Dynamic Compression Sector (DCS) at the Advanced Photon Source (APS) (at Argonne National Laboratory) that support the development of more advanced models of the detonation and performance of IHE.
- Time-resolved x-ray diffraction data at the DCS that pinpointed details of solid-solid and solid-liquid or solid-product phase transitions in metals and polymers.
- First radiance measurement made on shock-ramp experiment at the Z machine in order to minimize uncertainties in temperature within phase diagrams. Time-resolved temperature was measured on dynamically compressed Pu on Z.
- Successfully performed stripline containment authorization tests for the Z-machine (for higher pressure and accuracy).

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Dynamic Materials Properties $128,000,000	**Dynamic Materials Properties $130,981,000**	**Dynamic Materials Properties +$2,981,000**
• Performed experiments and modeling of two multi-phase materials as part of the Tri-lab strength collaboration. • Conducted JASPER experiments on plutonium at weapon-relevant conditions to measure phase transitions, kinetics, and aging-effects using dynamic diagnostics including temperature measurement. • Assessed the influences of microstructure and chemistry on dynamic performance from changes in production and processing (Pu, HE). • Executed automated phase mapping and high-fidelity EOS measurements of plutonium and plutonium alloys at High Pressure Collaborative Access Team (HPCAT) Sector at APS at moderate pressures and temperatures. • Completed qualification of the performance of legacy and new lots of PBX-9502 and LX-21 in support of the B61 LEP and W80-4 LEP. • Developed experiments to support the qualification of PBX-9502 and LX-17 high explosives for the W80-4 LEP and W87-1 Program. • Conducted experiments at the APS DCS to elucidate the formation of high explosive condensates during initiation, to inform reactive burn models. • Executed authorization tests of the next-generation containment (NGC) system for the Z Facility. This will enable higher pressure experiments on plutonium, supporting plutonium aging.	• Perform Multi-phase strength experiments on metals to support development of multi-phase strength models over wide range of weapons-relevant strain rates including new platform at PF-4 and new techniques at APS to reduce uncertainties in physics modeling. • Pursue Production Science efforts in support of pit production including chemistry, defects, and casting. • Develop and mature several high explosive options for the future stockpile. • Conduct shock ramp and shock release experiments on plutonium at JASPER using 40 mm barrel in support of material aging and certification. • Conduct first experiments at APS under new classified operations model for future exploration of questions related to material aging and production science. • Execute high pressure ramp compression, strength, and diffraction experiments at NIF using new and engineering aged Pu samples to validate models and reduce uncertainties in physics modeling. • Use HE pilot plant at Lawrence Livermore National Laboratory (LLNL) to create batches of promising new IHE molecules and characterize performance. • Additional pre-heating capabilities for Pu Experiments on Z-machine; improve containment to enable higher pressures on Z-	• Production Science held constant with upcoming pegpost in FY2023. • Sustains x-ray light source efforts (at Office of Science facilities) to characterize a variety of materials that lead to improved models for use in high-fidelity integrated ASC codes. • Maintain support of experiments on multiple high pressure platforms for Pu aging.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	machine, enabling access to weapons-relevant regimes to inform physics modeling	

Assessment Science
Advanced Diagnostics

Description

The Advanced Diagnostics (AD) subprogram establishes tomorrow's tools for delivering stockpile data by developing x-ray radiography and other diagnostics for hydrodynamic, subcritical, and other experiments that subject materials to strong shocks and high strain rates, including those experiments that are designed to determine the properties of plutonium. Requirements for new stockpile data are identified by NNSA and are based on recommendations from the weapons design program elements at LANL and LLNL, by the weapons system stewardship activities, including LEPs, and by other subprograms in ICF and Science.

Priority activities across the AD program include the continued development of the drivers, diagnostics, and methodologies to support the varying needs of the Weapons Program for intermediate and long-term experiments. These transformational technologies motivate new materials models with innovation and design optimization, validate models used in modern design codes, and advance and improve the quality of the scientific results obtained at the experimental facilities.

Efforts to advance drivers include work in: traditional pulsed power engineering, research and development (R&D) for energy storage, power flow and current adder; solid state pulsed power technologies; and application of lasers to produce extreme environments. The development and implementation of new diagnostics for subcritical, fundamental, and focused experiments include: photon, particle, and neutron detectors; visible light cameras; position, velocity, and temperature ("shock wave") diagnostics; advanced (non-x-ray) radiographic techniques such as proton and neutron radiography; and soft x-ray imaging. Methodological improvements for weapons experiments include: new techniques for hydrodynamic and subcritical experiments; and short-pulse laser driven electron and ion beam sources.

These transformational technologies improve the quality and reliability of scientific results at many NNSA experimental facilities at the national security laboratories and NNSS. These include the DARHT Facility, the Contained Firing Facility (CFF) using Flash X-Ray (FXR) technology, the Z Pulsed-Power Facility, the Cygnus radiography system at the U1a Complex, and the pRad Facility.

Highlights of the FY 2021 Budget

- Develop conceptual designs for n-pulse test injector and for a prototype system of the n-pulse, active-reset Linear Induction Accelerator (LIA). These designs are a part of the overall technological maturation of the technology to enable cinematographic radiography. Cinematographic radiography would support capturing a larger number of frames at a near-arbitrary frame rate of the time-evolution of a system under study, and in conjunction with hydrodynamic and sub-critical experiments, provide a robust test of the predictive capability of weapons design codes and help reduce the need for nuclear explosive testing.
- Increase maturity of compact pulsed power and component-level technologies. High peak pulsed power technology could be applied to multiple, future applications: next generation accelerator architecture for combined environments, neutron reactivity source, high flux neutron radiography source, and future programmable waveform driver to explore properties of dynamic materials, to name a few.
- Assess technologies to mitigate electrode contaminants to delay or prevent plasma formation which could provide improvements to current delivery on several accelerator systems at existing facilities. If this technology proves successful, it would solve a 50-year problem that is unavoidable with this type of accelerator system and provide revolutionary advances in preventing energy losses in current and future systems.
- Research and develop next-generation diagnostics and methodologies for hydrodynamic and subcritical experiments. Next-generation technologies are exploring new regimes and conditions not accessible with current diagnostics offering highly sensitive measurements which can deliver better quality and quantity of data. This can significantly impact the development and validation of new models of materials and of physical processes, and help reduce the need for nuclear explosive testing.
- Develop a technology maturation plan for promising technological approaches to long term radiography on integral, focused, and fundamental scales, following the results of future radiography assessment study in FY2020. This plan could be used to guide technology development for the next decade since radiography continues to be a key diagnostic for weapon physics experimentation, especially dynamic experiments.

- Develop radiographic system improvements and new diagnostics at existing facilities, mainly U1a Complex Cygnus, DARHT, and FXR, in support of hydrodynamic and subcritical experiments.

FY 2022 – FY 2025 Key Milestones

- Research and develop the next-generation DARHT and FXR replacement accelerator architectures to anticipate the long-term needs of the Weapons Program.
- Modernize radiographic analysis techniques and models for delivery of high fidelity data which may provide a better test of current codes and help reduce the need for nuclear explosive testing.
- Advance and field hydrodynamic diagnostics for both surrogate and plutonium experiments that support stockpile assessments and LEP developments.
- Mature the technology for cinematographic radiography for future hydrodynamic and sub-critical experiments to provide a robust test of the predictive capability of weapons design codes and help reduce the need for nuclear explosive testing.
- Provide next generation driver technologies to create physical environments needed to answer Weapons Program needs.
- Develop dynamic neutron radiography utilizing an intense, pulsed neutron source as a new capability which will support: fundamental understanding of how plutonium aging and manufacturing variances affect performance, radiographic and reactivity measurements, and assurance of stockpile survivability.
- Provide transformational diagnostics to increase learning from dynamic experiments that will help reduce the need for nuclear explosive testing by delivering better quality and quantity of data.
- Provide improved tools for design and optimization of diagnostics coupled with efficient data analysis techniques which could help reduce measurement uncertainties and ensure better quality data from experiments.

FY 2019 Accomplishments

- Demonstrated initial capability of a bi-polar solid state pulsed power driver and an active-reset capable LIA cell, providing progress toward achieving cinematographic radiography. Cinematographic radiography, in conjunction with hydrodynamic and sub-critical experiments, would provide high quality data to test the predictive capability of the weapons design codes.
- Built and tested compact pulsed power technologies and completed initial conceptual designs of next generation architectures. As described above, high peak pulsed power technology could be applied to multiple, future applications such as a next generation accelerator architecture for combined environments. Fast pulsed power systems can create nuclear weapon-like conditions and flash diagnostic sources for designing and assessing the future stockpile without the need to return to nuclear explosive testing.
- Developed advanced power flow simulations and deployed power flow and plasma diagnostics at the Z Facility to provide validation data for these simulations, delivering a hybrid plasma physics modeling capability that spans multiple programs which may help solve energy losses on large, pulsed power platforms.
- Assessed the potential for a photofission based approach for neutron diagnosed subcritical experiments (NDSE) in a relevant environment. NDSE provides a new capability of dynamic criticality measurements in subcritical experiments.
- Designed, built, tested, and installed a Broadband Laser Ranging (BLR) diagnostic system for the CFF, completing a multi-institutional collaboration. BLR has the potential to improve fidelity and quality of data return for hydrodynamic experiments by measuring position directly, avoiding the errors/uncertainties implicit with current experimental methodologies.
- Researched and developed new diagnostic capabilities for current and upcoming subcritical experiments. Modern diagnostics tied with sophisticated analysis tools produce quality data that provide vital weapons code validation that can directly influence calculations that support assessments and certification.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Advanced Diagnostics $32,710,000	**Advanced Diagnostics $35,989,000**	**Advanced Diagnostics +$3,279,000**
• Installed and initially demonstrate bi-polar solid state pulsed power driver and active-reset capable LIA cell on the FXR machine. • Conducted power flow experiments to refine validation data and to improve plasma diagnostics and other associated hardware. • Developed and evaluate plasma discharge cleaning technology. • Matured development of advanced pulsed power component-level technologies and pre-concepts for next generation architectures. • Assessed and develop next generation radiographic technologies and techniques in support of the current and future nuclear weapons stockpile. • Researched and assess diagnostics desired by weapon laboratories and validated by NNSA to reduce uncertainty in weapon codes. • Researched and develop next generation source technologies and diagnostics. • Research and develop modeling, simulation, and analysis to support diagnostic development. • Improved radiographic analysis methods. • Improved beam line physics models. • Improved imaging capabilities that include sources, scintillators, and cameras at existing NNSA facilities to increase data fidelity.	• Develop conceptual designs for technologies enabling cinematographic radiography which could provide high fidelity data for hydrodynamic and sub-critical experiments. • Complete power flow experiments for physics model validation and evaluate improvements from plasma discharge cleaning technology. These efforts may help solve energy losses on large, pulsed power platforms. • Increase maturity of compact pulsed power and component-level technologies. One application could be to create nuclear weapon-like conditions for assessing the future stockpile without the need to return to nuclear explosive testing. • Develop a Technology Maturation Plan for promising approaches to long term radiography which could guide development for the next decade as radiography continues to be a key diagnostic for weapon physics experimentation. • Continue to develop next generation radiographic technologies and techniques in support of the current and future nuclear weapons stockpile which could provide vital weapons data and code validation supporting assessments and certification. • Research and develop next-generation diagnostics and source technologies desired by weapon laboratories and validated by NNSA to reduce uncertainty in weapon codes. • Develop and improve modeling, simulation, and analysis which could help reduce measurement	• Growth supports combined-environment diagnostic research. • Growth supports establishing two major experimental test beds that will provide needed data informing stockpile stewardship decisions.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	uncertainties and ensure better quality data from experiments. • Improve imaging capabilities that include sources, scintillators, and cameras at existing NNSA facilities to increase data fidelity for hydrodynamic and subcritical experiments.	

Assessment Science
Secondary Assessment Technologies

Description

The Secondary Assessment Technologies (SAT) subprogram provides capabilities that increase confidence in the assessment of stockpile secondaries, enabling a broad range of sustainment options and resolution of SFIs. A principal focus of SAT is to provide the experimental and science capability used to quantify full system performance margins and associated uncertainties. The subprogram uses past nuclear explosive test data and conducts and utilizes a variety of above ground experiments to obtain new data and to develop and validate physical models needed to improve predictive capability. Key elements include primary output, radiation transport, complex hydrodynamics and burn, material properties, and weapons outputs and effects. For stockpile systems, secondary assessment facilitates: (1) the reacceptance of existing secondaries and other nuclear explosive package components for future sustainment options and (2) the development of the science basis for qualification methodology for physics performance of remanufactured canned sub-assembly (CSA) and other components. A major deliverable for Secondary Assessment Technologies in FY 2021 are the experiments and analyses supporting qualification of direct cast material, a FY 2021 Level-1 milestone and SCDS pegpost.

The subprogram validates the weapons physics models supporting the LEPs and modernization programs, anticipated stockpile responsiveness needs, develops new experimental platforms, continues model improvements, and expands the nuclear explosive test modeling suite in the common model framework, including directions identified through the FY 2019 off-nominal performance milestone. Efforts to evaluate new manufacturing processes, replacement materials, and aged materials in the stockpile and to evaluate their impact on stockpile performance are essential to the LEPs, modernization programs, and production modernization efforts. Understanding the impact of manufacturing processes for the production and restoration of CSA components requires both experimental measurements and modeling techniques to address performance impacts. Efforts will continue in weapon outputs, effects, and performance in hostile environments. Understanding survivability in a hostile environment requires understanding weapon outputs, propagation of outputs, and the subsequent effects coupling into the weapon intended for survival and how the performance of the weapon is impacted. This research includes obtaining experimental data supporting weapon design code validation for more accurate weapon output calculations, improving laboratory radiation sources and diagnostics to support code validation and hardware qualification experiments, and developing platforms for evaluating candidate and evolving stockpile technologies for radiation hardness.

SAT has strong programmatic coupling with other subprograms within Assessment Science, ICF, Engineering and Integrated Assessments, and ASC programs. It relies on experimental target capabilities and on the high-energy density (HED) facilities including the NIF at LLNL, the Omega Laser Facility at the University of Rochester, and the Z Pulsed Power Facility at SNL to execute HED experiments at conditions relevant to stockpile secondaries. SAT has significant coupling to advanced computing platforms and resources supported by the ASC Program and to the Nuclear Survivability subprogram in the Engineering and Integrated Assessments program.

Highlights of the FY 2021 Budget

- Expand the weapon science validation basis using studies of relevant nuclear explosive test data, off-nominal and non-stockpile designs, supporting stockpile assessments and LEP and modernization decisions.
- Support the Direct Cast physics qualification FY 2021 SCDS pegpost, tomography development, and repair options in support of LEP and production modernization efforts for secondaries.
- Develop new HED platforms and diagnostics and deliver constraining data using HED experimental facilities to gather data necessary to reduce uncertainties and increase confidence in physics modeling.
- Extend opacity measurements to additional materials and conditions and compare measurements between HED facilities to assess systematic errors and inform theoretical models of opacity necessary to reduce uncertainties and increase confidence in physics modeling.
- Continue to advance warm x-ray sources and platforms for Weapons Survivability assessments of new materials.

FY 2022 – FY 2025 Key Milestones

- Develop physics-based models for key secondary-relevant issues that include SFIs, the sustainment program, and the Annual Assessment Report, validate the models through HED and other experimental efforts, and develop new

platforms to obtain necessary experimental data to reduce uncertainties and increase confidence in weapons modelling.

- Execute program plans associated with secondary capabilities and design options consistent with the sustainment program schedule. Deliver data on radiation transport to validate models, in support of design assessments and Annual Assessments.
- Execute the program plan to deliver full-system weapon outputs modeling capabilities anticipating LEP and Stockpile Responsiveness needs.
- Advance manufacturing technologies for relevant materials and our understanding of new and aged materials impact on stockpile performance to support current stockpile, LEPs, and design options.
- Advance capabilities to assess survivability of nuclear weapons in hostile environments to reduce uncertainties in weapon performance.
- Develop warm x-ray, neutron sources, and system-generated electromagnetic pulse (SGEMP) platforms and common models for outputs and effects studies to reduce uncertainties and increase confidence in code predictions of weapon performance.
- Develop diagnostic and platform capabilities for HED experiments that study complex hydrodynamics and burn, equation of state of materials, material properties, and opacity to improve and validate models.
- Deliver opacity data on multiple materials from the Z Facility and the NIF to improve and validate first-principles opacity models and develop opacity platforms for outputs and effects.

FY 2019 Accomplishments

- Completed the FY 2019 Predictive Capability Framework (PCF) pegpost, delivering advances in understanding of secondary performance in nominal and off-nominal conditions.
- Delivered HED physics data in support of the W80-4 LEP, acquired equation-of-state data of a more manufacturable material in support of an LEP, validated models for secondary assessments, and began development of future HED platforms including a high-temperature hohlraum.
- Began experiments to underwrite qualification of a direct cast manufacturing method for a uranium alloy and investigations of the impact of impurities on the dynamic performance of that alloy. Manufactured cast materials with varying impurities to explore future stockpile material specifications, and continued efforts to study reforming aged components to enable alternative techniques for manufacturing future stockpile components.
- Advanced the hybrid complementary-metal-oxide semiconductor (hCMOS)-based spectrometer to measure the temperature and density evolution of samples during experiments on the Z Facility.
- Reduced the background noise in NIF opacity spectral measurements by over a factor of ten, significantly improving the quality of opacity data on NIF, and acquired and analyzed high-quality hCMOS time-gated absorption spectra from opacity experiments on Z.
- Conducted dedicated Z Facility experiments on blow-off impulse testing and System Generated Electromagnetic Pulse (SGEMP) to help validate models used for stockpile assessments and contribute to the FY 2020 SCDS pegpost.
- Continued to advance understanding of cold and warm x-rays and enhanced the capability of the Z Facility to validate models for Weapons Survivability by increasing yield and power from >20 keV x-ray sources, imaging warm x-ray sources with new Wolter optic diagnostic, and developing a platform that allows recovery of material samples following warm x-ray exposure on the Z Facility.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Secondary Assessment Technologies $77,553,000	**Secondary Assessment Technologies $85,104,000**	**Secondary Assessment Technologies +$7,551,000**
• Developed new HED platforms and deliver constraining data using existing platforms and facilities in support of stockpile stewardship. • Expanded the science validation basis in support of LEPs and anticipated stockpile responsiveness needs. • Delivered a new qualified HED platform to address a key issue in secondary performance modeling. • Investigated additional non-stockpile secondary devices to broaden validation of common modeling techniques and support design options. • Advanced manufacturing technologies for alloys and assess impacts on stockpile performance. • Developed warm x-ray sources to support model validation for survivability and produce data at higher fluences to evaluate thermomechanical shock response to inform LEP options. • Extended the systematic study of high-Z opacity measurements on the Z Facility and continue comparisons of data from the Z and NIF platforms at similar plasma conditions. • Measured the emission opacity of a high-Z material over a range of temperatures. • Support nuclear cross-section measurement activities in support of integrated design efforts and initiate modern look at radiochemistry in analysis of legacy samples. • Compared weapons outputs capabilities and predictions between current codes and alternate code.	• Complete the FY 2021 SCDS pegpost on Direct Cast material, executing the final set of experiments, completing analyses, and reporting results. • Perform modeling and analysis of non-stockpile designs to advance understanding of relevant physics processes and expand the validation domain of common modeling methodologies, increasing confidence. • Advance the platform design and diagnostic capabilities, field experiments, and analyze data from HED experiments to address secondary performance physics questions, including refining understanding of the impact of features on performance, radiation flow, and HED burn to reduce uncertainties and increase confidence in physics modeling. • Develop a low-energy-density (LED) experimental platform enabling physics assessments to aid in LEP and production modernization efforts. • Execute simulation studies and investigate CSA component repair, enabling refurbishment options supporting the Aging and Lifetimes program and the FY 2022 SCDS pegpost. • Experimentally inform nuclear models to improve cross-section evaluations of processes important for the interpretation of secondary performance and radiochemical activation measurements reducing uncertainty and increasing confidence. • Extend the systematic study of opacity to additional materials under multiple plasma conditions, compare data to existing models, and	• Increase supports direct cast material qualification and impurity specifications and investigations of aged Canned Sub-Assemblies (CSAs) to underpin LEP and production modernization efforts for newly manufactured and reused secondary components. • Increase supports development of low cost case dynamic LED experiments and model validation needed to qualify new case materials and production processes. • Increase supports HED platform development, modeling, and analysis to inform LEP design options and increase confidence in the assessment of stockpile secondaries. • Increase supports studies of non-stockpile designs and off-nominal performance studies anticipating LEP and Stockpile Responsiveness needs.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	compare measurements between Z and NIF at similar conditions to assess any systematic errors due to platform complexity. • Deliver advanced warm x-ray sources for survivability assessments and validation and streamlining of outputs calculation capabilities to inform programmatic decisions on stockpile, LEP, and modernization efforts.	

Assessment Science
Enhanced Capabilities for Subcritical Experiments

Description
The stockpile is inherently moving away from the nuclear explosive test database through aggregate influences of aging, modern manufacturing techniques, modern materials, and evolving design philosophies. In 2014, the national laboratories LANL and LLNL jointly identified that a capability gap exists to enable certification of these changes, which involves the evaluation of plutonium response. In 2016, the JASON Defense Advisory Group identified the same gap in current U.S. capability to carry out and diagnose such experiments; Enhanced Capabilities for Subcritical Experiments (ECSE) will close this gap. Data from ECSE is required as part of the certification of the W87-1 Modification Program in 2026, as well as future Annual Assessments and LEPs. ECSE delivery in the mid-2020s supports these efforts.

Research has advanced the understanding of plutonium in the early evolution of an imploding system and identified the need to similarly improve understanding of plutonium performance during the extreme physical conditions reached later in an implosion. This improved understanding will inform the evaluation of various components of stockpile transformation and certification of planned LEPs not possible given the current limitations of existing facilities and diagnostic methods. In addition to the physics gap, the national laboratories have identified a gap in experimental capabilities needed to develop the next generation of weapon designers in the absence of nuclear explosive testing. NNSA has validated this gap via the aforementioned 2016 JASON study. To fill these gaps and to support the program plan documented in the Stockpile Stewardship and Management Plan (SSMP), NNSA places a high priority on developing ECSE at the Nevada National Security Site's (NNSS) underground laboratory, the U1a Complex. Other Project Costs (OPCs) for the U1a Complex Enhancements Project are funded from the ECSE subprogram.

The ECSE subprogram consolidates a portfolio of work that includes (1) the Major Item of Equipment (MIE) titled Advanced Sources and Detectors (ASD), (2) a developing reactivity measurement technology named Neutron-Diagnosed Subcritical Experiments (NDSE), and (3) subcritical experiment entombment activities. Though managed by the ECSE subprogram, the construction project 17-D-640, U1a Complex Enhancements Project (UCEP) is funded under Infrastructure and Operations.

ASD, managed under DOE O 413.3B, designs and installs a large radiographic system that will generate the x-ray energies and multi-pulse capability necessary to diagnose late-time dynamics in plutonium implosion experiments. ASD is scheduled to complete by the mid-2020s. NDSE is a measurement concept that NNSA will apply to dynamic plutonium experiments that will measure the negative reactivity of a subcritical assembly. Since neutron multiplication is sensitive to the material properties of fissile material, the data will provide a new constraint on the codes and models used to simulate the performance of nuclear weapon primaries, improving our stockpile assessment capability. Entombment activities provide a disposition area in the U1a Complex for expended subcritical experiments.

As outlined in the NNSA SSMP, NNSA plans long-term investments supporting plutonium science at the NNSS. NNSS is the only site in the United States with the capability to perform experiments combining high explosives and plutonium in significant quantities, a core capability for NNSA's Stockpile Stewardship Program, as per 50 U.S. Code § 2521.

Highlights of the FY 2021 Budget
- On track for a FY 2025 completion of the Advanced Sources and Detectors (ASD) Major Item of Equipment, managed under DOE Order 413.3B acquisition requirements. This timeline will meet W80-4 confirmation experiment and W87-1 program certification requirements.
- Start of subcritical experiment entombment mining at the NNSS U1a Complex.
- Develop the Neutron Diagnosed Subcritical Experiment test bed.

FY 2022 – FY 2025 Key Milestones
- In FY 2021, begin long lead procurements for specialized accelerator equipment.
- In FY 2021, conduct static photofission-driven NDSE experiments using special nuclear material at the DARHT facility.
- In FY 2022, complete testing and characterization of the NDSE neutron source using a deuterium-tritium gas fill in the U1a Complex.
- In FY 2022, approve the performance baseline and start construction of the accelerator.

- In FY 2023, complete mining in the U1a Complex.
- In FY 2023, complete the accelerator injector testing.
- In FY 2024, receive and conduct initial checkout of the detector system for the accelerator.
- In FY 2025, complete construction and approve start of accelerator operations.

FY 2019 Accomplishments

- Designed prototype pulsers to mature injector and accelerator technology to TRL-6
- Designed new accelerator cell to be driven by solid state pulsed power
- Received DOE Order 413.3B project Critical Decision-1 (CD-1) approval for the Advanced Sources and Detectors MIE in preparation for FY 2019 Critical Decision-1 (CD-1) approval.
- Static reactivity measurements of highly-enriched uranium (HEU) test objects demonstrated the ability to measure <0.3% changes in K-effective. This level of precision exceeds the requirement for the first series subcritical experiments that will utilize NDSE.
- Recently acquired photofission R&D results indicate a simultaneous NDSE/radiography measurement is feasible and this conclusion supports the ECSE decision to pursue a NDSE photofission approach in the U1a.100/.104 Test Bed and a stand-alone NDSE system using a Dense Plasma Focus (DPF) neutron source in the U1a.03 Test Bed.
- Requirements documents and conceptual designs were completed for the U1a.03 NDSE neutron source and the U1a.03 Test Bed refurbishment.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Enhanced Capabilities for Subcritical Experiments $145,160,000	**Enhanced Capabilities for Subcritical Experiments $215,579,000**	**Enhanced Capabilities for Subcritical Experiments +$70,419,000**
• Demonstrated solid state pulsed power driving injector and accelerator cells. • Matured design to support the acquisition of Long Lead Procurements (CD-3A; primarily materials and components). • Executed preliminary/final design activities in preparation for CD-2/3 in FY 2021. • Completed fabrication of the U1a.03 NDSE neutron source consisting of a modular pulsed power system, new dense plasma focus (DPF) tube, and an integrated tritium containment system. • Completed the design of the ~9.0 m^2 U1a.03 fission gamma ray detector wall, procure the major components, and begin assembly of the ~175 individual detector "pixel" elements. • Acquired NDSE measurements of a high-K-effective static plutonium object that closely resembles the neutronic properties of a dynamic subcritical experiment.	• Approve ASD CD-3A and execute Long Lead Procurements. • Finalize ASD design and submit baseline documentation for approval (CD-2/3). • Optimize manufacturability of injector and accelerator cells. • Complete testing and characterization of the U1a.03 NDSE neutron source using a deuterium-tritium gas fill. • Complete the U1a.03 Test Bed refurbishment to enable installation of the U1a NDSE apparatus that consists of a DPF neutron source, large area gamma-ray detector, and shielding. • Conduct static photofission-driven NDSE experiments using SNM at the DARHT facility in conjunction with simultaneous radiography.	• Increase addresses cost growth to achieve a FY 2025 completion of the ASD Major Item of Equipment. • Increase supports start of Entombment mining. • Increase supports NDSE test bed development.

Assessment Science
Hydrodynamic and Subcritical Experiment Execution Support

Description
The Hydrodynamic and Subcritical Experiment Execution Support (HSEES) program maintains a robust testing capability to supply critical data to weapon physicists and design engineers, allowing assessment of potential impacts from design changes, material substitutions, or component changes associated with LEPs, Alts, or Mods on weapon performance safety. Experiments are also used to assess the effects of component aging or defects identified during stockpile surveillance activities. The data obtained from these experiments are foundational for the annual assessment process, certification decisions, advancement of nuclear weapon science, refinement of weapon computational models, development of emergency response tools, assessment of foreign and terrorist designs, reducing the risk of technological surprise, and developing the skills and experience of weapon physicists and design engineers.

Costs of the hydrodynamic and subcritical experiments are shared. Individual programs determine the need for a hydrodynamic experiment ("hydros") and are responsible for funding the design, fabrication and assembly of the test device. Hydros are funded by a number of programs, though subcritical experiments are funded through the Primary Assessment Technologies subprogram within Assessment Science. The HSEES subprogram and the individual hydro customers or the SCE subprogram currently share the costs associated with fielding and executing the experiment. HSEES has a strategic goal to grow funding to fully support the fielding and execution of all of these experiments and increase the number conducted annually (to keep up with the increasing demand for data from weapon physicists and design engineers), exercise the vital industrial elements within the complex, simplify budget structures, and streamline funding. Behind the scenes, the HSEES subprogram supports the intricate diagnostics capabilities to diagnose the experiment as well as funding hydro and SCE vessels, specialized steel containers used to confine hazardous experiment byproducts.

Hydros are conducted at LANL and LLNL facilities, and SCEs are conducted at the NNSS. The firing points are supported by a highly trained staff of technical professionals that operate the facilities in a safe and secure manner. New national policy direction and extensive need for data requires ramping up the fielding and execution during the FYNSP. The cost sharing model being implemented will enable programs to focus funding on building hydros without incurring the liabilities of fielding and execution. HSEES will focus on maintaining experimental systems and execution capabilities for fielding hydros and SCEs.

Highlights of the FY 2021 Budget
- Execute hydrodynamic tests in support of LEPs, nuclear weapon stockpile, global security, and experimental science. Ensure the operational capabilities of the NNSA complex firing point facilities and diagnostics in support of certification, surveillance, SFIs, life time extensions and modernization programs, and global security.
- Procure, assemble, and field impulsively loaded vessel in support of integrated weapon experiments hydrodynamic tests.

FY 2022 – FY 2025 Key Milestones
- Execute integrated weapons experiments that include surrogate and special nuclear material supporting LEPs, the nuclear stockpile, global security, and science.
- Improve programmatic equipment at the NNSA firing sites to maximize data return from each experiment.
- Maximize the number of hydrodynamic tests conducted each year to support modernization of the U.S. nuclear weapons stockpile.
- Procure, maintain, and enhance the impulsively-loaded vessel capability that is critical to execute hydrodynamic and subcritical experiments.
- Maximize efficiency of operations at our hydrodynamic test facilities through an improved business model.

FY 2019 Accomplishments
- Fielded & executed over 20 hydros and 1 SCE with corresponding data returns according to the National Hydrotest Plan.
  Highlights include:
  - 1 hydro for LLNL W80 LEP to validate design

- 1 hydro for LLNL W87 Mod to validate design
- 8 hydros for the B61 to address safety in existing stockpile
- 1 hydro for the B61 LEP to validate design
- 3 hydros for the W76 to address system performance
- 1 hydro for Stockpile Responsiveness Program (SRP)/ Advanced Certification and Qualification (ACQ) to demonstrate rapid experimental turnaround
- 1 hydro for high explosive pulsed power
- the Ediza subcritical experiment to address safety
- 2 hydros for global security in support of counter nuclear terrorism
- 2 hydros in support of a W87 Mod downselect

- Completed design of DARHT Firing Point and initiated fabrication of components to increase operational efficiency.
- Established a Hydro & SCE Vessel Engineering group that support hydros and subcritical experiments.
- Prepared for and support execution of initial experiments in the Nimble SCE series to inform material and manufacturing choices relevant to future life extension programs.
- Facilitated the testing and commissioning of new accelerator technologies in support of hydrodynamic and subcritical experiments needs.
- Completed the NNSS Integrated Plan for Experimental Diagnostics.
- Defined diagnostic needs with a 5 year horizon for Hydrodynamic (Hydros) and Sub Critical (SCE) Experiments.
- Completed Sierra Nevada SCE series successfully.
- Prepared for Red Sage SCE series to validate new physics-based models of ejecta.
- Executed hydros at LLNL Site 300 with multi-pulse, modern imaging radiography.
- Scheduled and Budgeted Excalibur experimental series framework.
- Finalized U1a.03 test bed requirements and started mining.
- Established SSDVE Project Baseline.
- Delivered new Broadband Laser Ranging diagnostic that facilitates the transition from legacy electric pin diagnostics to modern optical diagnostics for implosion hydrodynamics.

Hydrodynamic and Subcritical Experiment Execution Support

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Hydrodynamic and Subcritical Experiment Execution Support $116,242,000	**Hydrodynamic and Subcritical Experiment Execution Support $152,845,000**	**Hydrodynamic and Subcritical Experiment Execution Support +$36,603,000**
• Executed hydrodynamic experiments essential to meet requirements for both the W80-4 and W87-1 programs. • Prepared for and support execution of initial experiments in the Nimble SCE series. • Facilitate the testing and commissioning of new accelerator technologies in support of hydrodynamic and subcritical experiments needs. • Executed the FY 2020 National Hydrotest Plan. • Complete fabrication and construction of the DARHT Firing Point Safety & Reliability upgrades concurrent with the DARHT Weather Enclosure. • Prepared requirements for procurements of 3' and 6' vessels to support National Hydrotest Plan and subcritical experiments program schedules. • Completed U1.a.05 test bed configuration, safety basis implementation, and diagnostic readiness to enable Iris confirmatory experiment in Q2 FY 2020. • Finalized designs of vessel hardware and timing and firing systems through support of dynamic tests, including Red Sage Integrated Frag and Overpressure tests. • Assembled Iris confirmatory device at DAF. • Complete Red Sage Test Bed for FY 2020 execution. • Configured Cygnus for low energy X-rays. • Prepare for 3 new SCE Experimental Series Nimble, Great Basin, and Excalibur.	• Execute hydrodynamic experiments essential to meet requirements for both the W80-4 and W87-1 programs. • Prepare for and support execution of initial experiments in the Nimble SCE series to inform material and manufacturing choices relevant to future life extension programs. • Facilitate the testing and commissioning of new accelerator technologies in support of hydrodynamic and subcritical experiments needs. • Procure 3' and 6' vessels required to support and execute NHP and SCE program schedules. • Complete Red Sage Series to validate new physics-based models of ejecta for stockpile stewardship applications. • Conduct dynamic Pu experiments at the DAF to better understand weapons performance. • Prepare for Excalibur SCE series which will be the first user of the Neutron Diagnosed Subcritical Experiments capability. • Maintain/update DSA documentation in support of subcritical experiments.	• Increase supports the integrated weapon experiments hydrodynamic test cadence as well as the impulsively loaded vessel procurements and life cycle. The vessels are long-lead specialized steel structures that are designed for use for multiple experiments to support LEPs, modernization programs, and fundamental science necessary to execute the stockpile stewardship mission.

Overview

The Engineering and Integrated Assessments Program is responsible for ensuring system agnostic survivability in present and future Stockpile-to-Target Sequences (STS) and ensures a responsive nuclear deterrent through collaborative partnerships, proactive integration, and assessments. This program supports four key mission areas: (1) strengthening the science, technology, and engineering base by maturing advanced technologies to improve future weapon systems, (2) providing tools for qualifying weapon components and certifying weapons without nuclear explosive testing, (3) supporting annual stockpile assessments through improved weapons surveillance technologies and warhead component aging assessments, and (4) providing capabilities that accelerate the nuclear weapons acquisition process and strengthen the ability of the United States to respond to unexpected developments that could threaten nuclear security.

Primary responsibilities of this program include:

- Assessing nuclear and non-nuclear components without nuclear explosive testing;
- Providing fundamental, sustained engineering research and development for stockpile assessment and certification throughout the lifecycle of each weapon;
- Providing the ability to predict the response of weapon components and subsystems to aging and normal, abnormal, and hostile environments;
- Advancing components and materials testing processes to minimize destructive effects while ensuring high-level weapon reliability and certification;
- Maintaining the capabilities to assess and evaluate new materials for insertion opportunities into LEPs and major Alts;
- Developing and demonstrating capabilities to shorten design, certification, and manufacturing cycles to minimize time and costs leading to engineering prototype and production, and
- Preserve historical knowledge, records, and data related to U.S. nuclear testing and Stockpile Stewardship efforts and make the archives accessible to the Nuclear Security Enterprise workforce.

The Engineering and Integrated Assessments Program is comprised of seven subprograms:

1. **Archiving and Support** preserves historic knowledge, records, and data related to U.S nuclear testing in an era where nuclear explosive and atmospheric testing is no longer available; provides targeted studies, multi-system assessments, and independent reviews that support the annual assessment of the stockpile; and maintains program management and infrastructure to support research and development R&D capabilities and activities.
2. **Delivery Environments** funds the development and application of experimental and modeling capabilities, diagnostics, and data used to assess and qualify a weapon and its components in normal and abnormal environments.
3. **Weapons Survivability (formerly Nuclear Survivability)** funds tools and technologies to ensure U.S. weapons will penetrate current and future enemy defenses.
4. **Studies and Assessments** funds pre-Phase 1/6.1 assessments, studies, and other activities. This new control point was identified in the *Energy and Water Development and Related Agencies Appropriations Act of 202*0.
5. **Aging and Lifetimes (formerly Enhanced Surveillance)** funds scientific research to understand and mitigate the impacts of aging on materials and components in the stockpile, and develops diagnostics used to assess age-induced impacts on weapon systems.
6. **Stockpile Responsiveness** provides efforts that sustain, enhance, and exercise capabilities required to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons per the 2016 National Defense Authorization Act (section 3112). This effort does not include the actual production or deployment of a stockpile weapon system or engage in the acquisition of nuclear weapons for the US stockpile.
7. **Advanced Certification and Qualification** funds tools and methods to ensure that there is a certification path for stockpile systems and new components in the absence of additional nuclear testing by integrating computing, science, technology, and engineering advancements to facilitate certification of future life extensions and other warhead needs.

Engineering and Integrated Assessments
Archiving and Support

Description

The Archiving and Support program (formerly portions of the Directed Stockpile Work (DSW), Stockpile Services, R&D Support and R&D Certification and Safety programs) is responsible for preserving and maintaining relevant historic records, data, and knowledge related to U.S. nuclear testing and Stockpile Stewardship; providing targeted studies, independent reviews, and multi-system assessments that support the annual assessment process; and maintaining program management and infrastructure needed to support R&D capabilities and activities across the enterprise.

Archiving and Support activities include:

Archiving and Data Management (ADAM) – Preserves knowledge and historic data derived from the nuclear testing era and Stockpile Stewardship. ADAM ensures the continuity of data beyond the lifetime of its native formats, preserves and maintains knowledge gained from direct testing experience, and implements ways to easily access information by scientists and engineers across the Nuclear Security Enterprise.

Assessments and Targeted Studies – Responsible for multi-system studies, assessments, and analyses that support weapon certification and safety processes; physics and chemistry weapon assessments; and independent and cross-laboratory weapon assessments. This program also supports targeted studies – short 1 to 2 year studies that focus on specific gaps or results from an assessment.

R&D Infrastructure Support – Non-warhead specific, programmatic work that provides program management and integration and organizational infrastructure to support research and development capabilities and activities. This includes computer upgrades and software licenses, system and equipment upgrades, and laboratory support at NNSA Headquarters.

Highlights of the FY 2021 Budget

In FY2021, the Archiving and Support program directly supports NNSA's three highest priorities to sustain the nuclear stockpile, recapitalize the infrastructure needed to support the stockpile, and ensure the workforce of the future.

- Ensures knowledge preservation to inform future stewardship activities:
  - Continues digitization of large holdings at LANL, LLNL, SNL, and NNSS.
  - Collects and catalogs metadata on weapons-related documents and films.
  - Continues efforts to accelerate digitization of paper, films, microfilm, microfiche, aperture cards, and other media.
  - Maintains the US Geological Survey (USGS) Core Library and Data Center.
  - Funds the Nuclear Testing Archives at Nevada and the National Security Research Center (NSRC) at Los Alamos.
- Enables the Cycle 26 Annual Assessment for the nuclear stockpile:
  - Performs radiochemistry efforts for data analysis, full system modeling, engineering baseline analysis, and high explosive and special nuclear material physics studies.
  - Supports targeted stockpile studies and weapon-program agnostic research and development activities.
  - Performs the Independent Nuclear Weapons Assessment Program (INWAP) for Cycle 26 (2021).
- Supports the R&D infrastructure:
  - Funds computer upgrades and software licenses.
  - Maintains seismic monitoring stations used to monitor and record seismic measurements of experimental explosions and subcritical experiments and provides verification monitoring data for the Comprehensive Test Ban Treaty.
  - Upgrades and purchases new equipment used to digitize unique and critical archives dating back to the Manhattan Project.

FY 2022 – FY 2025 Key Milestones

- Provide support for Annual Assessment and INWAP to assess the current stockpile (annual).
- Complete targeted studies identified during the Annual Assessment reporting process (annual).
- Fund Nuclear Test Heritage activities at Nevada, including the USGS Core Library and Data Center, Seismic monitoring stations, and minimal risk reduction activities for test readiness (annual).

- Accelerate archiving and digitization efforts across the enterprise to ensure the data is available for certification and sustainment of the current stockpile and to train future stockpile stewards (annual).
- Maintain compliance with the Federal Facility Agreement and Consent Order (FFACO), a collaboration between the State of Nevada, DOE/NNSA, and the DOD to identify sites of potential historic contamination and implement corrective actions based on public health and environmental concerns (annual).
- Begins investment in machine learning and artificial intelligence for automating metadata collection and cataloging to ensure archived records are searchable (long term).

FY 2019 Accomplishments

- Completed a survey of media holdings at LANL, LLNL, SNL, and NNSS.
- Established the National Security Research Center (NSRC) at Los Alamos, housing 75+ years of nuclear weapons research, designs, procedures, videos, photos, and other reports.
- Deployed the Online Vault classified archive system and scanned, catalogued, and added over 3,000 new archives.
- Resumed scanning for the Film Analysis Project at Livermore; continued yield re-analyses and fallout work and outputs are being used to validate code results.
- Moved the GABBS PINEX module from NNSS to LLNL.
- Completed the Qualification Alternatives for the Sandia Pulse Reactor (QASPR) archiving project; verified that data has been successfully stored and is useable for future qualification and investigation activities.
- Purchased new classified and unclassified computers and scanning/digitization equipment (including film scanners, book scanners, microfilm scanners, microfiche scanners, aperture card scanners, etc.); implemented new scanning, quality control, material movement, and destruction processes.
- Maintained the Nuclear Testing Archives at Nevada which preserves, collects, and consolidates historic documents, records, and data dealing with the U.S. Nuclear Testing Program.
- Maintained the US Geological Survey (USGS) Core Library and Data Center, which stores and archives all samples involving drilling and past nuclear explosive testing.
- Monitored and recorded seismic measurements of experimental explosions and subcritical experiments; provided verification monitoring data for the Comprehensive Test Ban Treaty; and, recorded data from all natural seismic events.
- Completed FY 2019 Independent Nuclear Weapon Assessment Program (INWAP) studies and reported findings to the appropriate Laboratory Directors.
- Completed significant progress toward unified baseline model framework which supported development of non-LANL system baselines for INWAP.
- Enhanced Chamber 15 War Reserve test fire capability to be operational in all weather conditions; test fired detonators for multiple systems.
- Implemented new measurements on historic radiochemical samples to augment existing data; this was used to investigate historic anomalies and improve and expand constraints for models.
- Used full system modeling to update understanding of system interactions.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Archiving and Support $46,940,000	**Archiving and Support $45,760,000**	**Archiving and Support -$1,180,000**
• Supported Cycle 25 Annual Assessment activities and complete all planned Cycle 25 INWAP activities. • Continued ongoing archiving activities of historic nuclear test records and metadata collection. • Radiochemical Measurements of Archival Samples: joint LLNL-LANL comparison of new 'extinct' isotope technology. Continues work supported in FY 2019 and leverages new investments in radiochemistry infrastructure. • Applied the Engineering Analysis Baseline Model (EABM) to various weapons systems and develop scripts to facilitate conversion from other model formats to the EABM format. • Stockpile studies that improve physical models for assessments and improve modeling methods. • Stockpile studies that improve physical models for assessments and improve modeling methods. • Captured legacy test data in GRANTA. Add data capture to new tests and experiments. • Supported development of physics baseline common model framework. • Advanced assessment models and constraints, including full system models; improved safety assessments; aging assessments; higher fidelity models; improved radiochemical constraints, and improved prompt data constraints.	• Support Cycle 26 Annual Assessment activities; complete all planned Cycle 26 INWAP activities. • Perform targeted studies identified in the Cycle 25 annual assessment for the nuclear stockpile. • Continue to permanently archive critical weapons information to ensure it is available to future stockpile stewards. • Activities such as those listed below are key elements of this effort. o Continue acceleration and uploading of records into GRANTA. o Continue ongoing support of Engineering Analysis Baseline Models. o Continue film digitization efforts at LLNL. o Begin preliminary investments in artificial intelligence and machine learning. o Support ongoing digitization of paper, film, microfiche, microfilm, aperture cards, and other media. o Collect and catalog metadata. o Fund the USGS Core Library and Data Center and seismic monitoring stations. o Continue support for the Nuclear Testing Archives at Nevada and the National Security Research Center (NSRC) at Los Alamos. o Provide librarians at LANL and LLNL. o Fund computer licensing and equipment upgrades; purchase high end scanners and digitization equipment. o Provide M&O detail support at headquarters.	• Decrease reflects the transition of Mountain Peaks Firing System work and associated funding to the Hydrodynamic and Subcritical Experiments Execution Support Program. • Archiving and Support is paramount to preserving nuclear explosive test data still being used to certify and sustain the nuclear weapons stockpile and train the workforce of the future. The FY 2021 budget request will continue to digitize, store, and make searchable one-of-a-kind, high-priority test data that is rapidly deteriorating due to aging and will also ensure the successful completion of the Cycle 26 Annual Assessment for the nuclear stockpile.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Revitalized radiochemical analyses of historical core samples by analyzing archival test cores to generate new data to support LEPs and Annual Assessment. • Supported the Test Capability Assessment - a framework and process to facilitate agile management of weapons test capabilities focused on stockpile demands. • Continued support of the U.S. Geological Survey, Seismic monitoring, risk reduction, and maintain compliance with FFACO. • Engineering Support/IT/Personnel: Supported infrastructure and IT costs such as IT procurements, vault support, training, etc. • Licenses for PDMLink, GRANTA, and ABACUS.		

Engineering and Integrated Assessments
Delivery Environments

Description
The Delivery Environments program is responsible for ensuring weapon systems and related platforms survive current and future STSs in *normal* and *abnormal* environments. Future delivery systems and platforms will also be characterized by STSs different from those for the present stockpile. The Delivery Environments program is a cornerstone in reproducing weapon-relevant environments, as well as developing the necessary tools (e.g., models and simulations, diagnostics, experiments) to elucidate and quantitatively assess the performance of delivery systems in mission environments.

Delivery Environments activities include:
Mission Flight – Design, analyze, and engineer delivery systems to meet performance requirements during current and future Stockpile-to-Target Sequence. Select examples include the modeling and testing of shock, vibration, thermal stresses, pressure strains, adverse and normal effects, the combination of these environments with hostile or abnormal environments, and the effects of these phenomena on nuclear and non-nuclear weapon components and systems. This program works closely with the Weapons Survivability and Stockpile Responsiveness Programs, as well as with the Advanced Simulation and Computing (ASC) Program to ensure informed decisions, prioritization, and resource optimization.

Abnormal Environments – Assess the survivability and effectiveness of a weapon system following accidents or unexpected adverse events that could impact performance. Select examples include drops during the handling and/or mounting of a weapon, crash and burn, bunker fires, aircraft crashes, and fuel fires. This program collaborates with the ASC Program to ensure experiments and predictive capabilities are jointly developed.

Current and Future Stockpile Components – In addition to considering future systems, this effort also focuses on qualified stockpile components and investigates the application of said components for future Stockpile-to-Target Sequence and related survivability requirements.

Highlights of the FY 2021 Budget Request
- Develop two prototypes for future delivery platforms and conduct preliminary tests on quantifying survivability capability gaps with respect to future STS-driven requirements.
- Ensure confidence in future STS survivability by executing joint milestones to survey current experimental and computation tools, and initiating a joint DOE/DoD roadmap to plan future capability investments. Engineer combined environment (i.e., combinations of normal, hostile, abnormal environments) weapon components and systems to meet emerging environmental challenges informed by the Department of Defense.
- Advance planned activities and collaborations with the Weapons Survivability and Stockpile Responsiveness Program to meet the FY 2023 SCDS Reentry Pegpost.

FY 2022 – FY 2025 Key Milestones
- Successfully complete the FY 2023 SCDS Reentry Pegpost to prepare for future threat mitigation.
- Advance the two preliminary prototypes and make preparations to conduct a sled test to replicate realistic impact environments encountered during mission flights.
- Advance emerging threat and mitigation analyses and quantify capability gaps between current and future systems, and make comparisons with adversarial defenses.
- Mature combined environment capabilities (e.g., experiments, modeling, simulation, diagnostics) to meet future DoD requirements and provide higher confidence in safety assessments.

FY 2019 Accomplishments
- Successfully completed the joint DoD/NNSA studies on delivery and threat environments, an FY 2019 Getting the Job Done List deliverable for Defense Programs.
- Led the spring and fall Interagency Threat Environments Meetings at Hill Air Force Base and at the Los Alamos National Laboratory to ensure integrated interagency collaborations.
- Conducted a preliminary test related to combined environments. This test combined acceleration, spin, and vibration on non-nuclear weapon components related to the W87 Alt Fuse program.

- Completed early-stage assessments from fluid-structure interaction measurements relevant to re-entry environments.
- Executed uncertainty quantification and performed proof-of-concept tests in hypersonic wind tunnel.
- Completed first stage multi-system / multi-platform scrimmage studies and reentry computational predictive methods supporting prioritization of future delivery platform options.
- Quantified the damage and failure of high explosives at the crystal-binder length scale using a micro-digital correlation diagnostic; this work increases the fidelity of mock high explosives.
- Finalized first stage reentry computational predictive methods for future platforms and environments in preparation for Stage 2 validation.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Delivery Environments $35,945,000	**Delivery Environments $39,235,000**	**Delivery Environments +$3,290,000**
• Conducted ground, flight, and predictive tests for future weapon platforms and environments. • Formulated PBX 9502 mock explosives and reproduce future weapon environment responses. • Predicted integrated flight characteristics corresponding to future delivery platforms and environments. • Validated insensitive high-explosive failures under varying pressures and temperatures for future Stockpile-to-Target Sequences. • Improved requirements for next-generation flight vehicles through studies on trajectory and vehicle design concepts, inertial navigation, and sensors. • Performed a combined acceleration, vibration, and spin test at realistic environmental levels on a complete reentry system. • Developed experimental techniques and diagnostics for characterizing the mechanical performance of materials in relevant abnormal environments. • Measured hypersonic wakes and their relation to laminar-to-turbulent transitions.	• In FY 2021, Delivery Environments will focus on providing engineering options for the future weapons systems essential to understanding future weapon system performance in normal and abnormal environments, with some of this work impacting the W87-1 and W80-4. • Advances in understanding behavior in combined environments will give higher confidence in safety assessment of behavior in abnormal environments. • Continue two prototypes for future delivery platforms and conduct preliminary tests on future survivability requirements. • Develop joint roadmap with Department of Defense branches for future Stockpile-to-Target Sequence environment requirements. • Complete the joint Delivery Environments/Stockpile Responsiveness Program sled tests supporting future delivery platforms (LLNL & SNL CA partnership). • Integrate flight trajectory results from current mod/sim tests with engineering of future delivery prototype (LANL & SNL NM partnership). • Establish combined environment (i.e., any combination of normal, hostile, abnormal environments) engineering foundation to meet emerging environmental challenges informed by DoD. • Maintain and develop diagnostics for future Stockpile-to-Target Sequence measurements, analyses, and quantitative capability gaps.	• This increase will fully support the FY 2023 SCDS Reentry Pegpost and provide the engineering foundation to meet emerging environmental challenges in combined environments. This will be a significant improvement over current analytical capabilities and will give higher confidence in weapon behavior in abnormal environments.

Description

Weapons Survivability provides the tools and technologies necessary for ensuring that U.S. nuclear weapons will penetrate enemy defenses. Since weapons entering the stockpile are expected to be fielded for decades, Weapons Survivability includes projections for the evolution of defensive technologies.

Weapons Survivability scope includes: (1) developing scientific and engineering models for understanding radiation effects, (2) improving laboratory radiation sources and diagnostics to support code validation and hardware qualification experiments, (3) generating experimental data to validate scientific and engineering models, (4) understanding radiation-hardened design strategies, and (5) evaluating candidate and evolving stockpile technologies for radiation hardness capabilities in a generalized, weapon-relevant configuration.

Weapons Survivability activities include:

System-Generated Electro-Magnetic Pulse (SGEMP) and Electro-Magnetic Pulse (EMP) effects – Several electromagnetic (EM) effects driven by x-rays and high power EM sources can induce detrimental responses to nuclear and non-nuclear electrical components of the warhead. A particular environment of concern is System Generated Electro-Magnetic Pulse (SGEMP), whereby x-rays with sufficient energy to penetrate and interact with component materials inside the weapon produce energetic electrons generating large electromagnetic pulses internal to the weapon. Related environments can drive responses on system cables and local components (e.g., Cable Electro-Magnetic Pulse (EMP)) and on circuit boards (e.g., Box Internal EMP). Understanding SGEMP and its various counterparts requires knowledge of physical phenomena, including radiation transport across complex material interfaces; induced photo-driven charge emission; radiation-induced conductivity in solids, foams, and gases; time-dependent dielectric breakdown phenomena; and EM coupling through plasmas. Importantly, the responses are highly dependent on the temporal and spectral content of the x-ray drive, the properties of the materials undergoing irradiation, and the coupling between multi-material multi-component subsystems.

Related to this is the production of EMP environments driven in the atmosphere (e.g., Source Region Electro-Magnetic Pulse (SREMP)), whereby x-rays and high energy gamma rays dissociate the atmosphere, produce conductivity, and correspondingly drive currents and high frequency electromagnetic pulses. These environments can induce detrimental responses inside the weapon, depending on the Reentry Vehicle's (RV) / Reentry Body's (RB) shielding effectiveness. Future threats will also include high-power EM sources that must be considered for radiation regimes equivalent or greater than a Giga-Hertz (GHz frequencies).

Presently, there are limited high-fidelity experimental and test environments for driving relevant SGEMP, Cable EMP, Box Internal EMP, and other component EMP responses. Current and planned capabilities utilizing the Saturn and High-Energy Radiation Megavolt Electron Source III (HERMES III) Accelerators, the National Ignition Facility (NIF), and the Z Machine cannot adequately support component, subsystem, or system level testing for many of the xEMP effects, particularly those driven by x-rays. In the absence of suitable testing capabilities (e.g., adequate fluence, spectrum, volume, time history, etc.), this area has a strong focus on developing experimental platforms for physics discovery and code validation in order to support computational capabilities that enable the qualification of components for x-ray driven EM effects while advancing present phenomena understanding for future applications. In addition, this effort develops the platforms and diagnostics for test and evaluation where we are able to create relevant high-fidelity (real or surrogate) environments.

Effects of X-Rays and Air Blast on Materials – Work in this effort includes all activities related to material and structural responses driven by x-rays and air blast. This effort is relevant to study of both exo-atmospheric nuclear burst encounters as well as endo-atmospheric encounters. Structural effects and response from exposure to air blast can become significant for the terminal phase of flight.

Limited high-fidelity testing capabilities exist for analyzing and assessing these effects; for example, radiation testing is limited to small objects over a restricted range of photon energy. Mechanical surrogates are used in many cases for system level qualification for both cold x-rays and air blast. Hence, validated modeling and simulation capabilities are vital to understanding these effects and validating the efficacy of the surrogate platforms. Select activities include direct testing of materials and components at radiation generating facilities, development of diagnostics and platforms to increase the

applicability of these facilities, development of surrogate testing capabilities (e.g., explosive drives, intense particle beams or optical (intense laser) light), and development and validation of modeling and simulation capabilities based on modern codes.

Neutron Effects – Neutron radiation from nearby nuclear bursts has the potential to cause damage to various warhead components. For endo-atmospheric engagements, neutrons can be effective at ranges that are large relative to the effective ranges of other radiation. Assessing the effects of neutron exposure to warhead components requires understanding these interactions over a significant range of energies and pulse shapes. Importantly, exo-atmospheric engagements requires knowledge of high energy (14 MeV) neutron effect. Fortunately, many neutron effects lend themselves to testing in facilities such as pulsed reactors, ion accelerators, and fusion sources.

Work in this effort includes direct testing of materials and components along with developing corresponding modeling and simulation tools. Specific activities include: modeling and experiments to investigate fission heating, modeling to quantify the initiation response to external neutron fields, experiments and modeling to investigate displacement damage in semiconductors and other electronic effects, obtaining calibration data for neutron radiation aware micro-electronics models, facility and diagnostic development, material aging effects on neutron environment survivability development, and validation of modeling and simulation capability based on modern codes.

High Energy Photon Effects – The High Energy Photon Effects effort primarily focuses on the study of energy (dose) and power (dose rate) deposition in material, of high-energy (i.e., > 1 MeV) photons. High energy photons can penetrate deep into the interior of a weapon and cause disruptions, error readouts, and burnout of critical electronics. The scope of this effort encompasses electrical component response to dose-rate effects, single electron effects, high energy photon transport in materials, radiation hardened micro-electronics design, and the study of long lifetime Intrinsic Radiation (INRAD) effects found within the warhead. The latter (INRAD) activity is primarily focused on the development of capability to assess the aging and lifetime of critical components exposed to INRAD.

Weapon Outputs – A robust survivability capability relies upon the understanding and analyses of foreign weapon threats and their outputs. Until recently, legacy tools were validated with nuclear explosive test data. These legacy tools are reaching the end of their lives, and this effort supports the process for modernizing and improving those legacy tools and methodologies. Improved physics fidelity and hydrodynamics over longer simulation times is a cornerstone of this development. Validation of these new tools is necessary and will be done with a combination of legacy nuclear test data and aboveground experiments. This is coupled with higher fidelity diagnostics to enhance the calculated uncertainties associated with weapon output modeling. Further, the propagation and quantification of uncertainties is paramount to our ability to understand margins and provide certification assurances for survivability analysis – a robust understanding of survivability margins cannot be achieved without uncertainty quantification imbedded within the hostile threat characterization. This effort focuses on establishing a more comprehensive understanding of the required modeling fidelity based on understanding of weapon output uncertainty propagation in the mechanical and electrical response of components and systems, more transparent and functional databases, and improved visualization software.

Integrated Assessments – Legacy survivability analyses have generally been performed by separating and addressing individual effects, one at a time. As computational tools, diagnostics, and technology insertion have become more flexible and robust, integrated assessments are now possible.

This effort focuses on the development of experimental facilities and platforms for combined environment testing (e.g., radiation + mechanical, radiation + EMP, etc.), combined effects response discovery and analysis, and analysis of effects at high levels of integration. The major technical element is also focused on supporting the development and validation of modeling and simulation capabilities based on modern codes.

More, data generated with integrated survivability assessments can be utilized to improve understanding of integrated weapon response, electrical response and terminal flight dynamics of US warheads after a hostile or fratricide engagement.

Highlights of the FY 2021 Budget Request

- Execute research and development and qualification capability development shots on high energy denisty (NIF and Z) and radiation environment (Saturn, Hermes, ACRR, etc.) machines and facilities.
- Develop experimental test facilities for future delivery systems, focusing on the relationship between the delivery environment and the response of the nuclear explosive package.
- Begin joint experimental ground tests and computational models to assess combined environments, encompassing normal, abnormal, and hostile environments.
- Investigate non-nuclear survivability options and capabilities with the DoD and the United Kingdom.
- Develop laboratory weapon qualification platforms that reproduce the extreme environments characteristics of hostile nuclear encounters.
- Release validation data on required weapon systems internal and external intrinsic radiation environments.
- Provide experimental tools and advances in simulation capabilities to qualify the behavior of new electronics in radiation environments.

FY 2022 – FY 2025 Key Milestones

- Maintain and extend nuclear environment test capabilities at the Z machine, Hermes, Saturn, Annular Core Research Reactor (ACRR), and the NIF.
- Provide tools and technologies necessary to design and qualify components and subsystems to meet requirements to withstand radiation environments associated with hostile encounters.
- Evaluate performance damage to non-nuclear components and evaluate damage modes to the nuclear explosive package yield.
- Enable Quantification of Margins and Uncertainty (QMU) -based assessments for key survivability failure modes.

FY 2019 Accomplishments

- Completed E-beam experiments at Naval Research Laboratory (NRL) to examine material properties.
- Constructed and brought online a new EMP testing facility and pulsed power plasma system that exceeds previous plasma experiments.
- Provided combined environments engineering solution to physics.
- A method for determination of initiation levels and acceptance functions for the US stockpile has been reestablished and updated with modern computational methods and tools.
- Completed the necessary process to return LLNL Survivability Program testing at ACRR for first time in 35 years.
- Achieved 1x1016 neutron yield at NIF.
- Performed first demonstration of Configuration Transfer between Engineering and Physics.
- Returned to SGEMP and blast testing at LANL.
- Completed relevant program dependencies for the W88 Alt 370 program, including enabling NG X-ray qualification analysis and support, providing fusing and fire set capabilities, and completing reporting on uncertainty quantification analysis for major components.
- Constructed and fielded the ACRR High-G capability for neutron+mechanical combined environment testing.
- Advanced capability for materials research including tools for radiation transport modeling of advanced materials.
- Conducted end-to-end simulation of nuclear explosive test Box IEMP experiment.
- Executed 7 shots in 2 days on NIF for SGEMP Validation experiments.
- Fielded new E-beam source on Saturn for surrogate to warm x-ray environments.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Weapons Survivability $53,932,000	**Weapons Survivability $59,500,000**	**Weapons Survivability +$5,568,000**
• Developed and demonstrate experimental and/or modeling and simulation platforms and processes to assess component response to combined neutron and blast environments, component response to threat-relevant neutron environments, and component and integrated component response to threat-relevant x-ray and gamma environments. • Completed the SCDS FY 2020 Pegpost – baselining the hostile survivability capabilities and gaps across the NNSA Nuclear Security Eneterprise (NSE) and the greater US government. • Research, development, and engineering for x-ray radiation environment testing (Saturn) recapitalization. • Research, development, modeling, and testing to evaluate new strategic radiation-hardened microelectronics. • Development of cold x-ray surrogate test capability. • Enabled QMU-based assessments for key survivability failure modes.	• Continue development and demonstration of experimental and/or modeling and simulation platforms and processes to assess component response to combined neutron and blast environments, component response to threat-relevant neutron environments, and component and integrated component response to threat-relevant x-ray and gamma environments. • Initiate the SCDS FY 2023 Pegpost for Advanced Survivability capability. • Support research, development, and engineering for x-ray radiation environment testing (Saturn) recapitalization. This is a key area where we have an extremely aged and limited capability impacting our ability to ensure U.S. systems will be able to survive adversarial capabilities whose performance has increased over the years. • Continue development of Joint cold x-ray surrogate test capabilities. • Support research, development, testing, and engineering to develop capabilities to assess combined and hostile/normal environments for current and future stockpile systems.	• The increase will support advancement of understanding and mitigation of electromagnetic threats; accelerate assessment of evolving and future adversarial capabilities and associated threat environments, and develop improved understanding of the effects of combined hostile/normal environments on weapon performance and survivability.

Engineering and Integrated Assessments
Studies and Assessments

Description
Studies and Assessments funds all future budget requests for pre-Phase 6.1 assessments, studies, and other activities. This new control level was directed by Congress in the Energy and Water Development and Related Agencies Appropriations Act of 2020 with the purpose of improving oversight and visibility of all pre-Phase 6.1 activities by containing them under a single control level.

Studies and Assessments activities include:
Sea-Launched Cruise Missile Study– Conducts studies and assessments supporting the Sea-Launched Cruise Missile Analysis of Alternatives, cost estimation, schedule development, and impacts to NNSA workload for each option under consideration.

Other Pre-Phase 1/6.1 Activities – Conduct studies and assessments supporting future weapons systems.

Highlights of the FY 2021 Budget Request
- Further Department of Defense (DOD) requirements for this initiative have not yet been defined.

FY 2022 – FY 2025 Key Milestones
- Further DOD requirements for this initiative have not yet been defined.

FY 2019 Accomplishments
- This program was established in the Energy and Water Development and Related Agencies Appropriations Act of 2020 (December 2019); there were no activities in FY 2019.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Studies and Assessments $5,607,000	**Studies and Assessments $0**	**Studies and Assessments -$5,607,000**
• Conducted studies and assessments supporting the Sea-Launched Cruise Missile Analysis of Alternatives, cost estimation, schedule development, and impacts to NNSA workload.	• Further DOD requirements remain undefined and this program is unfunded in the FY 2021 Request.	• Decrease reflects the completion of studies and assessments supporting any new systems development.

Engineering and Integrated Assessments
Aging and Lifetimes

Description
Aging and Lifetimes develops diagnostics and funds the research related to weapon aging needed to ensure that aging will not harm the nuclear weapons stockpile. Aging and Lifetimes contributes to weapon safety, performance, and reliability by providing the tools needed to predict material, component, and subsystem lifetimes, and detect the precursors of potential age-induced defects. These efforts are dedicated to understanding aging phenomena and how they affect weapon lifetime assessments.

The Aging and Lifetimes program provides insight on the chemical compatibility of reused legacy materials and components with new materials introduced to LEPs and modernization programs. In addition to lifetime predictions, new diagnostic tools are being developed and deployed to support conventional surveillance efforts and to provide additional data needed to validate predictive aging models. Aging and Lifetimes enables a more robust stockpile surveillance program with the overarching goal of identifying problems as early as possible in order to minimize their impact on the effectiveness of the deterrent.

Aging and Lifetimes activities include:
Non-Nuclear Components and Materials – Addresses potential aging problems of components and materials and identifies highest risk aging concerns that cross-cut multiple weapon systems.

High Explosives in the NEP – Determines when main charges and boosters need to be replaced based on new predictive methods and non-destructive evaluation tools and examines early detection of potential changes in behavior related to safety, performance, and reliability.

Plutonium for Pits – Develops and delivers new analytical methods, tools, modeling, and diagnostics, including non-destructive evaluation techniques, to achieve timely, less invasive, and more cost-effective component surveillance.

Canned Subassemblies (CSAs) and Cases – Provides material aging models and integrated materials chemistry simulations needed to determine when, or if, CSAs or cases will need to be refurbished or replaced.

Polymers and Adhesives in the NEP – Assesses aging of polymeric materials used throughout the stockpile (i.e., potting materials, cushions, pads, adhesives, structural supports, containment vessels for explosives, and detonator cable assemblies).

Systems – Provides improved confidence in future weapons reliability, safety, and performance by augmenting the existing surveillance program with system-level evaluation diagnostics that include new capabilities to measure component-level parameters during system testing.

Highlights of the FY 2021 Budget Request
- Conduct studies to investigate plutonium aging phenomena and determine impacts from corrosion contributing to assessments on pit lifetime.
- Continue development of advanced imaging systems used to non-destructively detect the precursors of harmful aging effects on weapon components to increase our understanding through surveillance and reduce time and cost.
- Update and publish annual comprehensive aging and lifetime predictions used to assess the lifetime of key weapon components.
- Provide timely warning of aging phenomena that threaten the effectiveness of the nuclear deterrent.
- Conduct high explosive studies examining main charges and boosters to support the production complex and identify R&D needs to focus resources.
- Support and evaluate accelerated aging tests (designed to determine the response of individual materials to anticipated environmental stressors.

- Provide capabilities for accelerated aging and compatibility tests on relevant combinations and permutations of new and re-used materials.

FY 2022 – FY 2025 Key Milestones

- Develop advanced imaging systems for detecting the precursors of harmful weapon aging that provide confidence in component performance and lifetime while reducing the need for destructive testing.
- Provide predictive capabilities for extrapolating the effects of corrosion and other aging phenomena.
- Publish annual stockpile aging and lifetime assessment reports to predict aging issues in essential stockpile components.
- Provide timely warning of aging phenomena that threaten the effectiveness of the nuclear deterrent.

FY 2019 Accomplishments

- Developed new acoustic/vibration diagnostic NDE technique that provides detailed information on timing, aging trends, and performance of strong links and launch accelerometers as confirmed in Lab and HOTSHOT flight tests.
- Completed destructive and non-destructive thermal battery component and materials aging tests and accelerated aging studies of lithium/iron sulfide-chemistry batteries.
- Quantified aging effects of different moisture levels on the degradation of energetic materials in detonators to provide guidance for design specifications on new energetic components.
- Improvements were made to the DRACO code, realized improved speed, robustness, and expanded capabilities in new version for simulation of integrated aging effects in life extension program components central to enabling the integrated predictive modeling of weapon aging.
- Conducted neutron imaging experiments at the Los Alamos Neutron Science Center (LANSCE) to test performance of various scintillators; results were used to improve performance and steer further development.
- Performed a significant number of material aging studies to identify aging signatures in weapons materials with the development of material aging models.
- Received an R&D 100 award for an advanced x-ray scintillator.
- Qualified new production stream for silicone polymers.
- Installed key components of the neutron imaging infrastructure and completed calculations of neutron dose rates within the LLNL facility. This prototype neutron imaging project is approximately 80% complete.
- Completed an aging study by developing process that allows imaging of tritiated specimens under microscope enabling characterization of He-bubble degradation of gas transfer system structure components. Examples of first data on welds/HAZ representative of current stockpile welds that alert end-of-life fracture properties.
- Advanced the Multi-Mass Leak Detector (MMLD) prototype to Technology Readiness level 6, including work performed to enhance software development enabling automation, and evaluation of critical functions within the system.
- Extended the database of aging properties to include age-induced structural effects in a tritium reservoir.
- Successfully demonstrated X-ray Graded Collimation Computed Tomography diagnostic to assess CSAs nondestructively.
- Implemented Spectrally Encoded Imaging (SEI) as a new IHE diagnostic for transition and deployment into the Core Surveillance program.
- Developed diagnostic tool to measure burn rate of CL-20 (energetic material) as a function of age and pressure to characterize and better understand the fundamental aging effects of this material.
- Developed diagnostic techniques to characterize aging of encapsulants and adhesives. Re-engineered formulations of obsolete and proprietary weapon-applied polymers (e.g. potting compound).
- Characterized change of thermosets material properties as a function of chemical and physical aging mechanisms.
- Submitted Labs updated Aging Prediction and Lifetime Estimates (APLE) reports consistent with program Level 2 milestone highlighting most concerning stockpile aging issues or trends and status progress regarding the maturation of modeling/predictive lifetime capabilities.
- Electro refined first plutonium ring - aka "pony shoe" - produced in Superblock after many years of being dormant, to develop a Pu Accelerated Aging library in collaboration with Campaign 2 for the conduct of science experiments outlined in the National Plutonium Aging Strategy.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Aging and Lifetimes $55,000,000	**Aging and Lifetimes $62,260,000**	**Aging and Lifetimes +$7,260,000**
• Updated and publish aging predictions needed for assessing the lifetime of key weapon components. • Investigated aging phenomena to ensure an early warning of any significant impact to the effectiveness of the nuclear deterrant. • Tested the new Graded Collimator design on W88, B61, and W76. • Demonstrate imaging of a mock CSA with improved x-ray scintillator. • Produced a neutron radiograph of an object, using LLNL's prototype neutron imaging system. • Determined if acoustic sensing of thermal battery primers will yield quantifiable age-related degradation indicators for core surveillance needs. • Improved understanding of thermal and irradiation effects on main charge and detonator HE through ongoing studies. • Developed predictions of polymer material behavior. • Identified critical age-related materials performance parameters of encapsulated transformers and develop test methodologies to support the technical basis of a future core surveillance program evaluating reliability. • Examined use of new reservoir materials and subsequent aging phenomena effects on these materials.	• Develop advanced imaging systems for detecting the precursors of harmful weapon aging. • Provide predictive capabilities for extrapolating the effects of corrosion and other aging phenomena. • Promulgate stockpile aging and lifetime assessment reports. • Deploy full-scale Multi-Mass Leak Detector to Production and Core Surveillance to initiate full operations to improve operations at the production plants. • Qualify and deploy new scintillators for CoLOSSIS I and II to improve imaging of aging materials. • Validate acoustic sensor for flight environments to better understand and model component performance. • Update and publish aging and lifetime predictions used to assess the lifetime of key weapon components. • Conduct studies to investigate plutonium aging and determine impacts from corrosion. • Conduct high explosive studies examining main charges and boosters used to detect aging-related changes in behavior. • Support and evaluate improved methods of accelerated aging, particularly for advanced materials such as AM parts. • Investigated aging phenomena to ensure an early warning of any significant impact to the effectiveness of the nuclear deterrant.	• The increase will: o Continue advanced diagnostics development for non-destructive evaluation of weapon components. This will increase confidence in component performance and lifetime while reducing the need for destructive testing. o Conduct high explosive studies to examine main charges and boosters and detect potential changes in behavior due to aging. This will increase confidence in long-term performance of high explosives. • Accelerate studies investigating plutonium aging and impacts from corrosion. This impacts pit lifetime assessments.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Wrapped-up, completed, and/or transferred outstanding projects in preparation for the program shutting down in FY 2021.		

Engineering and Integrated Assessments
Stockpile Responsiveness

Description

The FY 2016 National Defense Authorization Act (NDAA), Section 3112 established a Stockpile Responsiveness Program (SRP) in NNSA, executed in consultation with DoD. The Stockpile Responsiveness Program has developed an initial two future scenarios, aligned with Nuclear Weapons Council (NWC) priorities, to drive a response to representative emerging threats, challenges, and opportunities, and to explore concepts jointly with the DoD including prototyping and flight testing. This program develops and exercises capabilities required to support all phases of the joint nuclear weapons life cycle process, transfer knowledge and skills to the newer generation of nuclear weapon designers and engineers, and strengthen integration between DoD and NNSA. As such, NNSA is not executing this program to work around the established process for nuclear weapons system acquisition. This program explores the art of the possible by using potential responses to future threats to explore the acceleration of design, engineering, testing, production and qualification methodologies that could increase responsiveness of the nuclear weapons complex.

Stockpile Responsiveness activities include:

Analysis of Emerging Threats and Technology Challenges and Opportunities – This effort uses laboratory technical expertise to analyze the consequences of emerging threats, to project technology trends, and to understand the implications for our deterrent on time horizon beyond that of the intelligence community. This effort supports ad hoc technical teams assembled to conduct rapid analyses of issues and scenarios.

Challenge Problems – Significant one-year multi-year multi-lab efforts to exercise integrated nuclear weapons design capabilities against potential future threats. These look at problems beyond the time frame of nuclear weapons acquisition activities to explore design for manufacturability and the certification and qualification challenges presented in such design efforts.

Prototyping, Testing, and Flight Testing – A key activity is exercising design, fabrication and testing capabilities through rapid prototyping and testing. This includes building and testing of non-nuclear prototypes of engineered systems and components, including environmental testing and light tests of non-nuclear prototypes. The program is conducting hydro testing and depending on priorities will conduct appropriate subcritical experiments to explore the certification challenges of potential new designs or configurations.

Acceleration of the Nuclear Weapons Lifecycle Extension Timeline and Reduction of Costs – The highest identified priority for the SRP is to examine alternative approaches to design, manufacturing, certification and qualification to accelerate the timeline for the nuclear weapons lifecycle process and reduce costs. Because the SRP lies expressly outside the acquisition process, it can take risks without impacting planned LEPs or detracting from confidence in the present stockpile. It can demonstrate the potential for alternative processes and materials to deliver nuclear weapons components and systems rapidly.

Highlights of the FY 2021 Budget Request

- Establish collaborative initiatives between Delivery Environments, Stockpile Responsiveness, Advanced Simulation and Computing, and Stockpile Management to address joint endeavors in cohesive, efficient, and informed manners.
- Continue the design competition outlined in the FY 2018 NDAA for a potential future strategic missile warhead exploring different manufacturing approaches and Stockpile-to-Target Sequence (STS) environments compared to today's systems.

FY 2022 – FY 2025 Key Milestones

- Conceptualize, study, develop, and engineer systems and/or operational concepts to offset future geopolitical or technical challenges.
- Identify shortfalls in the design, test, and production processes necessary to bring systems into production.
- Develop scenarios to respond to future threats, challenges, and opportunities.

- Exercise the ability to execute system design options that may have significantly different characteristics and requirements than current stockpile systems.
- Continue ground testing including hydro testing and environmental testing on unique STS environment to address future threats.
- Conduct flight tests on SRP prototypes as priorities and staff availability allow.
- Engage production plants in design for manufacturability exercises and initiate projects that will enable manufacturing agility and responsiveness.

FY 2019 Accomplishments

- Supported the joint Nuclear Posture Review task on Hardened and Deeply Buried Targets Defeat (HDBT) by examining a wide range of design options that could be mated to potential DoD delivery systems.
- Established and executed a governance process under the NWC to provide guidance on DoD priorities for the SRP, to coordinate NNSA and DoD activities, and to authorize DoD elements to participate in SRP activities.
- Completed a survey of design options to address future threats to our deterrent under the design competition.
- Executed experiments to support concept development focusing on responsive timescales including demonstration of the execution of a hydro test from a clean sheet design in about ten months.
- Explored potential new materials and manufacturing capabilities that could shorten the delivery of long lead time components for stockpile systems.
- Contributed to the development of the next generation of leaders by using young and mid-career technical staff to lead design teams and technology development teams. Using young and mid-career individuals exercised processes to work with DoD organizations to explore alternatives to address future challenges to the deterrent.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Stockpile Responsiveness $70,000,000	**Stockpile Responsiveness $70,000,000**	**Stockpile Responsiveness $0**
• Executed challenge problems against future threat scenarios identified jointly with the DoD. • Executed rapid design to hydro test. • Reestablished experimental capability to look at delivery environments for hard and deeply buried targets (HDBT).	• Perform analysis of emerging threats and technological challenges. • Continue design competition activities. • Continue to explore new materials and production techniques. • Complete experimental activities for delivery environment for HDBT defeat. • Explore and develop high potential opportunities to accelerate production of future systems and components. • Incorporate design for manufacturability exercises into challenge problem execution. • Explore opportunities for flight testing prototype hardware of non-nuclear systems and components.	• No change.

Engineering and Integrated Assessments
Advanced Certification and Qualification

Description
Advanced Certification and Qualification (ACQ) develops tools and methods to ensure that there is a certification path for stockpile systems and components in the absence of additional nuclear explosive testing by integrating computing, science, technology, and engineering advancements to facilitate certification of future life extensions and other warhead needs. In particular ACQ has moved from understanding the certification basis for the legacy stockpile to developing certification methodologies for the stockpile as it is evolving including planned LEPs and potential systems that could be needed in the future. Furthermore ACQ is exploring alternative paths to the qualification of components and systems to accelerate the introduction of newly developed technologies into LEP planning. This includes understanding the certification challenges in potential systems identified by the Stockpile Responsiveness Program (SRP) and expanding the certification basis to those systems where appropriate, and exploring the qualification benefits and challenges of modular architectures proposed for LEPs and future stockpile systems.

More specifically, Advanced Certification and Qualification: (1) Develops certification methodologies and integrates new experimental data into common models and assesses any impacts on stockpile performance, (2)develops certification and qualification paths for advanced manufacturing and replacement materials, (3) develops advanced surety solutions and architectures as directed in legislation, and (4) conducts certification readiness exercises in partnership with other programs to explore certification and qualification challenges in technologies that are being developed or demonstrated for future LEPs.

Highlights of the FY 2021 Budget
- Development of certification approaches for systems and components responsive to emerging threats.
- Develop approaches to accelerating and streamlining qualification approaches for new manufacturing methods, materials and components to reduce time and costs to introduce stockpile and to address and manage the inherent technical risk in new approaches.
- Continue a certification readiness exercise to assess the qualification readiness of proposed modular architectures to improve the flexibility and maintainability of stockpile systems and reduce lifecycle costs.
- Execution of hydrodynamic tests to support surety approaches and raise TRL/MRLs.
- Assessing nuclear tests, studies of failure modes, and other advanced methods to facilitate use in certification of upcoming sustainment programs.
- Studies supporting understanding of scaling and surrogacy to support the experimental basis for weapon assessments.
- Experiments supporting product-based certification methods of components made with advanced manufacturing.
- Exercises on the certifiability of reuse, surety, and hardening concepts, as well as concepts incorporating new manufacturing technologies.

FY 2022 – FY 2025 Key Milestones
- Pursue methods to certify additively-manufactured components for stockpile use, pursue advanced methods to enhance surety, and develop methods to assure the certifiability of systems and components to support future stockpile options.
- Explore issues involved in developing qualification processes for new processes and technologies to accelerate their introduction into LEPs.
- Explore the qualification implications (benefits and challenges) in modular architectures proposed to improve the ability to reduce the cycle time for inserting updated components into nuclear weapons systems.

FY 2019 Accomplishments
- Completed a hydro test in support of the Joint Technology Demonstrator (JTD).
- Developed methods for additively-manufactured, structured, high explosives including development of an additively-manufactured plane-wave generator.
- Completed development of diagnostics techniques to improve data collection from subcritical experiments.
- Completed gas-gun experiments in support of advanced surety solutions.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Advanced Certification and Qualification **$57,710,000**	**Advanced Certification and Qualification** **$60,649,000**	**Advanced Certification and Qualification** **+$2,939,000**
• Developed certification approaches for systems and components responsive to emerging threats consistent with the 2018 Nuclear Posture Review. • Coordinated with the W80-4 and W87-1 modification program office and laboratory leads to meet the certification needs of the modernization programs. • Evaluated and update common models for assessment of safety and reliability of present and potential stockpile systems against the latest experimental results, including High-Energy Density (HED) experiments, hydro tests, and subcritical experiments. • Developed qualification methods to qualify new materials to replace legacy materials in nonnuclear components. • Developed new diagnostic capabilities to expand the quality and range of data returned from subcritical experiments. • Developed approaches to accelerating and streamlining qualification approaches for new manufacturing methods, materials and components to reduce time and costs to introduce stockpile and to address and manage the inherent technical risk in new approaches. • Initiated an exercise to assess the qualification readiness of proposed modular architectures to improve the flexibility and maintainability of stockpile systems and reduce lifecycle costs.	• Develop certification approaches for systems and components responsive to emerging threats. • Execute hydrodynamic tests to support surety approaches as well as investigate ways to significantly reduce the cost of hydrodynamic tests. • Assess nuclear tests, studies of failure modes, and other advanced methods to facilitate use in certification of upcoming sustainment programs. • Studies supporting understanding of scaling and surrogacy to support the experimental basis for weapon assessments. • Experiments supporting product-based certification methods of components made with advanced manufacturing. • Exercises on the certifiability of reuse, surety, and hardening concepts, as well as concepts incorporating new manufacturing technologies. • Continue an exercise to assess the qualification readiness of proposed modular architectures to improve the flexibility and maintainability of stockpile systems and reduce lifecycle costs.	• Coordinate with modernization program office and laboratory leads to meet the qualification needs of future modernization programs. This is an area of increased focus with the significant ramp up in the efforts to modernize the production infrastructure. Reconstitution of many old or development of a multitude of new manufacturing processes are needed and the products of those processes will have to be qualified. Close coordination with the production modernization office and incorporation of reduced cost methods of qualification and certification are vital.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Execution of hydrodynamic tests to support surety approaches.		

Stockpile Research, Technology, and Engineering
Inertial Confinement Fusion

Overview

The Inertial Confinement Fusion (ICF) Program provides the nation's expertise and capabilities in high energy density (HED) science, a core technical competency of the NNSA Stockpile Stewardship Program (SSP). The majority of the energy released from a nuclear weapon is generated by matter in the HED state; therefore understanding the behavior of matter in the HED regime is critical to predicting the performance of nuclear weapons and understanding both primary and secondary nuclear weapon physics. The ICF program enables the study of this regime through (1) the design and execution of complex experiments to improve our underpinning science understanding, (2) the development and operation of experimental facilities capable of generating HED conditions, and (3) the development of instrumentation to assess extreme temperature, pressure, and density regimes relevant to nuclear weapons performance.

As our warheads age and eventually proceed through their LEP process, new materials and components are used and must be qualified and accepted. ICF supports the assessment of legacy stockpile systems, and the qualification and certification of the LEPs by providing access to data necessary to validate the physics models upon which our integrated simulation capability is built. Further, the development of diagnostics in this program also supports test readiness through both workforce (recruitment and training) and instrument development.

The capabilities provided by the ICF Program for Stockpile Stewardship include experimental diagnostics, computational models, national HED facilities, experimental platforms, and target engineering and production. Achieving the extreme conditions of HED experiments is only possible at facilities specifically designed to create such environments. The three national HED facilities are the National Ignition Facility (NIF) at LLNL, the Z Pulsed Power Facility (Z) at SNL, and the Omega Laser Facility (Omega) at the University of Rochester's Laboratory for Laser Energetics (LLE). Outside of nuclear explosive testing, these national facilities provide the only platforms that can be used to experimentally validate the simulation codes that couple transport processes with hydrodynamics models. These HED platforms also provide a vital capability for the study of radiation effects sciences used to determine weapon survivability in hostile environments.

The ICF Program also supports long-term stockpile research and development (R&D) efforts in HED and Ignition science for SSP applications, with a goal of developing a self-sustained, thermonuclear, burning plasma (i.e., ignition) platform, as well as ignition-generated fusion yields. Such a platform represents the next-generation of scientific capability to provide direct access to weapon-relevant regimes and nuclear environments for the study of high-yield, weapon-relevant conditions. The achievement of laboratory-scale thermonuclear ignition is one objective of the SSP and is a complex scientific problem that tests our codes, our people, our facilities, and our integrated capabilities. Its pursuit, and the subsequent generation of high fusion yields, not only opens the door to addressing an expanded suite of weapons-relevant questions without nuclear explosive testing, but also places the program at the leading edge of science and technology in the field of HED science. In 2020, NNSA will complete a review of the ICF program to determine (1) the efficacy of ignition at NIF and (2) the scientific credibility of scaling arguments for all ignition approaches. In parallel, the JASON panel will also assess the role of ICF within the SSP.

To accomplish its missions, the ICF Program coordinates closely with several other elements within the Stockpile Research, Technology, and Engineering (SRT&E) program and routinely interacts with external partners to collaborate on experiments in the interest of national security. Priorities and requirements for these programs are documented in the Stockpile Stewardship and Management Plan (SSMP) and captured in the SCDS.

Activities conducted by the ICF Program to advance our understanding of HED stockpile science include:

- Investigating material behaviors in HED regimes presently inaccessible via other experimental techniques;
- Improving the predictive capability of our science and engineering models in high-pressure, high-energy, high-density regimes;
- Developing high-fidelity diagnostics, advanced experimental platforms, and predictive capabilities and simulations;
- Characterizing and understanding perturbations prevalent in plasmas and thermonuclear environments;

- Maintaining the scientific leadership necessary to recruit, train, and retain the highest caliber scientists and engineers to engage in stockpile stewardship; and
- Making progress towards the achievement and application of multi-megajoule fusion yields.

The FY 2021 Request supports continued research and operations at NNSA's preeminent HED facilities, with research efforts focused on maturing HED stockpile science concepts and platforms in support of the broader NNSA portfolio and on advancing ignition science in keeping with the findings of internal and external FY2020 reviews. Emphasis on improving operational efficiencies at the NIF, Z, and Omega will continue.

The Inertial Confinement Fusion Program is comprised of three subprograms:

1. **HED and Ignition Science for Stockpile Applications** develops and matures the tools necessary to investigate dynamic material properties, fluid and plasma hydrodynamics, low-energy nuclear physics, hydrodynamic instability-induced mix, burn, boost, radiation transport and opacities, and yield applications relevant to outputs, environments, and effects.
2. **ICF Diagnostics and Instrumentation** conducts the R&D for new specialized technologies necessary to execute and determine the results of HED experiments.
3. **Facility Operations** provides the facilities and services required to ensure the safe and efficient operations of the national HED facilities, including research, design, and engineering.

(Dollars in Thousands)

	LLNL (NIF)	LANL	SNL (Z Facility)	LLE (OMEGA)
Site/Facility				
Research	49,000	10,525	10,144	25,000
HED & Ignition Science for Stockpile Applications	49,000	10,525	10,144	25,000
Operations	290,346	9,475	55,500	50,000
ICF Diagnostics and Instrumentation	48,346	5,475	6,500	2,000
Facility Operations	242,000	4,000	49,000	48,000
Total Operation and Utilization	**339,346**	**20,000**	**65,644**	**75,000**

Inertial Confinement Fusion
HED and Ignition Science for Stockpile Applications

Description

This subprogram is a combination of the previous subprograms Ignition and Other Stockpile Programs and Pulsed Power ICF in FY 2020, merging HED and ignition science research activity across all of the program's experimental facilities. In the HED state, materials experience pressures greater than one million Earth atmospheres and reach temperatures and densities far exceeding those of normal or condensed matter, generating complicated behaviors predominantly described by plasma physics. This complex and dynamic state dominates energy generation in nuclear weapons, making its study a key component of the SSP. Specifically, the research supported in this subprogram develops and matures the tools necessary to investigate dynamic material properties, fluid and plasma hydrodynamics, low-energy nuclear physics, hydrodynamic instability-induced mix, burn, boost, radiation transport and opacities, and yield applications relevant to outputs, environments, and effects. This subprogram coordinates closely with the Assessment Science program to provide the experimental infrastructure and capabilities required to execute stockpile-relevant experiments at all of the national HED facilities.

This subprogram largely supports R&D to advance experimental platforms to achieve thermonuclear burn onset, ignition, and ultimately multi-megajoule fusion yield in the laboratory. When realized, these provide a set of capabilities critical to the long-term viability of the Stockpile Stewardship Program—particularly, the future qualification of nuclear components and the assessment and certification of nuclear weapons in the full range of relevant HED regimes. The HED and Ignition Science for Stockpile Applications subprogram pursues these capabilities through theory, experiments, modeling, design, and engineering.

A near-term emphasis of this subprogram is to improve understanding of the key physics and engineering features that limit performance of integrated implosion experiments. In 2020, NNSA will complete a review of the ICF program to determine (1) the efficacy of ignition at NIF and (2) the scientific credibility of scaling arguments for all ignition approaches. In parallel, the JASON panel will also assess the role of ICF within the SSP. Beginning in FY 2021, NNSA will begin implementing the findings and recommendations of these reviews, to ensure that the program continues to be aligned with the highest-priority NNSA missions.

The long-term goals of this subprogram include generating necessary yields to conduct nuclear survivability tests and using burning plasma outputs to study previously inaccessible regimes relevant to nuclear weapons in a laboratory setting. The core requirements for this subprogram are described in the FY 2019 SSMP, the SCDS, the 10-year Boost Plan, the Ten-Year HED Strategic Plan, the National Diagnostics Strategy, and the ICF Program Framework.

Activities in Assessment Science, Advanced Simulation and Computing (ASC), Stockpile Management, and other stockpile programs use data and platforms developed in this subprogram's pursuit of thermonuclear ignition to successfully execute their respective SSP responsibilities – as reflected in the SSMP.

Highlights of the FY 2021 Budget Request

- Providing key data that reduces uncertainty in calculations of nuclear weapons performance
- Executing HED experiments that are critical to supporting stockpile needs
- Maturing experimental platforms to support future stockpile needs, including the generation of intense sources of x-rays and neutrons for survivability studies, temperature measurement of stockpile relevant materials at high pressures, and thermonuclear burn experiments to inform understanding of boost
- Obtaining data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes using the Z Facility at SNL and the NIF at LLNL; and
- Begin implementing findings and recommendations of the ICF 2020 and JASON reviews to ensure continued progress toward a burning plasma, ignition platform, and high yield in support of stockpile stewardship.

FY 2022 – FY 2025 Key Milestones

- Develop experimental burn platforms to address weapon physics issues.
- Collaborate with other Science Campaign to execute thermonuclear burn experiments that inform understanding of primary boost.
- Use ignition science experiments as a test bed to advance Uncertainty Quantification (UQ) methodology for Stockpile Stewardship applications.
- Continue to implement recommendations resulting from the ICF 2020 study.
- Establish modern mission requirements for a high fusion yield capability.
- Complete HED program-review to assess investments in high energy density science needed to meet modern mission requirements.
- Review and revise the national strategy towards the achievement of ignition and eventually high-yield.

FY 2019 Accomplishments

- Achieved record 14 MeV neutron yield for a directly driven exploding pusher on NIF, producing the highest sub-nanosecond impulse fluence of neutrons available in the complex. This is being used to test the dynamic response of electronics and materials. Further source development is being pursued in FY 2020 to increase the fluence in new regimes of implosion phase space different than ICF implosions.
- Realized significant progress in the study of NIF ignition physics on several fronts, advancing understanding of degradations in current implosions, developing new machine learning tools to inform interpretation and design of experiments, and fielding the first layered cryogenic implosions with a new design that substantially increases the coupling of laser energy to the target.
- Executed the first Z shot introducing trace tritium into a magneto-inertial magnetic direct drive target; the enhanced diagnostic return enabled by the tritium content provides important understanding of target implosion and stagnation dynamics. This capability opens new potential for tritium-enabled diagnostics of ICF target physics as well as future survivability studies with prompt, 14 MeV neutrons.
- Advanced understanding of the scaling of magnetic direct drive ICF platforms in support of the national 2020 ICF review with a series of successful experiments, theoretical advances, and 3D simulations. This work will provide the foundation for understanding what scale of magnetic direct drive experiment will be necessary to achieve ignition and high yield.
- Achieved a threefold increase in nuclear fusion yield in the direct drive approach to ignition at the Omega Laser Facility using a data-driven statistical approach to target design.
- Produced the first 3-dimensional visualization of a fusion capsule ‘hot spot’ using three neutron imaging lines of sight. Beyond carrying important information on target performance, 3-D imaging techniques will provide important insight across a range of experiments with stockpile applications.

HED and Ignition Science for Stockpile Applications

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
HED and Ignition Science for Stockpile Applications $114,571,000	**HED and Ignition Science for Stockpile Applications $110,825,000**	**HED and Ignition Science for Stockpile Applications -$3,746,000**
• Implemented the Ten-Year HED Strategic Plan to support the requirements of the SSMP, including development of an experimental platform coupled to thermonuclear outputs. • Determined the efficacy of NIF for ignition and credible physics-scaling to multi-megajoule yields for all ignition approaches. • Determined credible physics-scaling to multi-megajoule yields for magnetic direct drive ignition approach.	• Begin implementing the findings and recommendations of internal 2020 and JASON reviews focused on the credible and effective pursuit of an ignition platform in support of stockpile stewardship. • Provide high energy density (HED) capabilities and platforms to reduce uncertainty in calculations of nuclear weapons performance in support of annual assessments, LEPs, and future modernization needs (e.g., W87-1), in keeping with the priorities of the Five-Year Plan for HED Experiments.	• Decrease reflects a rebalance to facility operations in support of high-priority HED stockpile experiments. • Sustains development of new HED experimental platforms, capitalizing on recent progress in developing capabilities and platforms for hostile survivability studies and characterizing material properties at extreme temperatures and pressures. • Continues pursuit of fusion burn and an ignition platform for stockpile stewardship, prioritizing most effective research paths identified in 2020 reviews.

Inertial Confinement Fusion
ICF Diagnostics and Instrumentation

Description
The ICF Diagnostics and Instrumentation subprogram conducts the R&D for new specialized technologies necessary to execute and determine the results of HED experiments. It supports the development of experimental platforms that expand the performance range of the advanced laser- and pulsed-power facilities. The subprogram is responsible for the design and engineering of a complex array of diagnostic and measurement systems, along with associated information technology subsystems to automate data acquisition. This subprogram provides general support for the deployment of technologies for the experimental study of matter under extreme HED conditions to meet programmatic deliverables. The central requirements for this subprogram are presented in the SSMP, the Ten-Year HED Strategic Plan, the National Diagnostics Plan, and the ICF Program Framework.

Diagnostics developed by this subprogram underpin the scientific advances made in support of all HED experimental application areas, including assessment science, nuclear survivability, and the pursuit of high fusion yield. They provide the key link between facility generation of high energy density conditions and the use of experimental data to validate models and resolve weapons physics issues. Improvements in diagnostic performance enable the extraction of essential physics phenomena of interest from complex and dynamic experiments. Recent investments in this subprogram have provided unprecedented experimental fidelity in the HED regime, allowing more, and more useful, information to be gained in each experiment.

Assessment Science, ASC, Stockpile Management, and other stockpile programs are informed by and benefit from the capabilities developed by this subprogram to successfully execute respective SSMP responsibilities.

Highlights of the FY 2021 Budget Request
- Ensuring that required diagnostics are deployed and maintained to effectively support execution of experimental activities by capturing key data that will validate physics codes and reduce uncertainties in assessing nuclear weapons performance;
- Developing and fielding diagnostics to obtain data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes to support annual assessment and life extension activities; and
- Moving forward with the implementation of the National Diagnostic Plan in developing new transformative diagnostics to improve and maximize data collection in order to study physics phenomena relevant to stockpile work.

FY 2022 – FY 2025 Key Milestones
- Research, develop, and deploy diagnostics and their associated analysis packages that can operate in harsh HED environments on NIF, Z, and Omega that are necessary in understanding radiation physics and the behavior of matter in the HED regime that are critical to predicting the performance of nuclear weapons and understanding both primary and secondary nuclear weapon physics.
- Collaborate with France's CEA, deploy high energy, high-spatial-resolution toroidal x-ray imaging system on NIF.
- Execute the National Diagnostics Plan to develop diagnostics that will help acquire unprecedented information related to materials data, complex hydrodynamics, radiation flow and effects, and thermo-nuclear burn physics data.

FY 2019 Accomplishments
- SNL successfully deployed diagnostics at Z to measure temperature on dynamically compressed plutonium in a regime relevant for primary performance.
- LLNL commissioned a suite of nuclear and x-ray measurement capabilities to significantly improve ability to measure and gain new insights into the shape of the assembled fuel and provide rationale for future research directions.
- LLNL deployed a diagnostic that successfully captured the first plutonium equation of state experiment on NIF in a culmination of platform development. This is a significant measurement capability that will allow measurements of plutonium material data at a desired environment condition of interest to inform issues associated with plutonium pit lifetime study.
- LLNL/SNL successfully fielded the Z Line VISAR diagnostic to measure the spatially and temporally resolved motion of

magnetically driven materials in high energy density physics experiments.

- SNL completed deployment of diagnostics to obtain valuable x-ray and neutron data from chamber-confined tritium experiments on Z.
- LANL completed reconfiguration of the crystal spectrometer to improve recording of opacity data quality on NIF.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
ICF Diagnostics and Instrumentation **$75,000,000**	**ICF Diagnostics and Instrumentation** **$67,197,000**	**ICF Diagnostics and Instrumentation** **-$7,803,000**
• Implemented the National Diagnostic Plan. • Develop diagnostics which will be deployed on NIF, Z, and Omega facilities to adequately support HED experimental activities and schedule in support of Stockpile work. • Ensured that diagnostics capture new experimental observables in weapons-relevant regimes to support validation of ASC codes and models. • Continued development of Optical Thomson scattering diagnostics on NIF, and the GCD -3 at NIF. • Initiated two new national diagnostics work associated with the development of a 2D Visar for measuring shock uniformity through materials and high-energy cathodes to measure electron temperature for ICF.	• Implement the National Diagnostic Plan at a slightly reduced level. • Maintain support to stockpile work by prioritizing development and implementation of key diagnostics to ensure that high fidelity data of key physics phenomena at HED facilities can be obtained to support annual assessments and life extension activities: ○ Next-generation fast, efficient, high resolution x-ray detectors, with applications across HED science missions ○ New time-resolved x-ray platforms, to understand the evolution of material structure and strength at high pressure ○ 3-dimensional photon and neutron imaging, to fully reconstruct non-symmetric implosions	• Realize recent investments as key diagnostics near completion • Rebalance toward facility execution of high-priority HED science experiments in support of the stockpile • Continue development and support of cryogenic systems, user optics, laser, and pulsed-power capabilities at all national HED facilities to maintain efficient experimental operations and meet program requirements • Prioritize and align, where appropriate, local diagnostics development work to improve integration and increase leveraging opportunities across the sites.

Inertial Confinement Fusion
Facility Operations

Description
This subprogram provides the facilities and services required to ensure the safe and efficient operations of the national HED facilities, including research, design, and engineering. The Facility Operations subprogram principally supports operational and target fabrication costs for the National Ignition Facility, the Z Pulsed Power Facility, and the Omega Laser Facility. This funding also supports access to the HED facilities for external mission partners including Defense Threat Reduction Agency and the Atomic Weapons Establishment. Additionally, facility user meetings such as the Omega Laser Facility Users Group (OLUG) and the NIF Users Group are supported by this subprogram. These meetings provide a venue for receiving feedback regarding future facility improvements and an opportunity for user-collaborators to exchange ideas and best-practices for use of the facilities. This subprogram also provides funding for a limited number of targeted cooperative agreements with external private-industry and academic partners, facilitating technology transfer out of the laboratories to promote development of potential future staff. The core requirements for this subprogram are described in the Ten Year HED Strategic Plan, the National Diagnostics Plan, and the ICF Program Framework.

Assessment Science, ASC, Stockpile Management, and other stockpile program elements are informed by and benefit from the capabilities developed by this subprogram to successfully execute the NNSA SSMP.

Highlights of the FY 2021 Budget Request
- Providing operational facilities to obtain the key data that reduces uncertainty in calculations of nuclear weapons performance;
- Obtaining data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes using the Z Facility at SNL and the NIF at LLNL;
- Continuing safe and efficient operation of all NNSA-funded national HED facilities in accordance with their Governance Plans;
- Maintain the full spectrum of capability and operational tempo at NIF, Z and Omega to adequately support the HED experimental needs of assessment science, nuclear survivability, and the pursuit of multi-MJ yield.

FY 2022 – FY 2025 Key Milestones
- Maintain safe and efficient facility operations at NIF, Z, and Omega, which work in concert to provide key data in support of activities associated with annual assessments of nuclear weapons, life extension program certification and qualification, SFI resolution, understanding of primary and secondary physics phenomena, and pure HED research, ignition studies.
- Execute experiments at HED facilities to facilitate research and study of physics phenomena associated with thermo-nuclear burn, radiation transport, material and plasma properties, and weapons outputs and survivability.
- Collaborate with other science campaigns to perform experiments that will validate fundamental physics models used in modeling complex hydrodynamics which is critical to predict primary and secondary performance.

FY 2019 Accomplishments
- **High-impact stockpile stewardship experiments:**
  - Z facility successfully executed experiments to measure temperature on dynamically compressed plutonium in a regime relevant for primary performance.
  - NIF facility operations enabled the completion of several high-energy-density science campaigns for stockpile stewardship, including radiation-transport studies in support of the W80-4 LEP and the first plutonium equation of state experiment on NIF, a culmination of platform development that will enable plutonium experiments to inform issues associated with plutonium pit lifetimes.
- **Experiments executed on the NNSA's HED facilities:**
  - NIF Experiments: 385; Z Facility Experiments: 104; Omega Experiments: 2,320.
- **New or improved capabilities developed on HED facilities:**
  - SNL chamber-confined tritium capabilities continue to improve, enabling valuable x-ray and neutron data to be collected.

- LLNL developed a new high-neutron-yield platform for testing the nuclear survivability of systems to intense bursts of 14 MeV neutrons.
- LLE fielded a new tunable "61st" beam that enables high-fidelity studies of laser-plasma interaction physics, on the key science gaps in scaling the direct drive approach to ignition conditions.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Facility Operations $366,937,000	**Facility Operations $376,703,000**	**Facility Operations +$9,766,000**
• Maintained required operational experimental capacity at all of the national HED facilities: NIF, Z, and Omega. • Emphasized experiments in support of the stockpile. • Ensured that stockpile requirements associated with annual assessment and life extension programs are met.	• Maintain safe and efficient operations at all of the national HED facilities: NIF, Z, and Omega. • Emphasize experiments in direct support of the stockpile and implementation of the findings and recommendations of ICF 2020 and JASON reviews.	• Increase supports execution of high-priority HED science experiments in support of the stockpile. • Continues to provide the full spectrum of operational capability and shot rate at NIF, Z, and Omega to meet stockpile stewardship mission requirements

Stockpile Research, Technology, and Engineering
Advanced Simulation and Computing

Overview

The Advanced Simulation and Computing (ASC) program provides high-end simulation capabilities (e.g. modeling codes, computing platforms, and supporting infrastructure) to meet the requirements of the Stockpile Stewardship Program (SSP). Modeling the complexity of nuclear weapons systems is essential to maintaining confidence in the performance of our stockpile without additional nuclear explosive testing. The ASC program provides the weapon codes that provide the integrated assessment capability supporting annual assessment and future sustainment program qualification and certification of the stockpile. ASC is an integral element of the Stewardship Capability Delivery Schedule, as described in the FY 2021 Stockpile Stewardship and Management Plan (SSMP). ASC provides critical capabilities that help inform decision-making related to the sustainment of the nuclear stockpile in support of U.S. national security objectives. The program also coordinates with the NNSA and other Government agencies, including the intelligence community, to support nonproliferation, emergency response, nuclear forensics, and attribution activities.

The ASC computing capabilities are the key integrating mechanism across the nuclear weapons program through the Integrated Design Codes (IDCs), which contain mathematical descriptions of the physical processes of nuclear weapons systems and functions. Combined with weapon-specific data, these IDCs support high-fidelity physical models used to carry out design studies, maintenance analyses, the Annual Assessment Reports, sustainment programs, significant finding investigations (SFIs), and weapons dismantlement activities all without additional nuclear explosive testing. The IDCs currently perform well for general mission-related activities. However, issues such as aging, potential new threats, and new manufacturing techniques require IDCs with enhanced fidelity physical models that use high-performance computing (HPC) resources more effectively. ASC capabilities that support the stockpile stewardship mission were built on the computing technology commercially available for the past two decades. In order to continue to increase computing power, industry has evolved beyond that technology paradigm. ASC must maintain currency with the computing industry to ensure continued validated performance of the high-fidelity physics modeling capabilities required to maintain a credible deterrent and address additional mission needs in non-proliferation, emergency response, nuclear forensics, and attribution programs.

In addition to these capabilities, the ASC Program is advancing several internal initiatives, or special projects, to leverage developing technologies and capabilities to support the sustainment of the nuclear stockpile. The Large-Scale Calculations Initiative (LSCI), currently underway, was initiated to determine the limitations and scaling potential of our current assessment capabilities. The LSCI is assessing what is achievable with current platforms, codes, and qualified personnel and what cannot be achieved with those capabilities. "Large-scale calculations", as defined by this initiative, are impractical to perform on available capacity computing platforms due to size, run length, or a combination of the two. The initiative directs the national security laboratories to look beyond current computing abilities and ask how calculations on this scale will enhance delivery of our mission. The ASC Program has also introduced an Advanced Machine Learning Initiative to expand the use of artificial intelligence or machine learning algorithms to better manage complexity in physics-informed simulations. This initiative can significantly increase efficiency, improve models to better match experimental data, and tighten the integration of multi-scale and multi-dimensional models, while addressing concerns with validation of these techniques and better understand when new errors are introduced. The ASC program aims to drive efficiencies into the manufacturing process through ASC's Production Simulation Initiative (PSI). Efforts such as the Simulation First or "SimFirst" initiative at Kansas City National Security Campus (KCNSC) incorporates physics-based simulation into production operations in order to optimize solutions.

The Advanced Simulation and Computing Program is comprised of six subprograms:

1. **Integrated Codes** produces large-scale, integrated design codes (IDCs) that allow the performance of detailed nuclear weapons assessments without the need for additional nuclear explosive testing.
2. **Physics and Engineering Models** provides the models and databases used in simulations supporting the U.S. stockpile.
3. **Verification and Validation** brings the Integrated Codes and Physics and Engineering Models subprograms of ASC together with the Stockpile Management program to evaluate the capability of IDCs. It also funds the critical skills

needed to apply systematic measurement, documentation, and demonstration of the ability of the models and codes to predict physical behavior.

4. **Advanced Technology Development and Mitigation** addresses the need to build new IDCs that are more aligned with emerging next-generation computing architectures, to engage in co-design ventures with industry to evolve operation systems and other support software, and to work with HPC vendors to deploy technologies that are useful for stockpile stewardship.
5. **Computational Systems and Software Environment** builds integrated, balanced, and scalable computational capabilities, including high-performance computing systems and required computing environment.
6. **Facility Operations and User Support** provides the facilities and user services required to enable nuclear weapons simulations.

Advanced Simulation and Computing
Integrated Codes

Description

Integrated Codes (IC) subprogram produces large-scale, integrated design codes (IDCs) that allow the performance of detailed nuclear weapons assessments without the need for additional nuclear explosive testing. They are the codes used for physics and engineering stockpile assessments to support concept studies, certification, maintenance analyses, LEPs, Alts, SFIs, and weapons dismantlement activities. The IDCs represent a repository of knowledge gained from experiments on NNSA's wide range of facilities, legacy nuclear explosive tests, enhancements made to support the Stockpile Management program, and a variety of other critical national security missions. The codes enable nuclear forensics, foreign assessments, and device disablement techniques related to nuclear counter-terrorism efforts and the study of nuclear weapons behavior in normal, abnormal, and hostile environments, as well as outputs to enable effects estimates.

The IC subprogram also maintains selected legacy codes and is responsible for ancillary tools that support the weapons mission. These specialized codes enable simulation workflow, generate models or information used by the IDCs, and validate the IDCs by comparison with experiments performed at facilities such as the Z pulsed power facility and National Ignition Facility (NIF). In this way, IC integrates activities across all of SRT&E.

Long-term technical goals for the IC subprogram are to provide credible simulation capabilities that cover all the relevant physics and maximize performance on existing and future computing architectures. These goals are achieved through collaborative activities with the Physics and Engineering Models (PEM), Verification and Validation (V&V), and Computational Systems and Software Environment (CSSE) subprograms and experimental programs in SRT&E. The IC subprogram will prepare for the emergence of heterogeneous exascale computing platforms through the advancements achieved by the Advanced Technology Development and Mitigation (ATDM) subprogram.

Highlights of the FY 2021 Budget Request

- Continue to provide weapons code capabilities to the NNSA Nuclear Security Enterprise (NSE) for annual assessments, SFI investigations, LEP qualification and certification, and related nuclear security assessments.
- Initiate porting of current and next-generation integrated design codes to the exascale-system early access hardware.
- Deliver analysis on LSCI phase I activities which will identify system requirements for today's hero-scale simulations and resource requirements for supporting these calculations.

FY 2022 – FY 2025 Key Milestones

- Demonstrate a simulation capability for hostile environments with a goal of completing production capability for hostile environment simulation.
- Enhanced modeling of High Energy Density Physics relevant validation experiments, which will permit training designers and engineers for environments that were traditionally associated with nuclear tests.
- Demonstrate performance portability for select IDCs on ATS-3, Crossroads, in FY 2022, and DSW applications in FY 2023.
- Quantify the value proposition of PSI in production cycle resources for DSW components in FY 2024.
- Demonstrate performance portability for select IDCs on ATS-4, El Capitan, in FY 2025.

FY 2019 Accomplishments

- Advanced nuclear performance assessment codes for boost and secondary performance; safety codes to address multi-point safety issues; and engineering assessment codes for hostile, normal, and abnormal environments.
- Adapted existing codes to new architectures, and migrate current design and safety codes to run efficiently on hybrid computer architectures.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Integrated Codes $127,714,000	**Integrated Codes $137,956,000**	**Integrated Codes +$10,242,000**
• Further developed nuclear performance assessment codes for boost and secondary performance, safety codes to address multi-point safety issues, engineering assessment codes for hostile environments, and engineering assessment codes for normal and abnormal environments. • Adapted existing codes to new architectures. • Migrated current design and safety codes to run efficiently on hybrid computer architectures. • Supported KCNSC in the use of ASC codes and computing resources to solve production manufacturing problems. • Sustained code builds and ports. • Regularly scheduled testing and bug fixes. • Maintained mentoring program for early career staff. • Collaborated with Predictive Science Academic Alliance Program centers on technical topics and staff recruitment.	• Continue development of existing and next generation integrated codes to support nuclear performance assessments for boost and secondary performance, safety to address multi-point safety issues, engineering assessment for hostile environments, and engineering assessment for normal and abnormal environments. • Migrate current design and safety codes to run efficiently on heterogeneous architectures. • Support KCNSC's on-going use of ASC codes and computing resources to solve production manufacturing problems. • Continue with code builds and ports, testing and bug fixes.	• Transition select next-generation integrated codes from ATDM to IC subprogram. • Coordinate with ATDM subprogram to document and archive nascent next-generation integrated codes.

Advanced Simulation and Computing
Physics and Engineering Models

Description
The Physics and Engineering Models (PEM) subprogram provides the models and databases used in simulations supporting the U.S. stockpile. These models and databases describe a wide variety of physical and engineering processes occurring in a nuclear weapon life cycle. The capability to accurately simulate these processes is required for annual assessment; design, qualification, and certification of warheads undergoing sustainment programs; resolution (and in some cases generation) of SFIs; and the development of future stockpile technologies. The PEM subprogram is closely linked to the Assessment Science program within the Office of Defense Programs, Stockpile Research, Technology, and Engineering Program, which provides the experimental data that informs development of new models used in simulation codes.

The PEM subprogram's responsibilities are threefold: 1) To provide mathematical models and databases to represent physical behavior and physical data (for example, Equation of State (EOS), strength parameters, radiation opacities and nuclear cross sections) for use in the IDCs; 2) To collaborate with the IC subprogram to implement these models and data in the IDCs; and 3) To collaborate with the V&V subprogram to ensure the models have been implemented correctly (verified) and have been compared to experimental data (validated).

Highlights of the FY 2021 Budget Request
- Support survivability and hostile environment modeling across current and future HPC systems.

FY 2022 – FY 2025 Key Milestones
- Apply machine learning techniques to discover computationally efficient models for turbulent flow.
- Assess current capabilities and deliver improved capability to assure survivability in hostile environments.
- Provide initial modeling capabilities for aging and manufacturing assessments that capture structure features in new and aged materials.
- Revamp foundational materials modeling infrastructure to fully support and utilize next-generation architectures.
- Develop UQ/machine learning toolkits to enable physics models and holistic data assessments. This encompasses projects by several different subcomponents, such as strength and damage and nuclear data.
- Improve physics models relevant to full range of applications. This includes improved modeling of multi-physics response to combined abnormal environments, expanding current inline opacity capabilities to support modeling certification efforts and hostile environments, and implementing phase aware material models for strength and ejecta.

FY 2019 Accomplishments
- Developed methods to characterize explosives in support of the W80-4 LEP.
- Quantified sensitivity of yield and criticality to a wide range of primary design parameters.
- Developed and deployed new higher-fidelity models to improve predictions of poor-performing nuclear explosive tests and legacy systems in support of FY 2019 milestone on Secondary Performance.
- Concluded the 3rd Sandia Fracture Challenge, with a focus on reliability of additively manufactured metals. The challenge elicited responses from 22 international teams using a variety of computational approaches to link material structure to performance of an additively manufactured component loaded to failure.
- Developed and implemented models of common circuit failure mechanisms to aid in the qualification of commercial off-the-shelf parts and can be used to predict deterioration on performance and ultimate failure of application-specific integrated circuits as a function of aging.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Physics and Engineering Models $69,650,000	**Physics and Engineering Models $77,967,000**	**Physics and Engineering Models +$8,317,000**
• Further developed reactive flow models for high explosive (HE) detonation and burn that capture grain scale material heterogeneity and are computationally efficient. • Developed additional models for complex hydrodynamic processes that are sufficiently predictive to help the design and assessment of various stockpile options. • Further refined models needed for certification on new safety options. • Adapted models for components built by advanced/adaptive manufacturing techniques.	• Revamp and further develop material models and infrastructure to fully support and utilize El Capitan. • Further refinement and improved credibility of predictive models for manufacturing processes, including pre-production and post-production processes. • Develop machine learning toolkits to enable physics models in areas such as strength/damage and nuclear data. • Further refinement of models to enable assessments of future stockpile options • Support production agencies in the use of ASC models to solve production manufacturing problems. • Develop mission-relevant quantum algorithms.	• Improve and transition necessary next-generation modeling efforts from ATDM to PEM subprogram. • Coordinate with ATDM subprogram to document and archive next-generation modeling activities. • Advance quantum simulation capability for NNSA mission need.

Advanced Simulation and Computing
Verification and Validation

Description

The Verification and Validation (V&V) subprogram brings the IC and PEM subprograms and the Stockpile Stewardship Program together to evaluate the capability of IDCs. Verification activities demonstrate that the IDCs and PEM models are correctly solving their respective governing equations. Validation activities ensure that both science codes and IDCs are solving the equations accurately, and that the models themselves are sufficiently precise for the intended application. Together, these subprogram activities provide a technically rigorous, credible, and sensible foundation for computational science and engineering calculations by developing, exercising, and implementing tools that provide confidence in simulations of high-consequence nuclear stockpile problems.

The V&V subprogram funds the critical skills needed to apply systematic measurement, documentation, and demonstration of the ability of the models and codes to predict physical behavior. The V&V subprogram is developing and implementing UQ methodologies as part of the foundation for the QMU process of weapons assessment and certification. The V&V subprogram also drives software engineering practices to improve the quality, robustness, reliability, and maintainability of the codes that evaluate and address the unique complexities of the stockpile. As the stockpile ages, and as weapons designers and engineers with weapon development and test experience leave the NNSA nuclear security enterprise, it has become increasingly important that the codes are verified and validated, so that future generations of designers display high levels of confidence in the use of these foundational tools.

During the planning period, V&V efforts will enhance NNSA's abilities to handle complex safety and engineering issues within the nuclear weapons stockpile. With major modifications to adapt existing codes to future hardware a primary focus of the IC subprogram, and development of new codes a primary focus of the ATDM subprogram, the primary focus for the V&V subprogram will be ensuring the modifications and new codes are subjected to thorough verification and validation methodologies.

The V&V subprogram provides the capabilities to assess the fidelity of the simulation tools in collaboration with the code, model development, and weapon application communities, as follows:

- Comprehensive assessments of new models and code features. The V&V subprogram will provide the tools and methods necessary for evaluation of new PEM models and IDC versions. Where possible, the V&V subprogram will coordinate with the PEM and IC communities to perform these assessments together and provide feedback to PEM and IC on potential improvements or insufficiencies.
- Improved simulation uncertainty treatment. The V&V subprogram will provide the tools and methodologies for estimating the uncertainty in weapon simulation results from the IDCs. Part of the uncertainty estimate will help analysts connect the physical processes in the models to the relevant experimental data.

Highlights of the FY 2021 Budget Request

- Establish the transition of next-generation verification and validation capabilities from research to production within Defense Applications and Modeling portfolio of the ASC program (IC, PEM, V&V, ATDM Codes). This transition will reflect tighter integration with codes and models and access to expanding computational capabilities.

FY 2022 – FY 2025 Key Milestones

- Assessment and comparison of advanced adaptive sampling methodologies to support development of a fully probabilistic UQ methodology that couples both discrepancy and model parameter uncertainty.
- Achieve code verification of the thermo-structural response of a simplified warhead to a hostile neutron assault though code comparisons.
- Exercise ASC codes and linking tools and develop the analytical process used to perform combined hostile analysis to support future weapons certification.
- Develop and demonstrate multiscale electrical UQ/QMU for analysis of digital bus-based communication performance under electrical noise and EM/radiation environments.

FY 2019 Accomplishments

- Completed the assessment of primary performance sensitivity to uncertainties in equation of state and nuclear data.
- Developed and applied a new statistical approach for discrepancy based on a fully Bayesian framework in uncertainty analysis. Applied newly developed methodologies to perform initial quantification of margins and uncertainties assessment of the W87 in support of the FY 2018 Annual Assessment Review process.
- For the first time, used a 3D physics simulation capability to address and successfully close a SFI.
- Performed validation and uncertainty quantification of the surface loading models used to predict re-entry random vibration environments, and applied said models to the W87 and W78 stockpile systems.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Verification and Validation $58,114,000	**Verification and Validation $61,676,000**	**Verification and Validation +$3,562,000**
• Verified improvements in nuclear performance codes. • Verified improvement in safety codes to address multi-point safety issues. • Validated improvements to physics and material models. • Validated improvements in engineering codes for normal, abnormal, and hostile environments. • Developed V&V protocols for algorithms running on hybrid HPC architectures. • Assessed predictive capability as improvements to codes and models, including new nuclear material data, are made available. • Refined the primary and secondary common models. • Implemented quality assurance controls to ensure material and nuclear databases are correctly updated and maintained.	• Continue to verify and validate improvements in nuclear performance and safety codes to address multi-point safety issues. • Validate improvements to physics and material models. • Validate improvements in engineering codes for normal, abnormal, and hostile environments. • Adopt new V&V protocols for algorithms running on heterogeneous HPC architectures. • Advance predictive capability of codes and models. • Improve existing and develop new primary and secondary common models. • Provide training on the use of UQ tools, aided by initial advanced machine learning techniques • Implement quality assurance controls to ensure material and nuclear databases are correctly updated and maintained.	• Develop techniques to support verification and validation of the transitioning ATDM codes and models. • Improve and transition necessary next-generation verification and validation efforts to continue support in methods, assessments, and data archiving.

Advanced Simulation and Computing
Advanced Technology Development and Mitigation

Description

The Advanced Technology Development and Mitigation (ATDM) subprogram includes laboratory code and computer engineering and computer science projects that support long-term simulation and computing goals relevant to both exascale computing and the broad national security missions of the NNSA. This subprogram addresses the need to build new IDCs that are more aligned with emerging technologies, to engage in co-design ventures with industry to evolve operating systems and other support software, and to work with HPC vendors to deploy technologies that are useful for stockpile stewardship.

The ASC capabilities that support the Stockpile Stewardship mission are challenged as HPC technologies evolve to radically different and more complex (many-core or heterogeneous) architectures. The efficiency of the current generation of IDCs is deteriorating as these codes are migrated to the latest HPC platforms, and this trend is expected to continue and accelerate on future platforms unless mitigated. The subprogram must address three major challenges: 1) the radical shift in computer architectures; 2) maintaining current IDCs that took more than a decade to develop and validate; and 3) adapting current capabilities as evolving computer technologies become increasingly disruptive to the broad national security missions of NNSA.

The ATDM subprogram is prioritized to tackle the most critical subset of issues that are occurring during this period of disruptive change in HPC architectures in order to continue the current level of support to the Stockpile Stewardship mission. There are three focus areas for investment. Next-Generation Code Development and Application is focused on long-term investigation of how future code development must address new HPC challenges of massive, heterogeneous parallelism using new programming models and data management techniques developed through co-design of applications and systems with industry. Next-Generation Architecture and Software Development is focused on computing technology research of extreme, heterogeneous architectures, mitigating its impact and advancing its capabilities for ASC simulation codes. Inter-agency Co-Design will leverage NNSA HPC advanced architecture activities and software technologies to address the sponsor agencies' mission needs. Sponsor agencies will also have the opportunity to participate in co-design activities with vendors and academia, in addition to workforce development and training opportunities.

Highlights of the FY 2021 Budget Request

- Transition ATDM research and development (R&D) activities to other ASC sub-programs to address production-use and platform-specific requirements.

FY 2022 – FY 2025 Key Milestones

- Demonstrate next-gen IDC and hostile environment initial capabilities.
- Develop new IDCs for the stockpile missions (one at each laboratory) that will ensure mission continuity on future computing architectures. Lessons learned, developed codes, and code infrastructure will be shared with the IC subprogram when appropriate.
- Develop next-generation codes and computing infrastructure.
- Develop technologies for simulation at scale and transfer those technologies with the CSSE and IC subprograms.
- Complete transition of ATDM activities to the Defense Applications and Modeling and CSSE portions of the ASC Program in FY 2025.

FY 2019 Accomplishments

- Expanded the portfolio of the ATDM subprogram to include new simulation capabilities to evaluate hostile environment response, and to accelerate development of next-generation IDCs, and mission-support software stack.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Advanced Technology Development and Mitigation **$174,825,000**	**Advanced Technology Development and Mitigation** **$40,000,000**	**Advanced Technology Development and Mitigation** **-$134,825,000**
• Sustained development of next-generation programming models and ASC physics & engineering codes. • Developed hostile environment simulation capabilities for next-generation weapons codes. • Initiated new PEM and V&V activities to strengthen the next-generation codes. • Initiated new advanced machine learning and next-generation hardware research activities. • Maintained laboratory and vendor personnel participation in the ASC El Capitan Application Center of Excellence collaboration. • Jointly managed Exascale PathForward projects with DOE Office of Science. • Transitioned Astra system to classified computing service. • Sustained Interagency CoDesign activities with National Cancer Institute and biomedical industry.	• Sustain ASC investment in the DOE Exascale Computing Project for the Application Development and Software Technology focus areas. • Continue Interagency CoDesign activities with National Cancer Institute and biomedical industry. • Coordinate activities associated with transitioning, documenting, and archiving next gen simulation capabilities with IC, PEM, and V&V subprograms.	• Transition mature technologies into the CSSE, V&V, PEM and IC subprograms. • Suspend new development of all next-generation simulations capabilities.

Advanced Simulation and Computing
Computational Systems and Software Environment

Description

The Computational Systems and Software Environment (CSSE) subprogram builds integrated, balanced, and scalable computational capabilities. The complexity and scale of weapons simulations require the ASC Program to lead the mainstream HPC community by investing in and influencing the evolution of computing environments. This subprogram provides the stability to ensure productive system use and protect NNSA's investment in IDCs.

Along with the powerful Commodity Technology (CT) and Advanced Technology (AT) systems that the program fields, the supporting software infrastructure that is deployed on these platforms include many critical components, from system software to input/output (I/O), storage and networking, and post-processing visualization and data analysis tools. CSSE also examines possible future technologies beyond exascale, such as quantum, neuromorphic, and non-complementary metal-oxide-semiconductor (CMOS)-based computing techniques.

The CSSE subprogram provides the computational infrastructure, both hardware and software, necessary to support weapon applications, as follows:

- Design and develop usable computing systems. The CSSE subprogram will design and procure the computer systems required to support stockpile stewardship and broader nuclear security issues. These systems will include test beds for system development, CT systems for most stockpile computing work, and AT systems for large-scale computing requirements and future technology readiness.
- Comprehensive, stable computing and development environments. The CSSE subprogram will also provide the system software and code development environments necessary for code development and simulation using the computing hardware.

Highlights of the FY 2021 Budget

- Support the development of exascale node architecture and associated software and applications, including non-recurring engineering development for the exascale system, ATS-4/El Capitan.
- Transition mature ATDM next-generation computer science capabilities into CSSE's Next-Generation Computing Technology product group.

FY 2022 – FY 2025 Key Milestones

- Accept ATS-3/Crossroads system in FY 2021 and transition it to General Availability in FY 2022.
- Deploy Exascale computing environment in FY 2022.
- Accept ATS-4/El Capitan in FY 2023 and transition it to General Availability in FY 2024.
- Apply advanced machine learning techniques for nuclear weapons complex applications in FY 2024.

FY 2019 Accomplishments

- Deployed ASC Sierra platform at LLNL, with system acceptance in Quarter 4 FY 2018, to address stockpile stewardship issues and to advance predictive science.
- Transitioned the ASC Astra system into classified computing environment.
- Issued the ASC El Capitan system contract award.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Computational Systems and Software Environment $156,828,000	**Computational Systems and Software Environment $237,953,000**	**Computational Systems and Software Environment +$81,125,000**
• Performed ASC application porting and scaling on Sierra system. • Improved tri-lab computing environment consisting of user tools, networks, file system, archival storage, and visualization and data analysis. • Evaluated the suitability of various post-CMOS technologies, such as quantum and neuromorphic computing, to NNSA's national security mission. • Procure additional CTS1+ platform for tri-labs. • Conducted market survey to prepare CTS2 procurement at end of FY 2020. • Operated ASC Sierra system in the classified environment. • Signed contract with selected Crossroads vendor. • Completed ASC El Capitan (ATS-4)'s node architecture design and kicked of Center of Excellence effort. • Negotiated Vanguard 2 contract.	• Deploy ASC Crossroads system at LANL. • Closely co-design with HPE on El Capitan's non-engineering (NRE) activities. • Execute Vanguard 2 contract. • Sign new contract for CTS2 platforms for NNSA tri-labs. • Perform ASC application porting and scaling on Crossroads system. • Prepare tri-lab computing environment for El Capitan. • Deploy new quantum computing testbeds.	• Deploy ASC Crossroads system at LANL. • Execute El Capitan contract. • Execute Vanguard 2 contract. • Execute new contract for CTS2 platforms for tri-labs.

Advanced Simulation and Computing
Facility Operations and User Support

Description

The Facility Operations and User Support (FOUS) subprogram provides the facilities and services required to provide nuclear weapons simulations. Facility Operations includes physical space, power, and other utility infrastructure, and Local Area/Wide Area Networking for local and remote access, as well as system administration, cybersecurity, and operations services for ongoing support. User Support includes computer center hotline and help-desk services, account management, web-based system documentation, system status information tools, user training, trouble-ticketing systems, common computing environment, and application analyst support.

The FOUS subprogram is responsible for management of the computer operations and maintenance, and for system administration and user support. This includes:

- Effective management of computing hardware infrastructure. The FOUS subprogram will provide adequate power, cooling, and integrated facilities to support the computing system hardware, and it will provide the requisite networking and storage infrastructure.
- Responsive system administration, maintenance, and user support. The FOUS subprogram will administer the computational systems, manage the job scheduling capability, and provide responsive support to the user community.

Highlights of the FY 2021 Budget

- Prepare the ASC facilities at the NNSA Laboratories for the next-generation platforms.

FY 2022 – FY 2025 Key Milestones

- Initiate deployment of new CTS2 platforms at NNSA labs in FY2022
- Complete required El-Capitan-related building prep work before system delivery in FY 2023
- Demonstrate a stable, production-level exascale computing environment, including remote computing capabilities in FY 2023.
- Integrate ATS-4/El Capitan into tri-lab production computing environment in FY 2024.

FY 2019 Accomplishments

- Increased ESNet bandwidth to 100 Gb/s
- Deployed CTS-1 Cyclone system into production use
- Completed the 725-E HPC facility at SNL and placed it into production with Astra installed and new infrastructure in place to support installation of the CTS-1+ cluster
- Deployed replacement firewall for the network supporting CT systems
- Developed, deployed, and released Tri-lab Operating System Stack (TOSS) version 3.4

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Facility Operations and User Support $180,718,000	**Facility Operations and User Support $176,462,000**	**Facility Operations and User Support -$4,256,000**
• Decommissioned Sequoia system at LLNL. • Maintained full operation of CTS1 systems. • Deployed a common computing environment for users. • Maintained maximum availability of computer cycles to end users. Implement best practices. • Provided operational support and user help desk for reliable and secure production computing environment. • Prepared for incorporation of next generation architectures. • Deployed file system and archival storage technologies. • Assessed facility for future operations. • Prepared for the installation of next-generation systems, including El Capitan, into the Nuclear Security Enterprise.	• Maintain full operation of CTS1 and CTS1+ systems. • Improve tri-lab common computing environment to include more heterogeneous architectures in the CTS environment. • Maintain maximum availability of computer cycles to end users. • Document and implement new best practices. • Provide operational support for reliable and secure production computing environment. • Prepare for insertion of next-generation architectures (systems and testbeds) • Implement contingency response plans, as necessary. • Improve and deploy the needed file system and archival storage technologies. • Support execution of the LLNL Exascale Computing Facility Modernization project.	• The reduction reflects reduced operational costs by upgrading infrastructure equipment while maintaining high-caliber user support services for NSE users.

Stockpile Research, Technology, and Engineering
Weapon Technology and Manufacturing Maturation

Overview

The Weapon Technology and Manufacturing Maturation program is responsible for developing agile, affordable, assured, and responsive technologies and capabilities for nuclear stockpile sustainment and modernization to enable Defense Programs' mission success and the future success of the nuclear security enterprise.

The core areas of work include:

- **Agile, Assured, and Affordable Technologies**: Develop and modernize stockpile technologies and processes so they are agile, assured, and responsive to change. Shorten design, qualification, certification, and manufacturing cycles and timelines to improve future affordability.
- **Partnership with Stakeholders to Meet Stockpile and Customer Requirements:** Identify, sustain, enhance, integrate, and continually exercise all capabilities, tools, and technologies across the science, engineering, design, certification, and manufacturing cycle working together with the Department of Defense, nuclear security laboratories, nuclear weapon production facilities, and other partners.
- **Qualification and Certification:** With other Defense Programs partners, conduct experiments and simulations to enable qualification and certification without nuclear explosive testing.
- **Skilled Technical Workforce and Enhanced Capabilities:** Maintain a qualified and technical workforce and enhanced capabilities by transferring knowledge, skills, and direct experience with respect to all stockpile technologies and processes.

Primary responsibilities of this program include:

- Developing enhanced technologies that both minimize the probability of unauthorized use and maximize reliability for authorized use;
- Lead technology and system demonstration efforts, with various mission partners, to speed development and improve acceptance of advanced technologies and processes into the stockpile and NSE; and
- Improve agility, effectiveness, safety, and efficiency in the design and manufacture of war reserve components.

The Weapon Technology and Manufacturing Maturation program comprises of three subprograms:

1. **Surety Technologies** creates and matures options, internal and/or external to the warhead, to minimize the potential for deliberate unauthorized use of a U.S. nuclear weapon and maximizing the reliability of authorized use of a U.S. nuclear weapon while maintaining the highest levels of safety.
2. **Weapon Technology Development** funds activities associated with the development, engineering, and integration of technologies that ensure the reliable performance, safety, and handling of current and future stockpile systems. Technology demonstrations and related activities are also covered under this subprogram.
3. **Advanced Manufacturing Development** rapidly develops and deploys advanced manufacturing methodologies and technologies that are responsive to the NNSA mission.

Weapon Technology and Manufacturing Maturation
Surety Technologies

Description
The Surety Technologies program is dedicated to simultaneously minimizing the probability of unauthorized use and maximizing the reliability of authorized use of a U.S. nuclear weapon while maintaining the highest levels of safety. Surety Technologies creates, develops, and matures advanced safety, security, and use-control or denial technologies to minimize the probability of an accidental nuclear explosion and, in the unlikely event that security fails and unauthorized access is gained, reduces the risk of an unauthorized nuclear yield to the lowest possible level.

Surety Technologies seeks advances in leading-edge technologies in two timeframes:

- Maturing near-term surety concepts and technologies to offer the most effective surety solutions for the enduring stockpile and future insertion opportunities achievable within the timelines of known LEPs or other improvements in weapon functionality; and
- Creating and evolving highly advanced surety technologies, independent of specific weapon types or insertion opportunities that can result in major surety improvements.

Surety Technologies incorporates national security guidance as outlined in the Presidential Policy Directive (PPD)–35; Department of Energy Order 452.1D, *Nuclear Explosive and Weapon Surety Program*; the NNSA Defense Programs surety strategy; and the 2010 JASON Surety Study findings and recommendations; in conjunction with the Joint Integrated Lifecycle Surety (JILS) risk assessment capability to identify the most cost-effective surety technologies. This enables program and weapon system managers to make better-informed implementation decisions on stockpile surety improvement options.

Surety Technologies activities include:
Advanced Safety – Minimizes the probability of accidental nuclear yield or dispersion of fissile material. Develops improved control over warhead initiation including improved stronglinks, weaklinks, firing systems, and high explosive initiation systems, in order to provide nuclear weapon safety.

Advanced Use Control/Denial – Creates and matures options, internal and/or external to the warhead, to minimize the potential for deliberate unauthorized use of a U.S. nuclear weapon.

Advanced Security Systems – Develops and demonstrates system concepts and associated enabling technologies that could integrate weapon capabilities with physical security.

Highlights of the FY 2021 Budget Request
- Resumes development of direct optical initiation systems and supports the Optical Initiation Technology Realization Team, a collaborative effort between the labs and plants created to ensure the successful maturation of optical initiation as that technology eventually transitions to production and insertion into the next weapons systems.
- Develops advanced safety mechanisms and demonstrates technologies on the next HOTSHOT campaign.
- Develops improved safety architectures that minimize/eliminate issues with electrical transmission.

FY 2022 – FY 2025 Key Milestones
- Integrate physical security subsystems for U.S. Air Force weapon storage.
- Develop enhanced capability shipping configurations for all legacy stockpile systems.
- Ensure advanced surety options are available for future weapons systems to meet threshold and objective surety requirements.
- Explore the options to replace detonator technologies and booster and alternate main charge material.

FY 2019 Accomplishments

- Completed the electrical and mechanical systems activities and transitioned these technologies to a life extension program for final development and insertion.
- Defined critical design interfaces and fabricated a system assembly fixture to support the production of NextGen.
- Evaluated commercial off-the-shelf materials needed to produce NextGen that led to the in-house development of a new cost-effective, environmentally-friendly and worker-safe formulation.
- Developed initial plans and process for full-scale production and manufacturing of NextGen components.
- Designed and fabricated full-scale functional hardware sets and delivered them to the U.S.-UK Joint Technology Demonstrator project for their ground test unit.
- Completed the modification of an existing Multi-Point Safe (MPS) design concept to address manufacturing and effectiveness concerns.
- Collected nine months of data from the full-scale MPS experiment; evaluated the full-scale aging samples against the accelerated small test samples and found no deviation between the two experiments.
- Developed the initial path forward on MPS production.
- Developed a comprehensive qualification plan to address the requirements on use-control technology.
- Integrated memory into the use-control design that allows for microelectronics fabrication.
- Completed the printed circuit board design, fabrication, and component testing for the integration of intrinsic use-control technology in future flight testing.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Surety Technologies $43,000,000	**Surety Technologies $54,365,000**	**Surety Technologies +$11,365,000**
• Designed and fabricate flight test hardware for use-control options. • Conducted coupon and component material qualification for NextGen. • Prove-in production capabilities of two main NextGen components. • Conducted residual MPS material effects analysis. • Initiated studies to evaluate potential MPS materials against aging effects experiments and their efficacy to finalize MPS material compositions. • Resumed development of the multi-venue system architecture for U.S. Air Force applications.	• Resume development of direct optical initiation systems. • Develop improved safety architectures. • Mature advanced surety options for future weapons. • Advanced surety options availability for future weapons systems to meet threshold and objective surety requirements. • Prove-in MPS material in a sub-system architecture for future security needs • Develop integrated use control and physical security subsystems for U.S. Air Force weapon storage by FY 2022.	• Develop and deploy solutions designed for the immediate needs of the Stockpile Management program. • Test and evaluate technologies for integrated security solutions for use within multiple U.S. Air Force weapon storage systems. • Develop advanced safety mechanisms for future weapons systems. • Develop enhanced capability shipping configurations for all legacy stockpile systems. • Target NextGen hardware for upcoming flight test to demonstrate viability.

Weapon Technology and Manufacturing Maturation
Weapon Technology Development

Description

Weapon Technology Development (WTD) (formerly portions of the DSW R&D Certification and Safety and DSW R&D Support) is responsible for developing technology options that are responsive to changing global security environments and for activities that reduce risk and increase the likelihood of insertion of those technologies into the stockpile.

This is done by funding activities for the research, development, engineering, integration, and demonstration of technologies that enable the performance, reliability, safety, and responsiveness of current and future stockpile. Technology demonstrations for maturing these technologies such as the HOTSHOT and the U.S.–U.K. Joint Technology Demonstrator (JTD) are just two of several demonstrators.

Highlights of the FY 2021 Budget Request

- Early-stage development and testing of weapon components targeted to replace sunset technologies and modernize subsystems, defined as components facing performance, aging, and/or security issues that can have negative impacts on the performance and safety of a weapon.
- Develop and mature technologies early for future systems and LEPs.
- Field and perform Campaign 4 of the HOTSHOT program to demonstrate and mature technologies.
- Continue integration and development of technologies for the joint U.S. Air Force – NNSA Demonstrator Initiative (ANDI) flights to reduce risks and test insertion options in relevant environments.
- Continue efforts with the U.K. on JTD as a strategic collaboration focusing on design and development of new technologies.
- Continue development of modular and adaptable architectures with enhanced capabilities that result in a nuclear stockpile able to respond quickly and easily to changing policy, technology, and threat environments.

FY 2022 – FY 2025 Key Milestones

- Transition technology options for the W87-1 Modification Program.
- Development of modular and adaptable architectures with enhanced capabilities that result in a nuclear stockpile able to respond quickly and easily to changing policy, technology, and threat environments for insertion into the future stockpile.
- Investigate and invest in exploratory R&D and technology development options for the W93/Mk7 Program.
- Advance JTD projects in partnership with the United Kingdom.
- Field technologies on the ANDI flights in coordination with the USAF.
- Increase in the number and capability of sounding rocket flights for reduced cost per rocket and payload recovery for technology maturation.
- Develop a state-of-health monitoring capability for future systems (e.g., embedded sensors).
- Mature a technology to eliminate a Major Assembly Release exception for future systems.

FY 2019 Accomplishments

- Testing of the JTD Ground Test Unit 1 (GTU1) and JTD Ground Test Unit 2 (GTU2) at Little Mountain Test facility.
- Successfully launched 4 payloads in 2 HOTSHOT campaigns resulting in an increase in technology readiness levels (TRLs) for all technologies flown.
- Stationed production agency personnel at design agencies to facilitate technology transfer and reduce manufacturing risk early.
- Initial ELNG non-digital bus design completed and timer/driver maturation initiated as an option for the W87-1 Program.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Weapon Technology Development $112,392,000	**Weapon Technology Development $131,692,000**	**Weapon Technology Development +$19,300,000**
• Continued development efforts for long-life GTS design options. • Increased technology development activities for the development of high energy, low sensitivity energetic components for future systems, as well as additively manufactured high explosives. • Continued executing the JTD project according to given schedule and objectives. • Continued development and testing of conformal thermal batteries, abnormal launch accelerometers, and replacement inertia sensor technologies. • Continued the development of a new warhead bus architecture and ELNG for future system insertion. • Continued development of thin film thermal batteries, field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing, and other functions within nuclear weapons. • Evaluated options for positional aware fuzing. • Continued to evaluate the effectiveness of sounding rockets and other platforms for the qualification of weapon components. • Continued the development and integration of embedded sensors capability. • Continued development of the common high energy adaptable firing set. • Evaluated integrated data instrumentation capabilities for future telemetry systems.	• Continue development of modular and adaptable architectures with enhanced capabilities that result in a nuclear stockpile able to respond quickly and easily to changing policy, technology, and threat environments. • Continue integration and development of technologies for the joint U.S. Air Force – NNSA Demonstrator Initiative (ANDI) flights to reduce risks and test insertion options in relevant environments. • Continue development efforts for long-life GTS design options. • Continue development and testing of conformal thermal batteries, abnormal launch accelerometers, and replacement inertia sensor technologies. • Continue the development of a new warhead bus architecture and ELNG for future system insertion to enable reduced cost for future modifications • Continue development of thin film thermal batteries, field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing, and other functions within nuclear weapons. • Evaluate options for positional aware fuzing. • Continue to evaluate the effectiveness of sounding rockets and other platforms for the qualification of weapon components. • Continue the development and integration of embedded sensors capability.	• Develop and integrate flight-ready payloads on a flight platform to demonstrate and mature technologies. This will provide confidence in the technology and significantly increase likelihood of adoption in future systems. • Accelerate development of modular and adaptable architectures with enhanced capabilities that result in a nuclear stockpile able to respond quickly and easily to changing policy, technology, and threat environments. • Increase technology development activities for the development of high energy, low sensitivity energetic components for future systems, as well as additively manufactured high explosives.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Continued supporting the operation and maintenance of the Joint Integrated Lifecycle Surety database at the design laboratories. • Supported design and production agency experts serving detail assignments at NNSA HQ and other sites to provide technical advice and support. • Continued implementing quality control procedures, methods, and processes in R&D activities. • Implemented Nuclear Enterprise Assurance and supply chain risk management for R&D activities. • Continued to support contractor staff integration into U.K. work flow to bolster collaboration JTD technology maturation activities.	• Continue development of the common high energy adaptable firing set. • Begin evaluating integrated data instrumentation capabilities for future telemetry systems. • Continue supporting the operation and maintenance of the Joint Integrated Lifecycle Surety database at the design laboratories. • Continue implementing quality control procedures, methods, and processes in R&D activities. • Implement NEA and supply chain risk management for R&D activities. • Develop and integrate flight-ready payloads on a flight platform to demonstrate and mature technologies. Continue efforts with the U.K. on JTD as a strategic collaboration focusing on design and development of new technologies.	

Weapon Technology and Manufacturing Maturation
Advanced Manufacturing Development

Description
The Advanced Manufacturing Development (AMD) program comprises two formerly separate programs: Additive Manufacturing (AM) and Component Manufacturing Development (CMD). The new consolidated AMD program will directly affect the future agility and responsiveness of the National Nuclear Security Administration's (NNSA) manufacturing infrastructure by providing capable, efficient, and effective manufacturing solutions to address technical challenges and replace obsolete processes.

AMD accelerates the development of new manufacturing science and engineering capabilities that will replace hazardous, inefficient, and obsolete processes prior to Phase 6.3 of a future weapon system. In pursuing the long-term advanced manufacturing strategy, this program prioritizes developing improvements that demonstrate viability for a particular application, which allows future weapon modernization efforts to incorporate those production methods with confidence to meet program requirements, costs, and schedule. Replacing specific processes by Phase 6.3 of the W87-1 Modification Program will allow the NNSA to reduce future demand on the supply of a strategic material by minimizing efforts needed to recover, recycle, and/or produce the material, reduce production floor space for certain processes by over fifty percent, and manufacture with replacement materials that are less hazardous and costly to produce.

Highlights of the FY 2021 Budget Request
- Support key manufacturing technologies that are replacing obsolete materials and processes on a timeline to support the W87-1 and future systems.
- Advance qualification and certification methods to use AM-produced parts in the active stockpile.
- Transition AM machine capabilities to a production environment to deliver AM parts to the stockpile.
- Leverage scientific knowledge for new qualification and certification methods to enable delivery of AM components intended for the W87-1 Modification Program.
- Conduct testing to confirm components manufactured with new production methods will improve performance margins.

FY 2022 – FY 2025 Key Milestones
- Demonstrate various approaches for cost effective rapid prototyping in support of both basic research and development and stockpile systems programs.
- Advance understanding of additively manufactured components and materials in normal, abnormal, and hostile environments expected for components in the U.S. nuclear arsenal.
- Develop new advanced manufacturing techniques to reduce costs and turnaround time for prototyping of new weapon components and materials.
- Investigate the applicability and viability of additively manufactured energetics and new types of plastics by FY 2022.
- Develop AM thermoset materials that may have advantages in performance, cost, manufacturability, reliability, and/or supply chain security.
- Develop the methodologies required to qualify and certify AM for metal lattices by FY 2023.
- Develop paths to certification and qualification for new components and materials produced via advanced and novel manufacturing techniques.

FY 2019 Accomplishments
- Matured AM processes for stochastic coatings, specifically the Controlled Atmospheric Plasma Spray.
- Initiated a project execution plan to shift from conventional to AM polymers that by 2025 will result in a ninety percent reduction in polymer production footprint at half the cost per part.
- Advanced metal AM and lattice technology readiness levels at multiple sites.
- Developed and tested additively manufactured HE with improved safety margins over conventional HE and better performance than insensitive HE.

- Completed legacy components/material property survey and created target properties and functional requirements table for AM thermosets. Identified first technology and risk reduction opportunities. Advanced ability to print strong materials at scale and in complexity.
- Multi-site AM applications for HE identified significant improvements at Design Agencies for formulations and process development; successfully shipped parts each made by HE AM to Pantex for performance testing.
- New thermoset AM processes give us the degrees of freedom to optimize structure for shearing stresses and properties at ground level, design optimization tools are allowing us to realize these goals.
- Completed all technology maturation deliverables for Direct Cast and achieved TRL 5; multi-zone VIM furnace contract awarded.
- Successfully collected data on materials experiments flown on two HOT SHOT flights.
- At risk materials were released the Granta Weapons Materials Specifications Database for cross-site sharing on the Enterprise Secure Network.
- Invented a toluene-free amination high explosive that reduces environmental hazards and improves batch throughput over 50%.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Advanced Manufacturing Development **$66,910,000**	**Advanced Manufacturing Development** **$111,908,000**	**Advanced Manufacturing Development** **+$44,998,000**
• Developed manufacturing processed and prototypes for potential stockpile applications, such as energetics, metal and polymer lattices, and gas bottles. • Improved understanding of the science behind additive manufacturing through material performance and process controls. • Explored methodologies to improve AM process reliability and repeatability. • Leveraged qualification / certification methods to enable delivery of AM components intended for the W87-1 Modification Program. • Developed associated technologies with advanced additive manufacturing, advanced materials, and digital manufacturing. • Leveraged LANL production development work for components at Y-12. • Accelerated development of manufacturing process control diagnostics to mitigate supply chain risks. • Completed CNS evaluation and implementation of additive manufacturing methods in unexplored tooling and engineering applications.	• Continue work in Design for Manufacturing • Advance certification and qualification methods to widen the use of AM-produced parts in the active stockpile. • Incorporate next generation digital manufacturing methods through use of computational simulations and model-based designs. • Implement new strategically radiation-hardened microelectronics production capabilities to enable new systems architectures. • Develop new energetic materials formulations that are safer to produce and replace legacy materials that are no longer commercially available. • Increase technology development for use of laser powder bed fusion technology to demonstrate the potential to supplement production capabilities for near term programs of record • Development of additively manufactured thermoset materials that have advantages in performance, cost, manufacturability, reliability, and supply chain security. • Development of methodologies required to qualify and certify AM for metal lattices. • Development of AM processes for stochastic coatings. • Development and testing of advanced methods for high explosives manufacture with improved	• Investigate the applicability and viability of additively manufactured energetics and new types of plastics. • Accelerate procurements for critical equipment needed to inform technology readiness development that informs TRL6 and TRL7 through increased test requirements as well. This is a major driver of the requested increase. • Address resource requirements necessary to advance technologies and training during the technology development advancement process • Increase the scope of the Design for Manufacturing effort, partnering with the Production Modernization office to look at opportunities involving Special Nuclear Materials. This will also be a large cost driver, albeit with a significant long-term payoff. • Accelerate technology and manufacturing readiness advancement for direct cast. • Accelerate technology and manufacturing readiness advancement for special materials. Additionally, investigate advanced machining and post processing alternatives. • Investigate material properties and mechanical performance of stochasticly produced coatings and sensitivity to manufacturing processes.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	safety margins over conventional HE and better performance than insensitive HE.	

Stockpile Research, Technology and Engineering
Academic Programs

Overview

The challenges of modernizing our nuclear stockpile demand a strong and diverse base of national expertise and educational opportunities in specialized technical areas that uniquely contribute to nuclear stockpile stewardship. The Academic Programs of Stockpile Research, Technology, and Engineering are designed to support academic programs in science and engineering disciplines of critical importance to the NNSA Nuclear Security Enterprise (NSE), such as nuclear science, radiochemistry, materials at extreme conditions, high energy density science, advanced manufacturing, and high performance computing. In addition, building a diverse workforce will strengthen our stewardship of the future. The role of the Academic Programs is three-fold:

1) Develop the next generation of highly trained technical workers able to support its core mission
2) Maintain technical peer expertise external to the NSE for providing valuable oversight, cross-check and review
3) Enable scientific innovation to enhance the NSE missions to strengthen the basic fields of research relevant to the NNSA mission

The Academic Programs enable a robust and diverse research and STEM educational communities through a variety of methods of support to achieve the goals. Investments in Consortia and Centers of Excellence provide collaborative groups to tackle large questions through multi-disciplinary approaches and leverage preeminent scientists in the field. Research grants and Focused Investigatory Centers support individual principal investigators to foster a vibrant community responsive to new breakthroughs by providing flexibility for new ideas, diversity, and career growth. Specific support to minority and tribal serving institutions prepares a diverse workforce of world class talent through strategic partnerships. Fellowships provide graduate students with key opportunities to connect with the NNSA missions and provide direct experiences at the NSE sites. User Facilities open opportunities for academic partners to use NNSA's cutting edge research facilities and push frontiers of current scientific understanding. Several underlying features of all Academic Programs include the focus on quality science through competitive award, connection with NNSA mission lab/site work, and a view to future needs and opportunities of the NSE.

Primary responsibilities of this program include:

- Manage academic solicitations and competitive awards
- Provide a vibrant technical expertise aligned with NSE current and future needs
- Enable connections between academic research communities and NSE to foster understanding of NNSA mission
- Train future workforce through on-site opportunities and personal connections with laboratory scientists

Highlights of the FY 2021 Budget Request

Changes from FY 2019:

The Academic Programs has been established in FY 2021 to bring together similar activities across the SRT&E programs. By combining these activities, NNSA will gain coordination across programs, leveraging strengths and integrating to address the needs of NNSA interactions with academic partners.

The Academic Programs is comprised of five subprograms:

1. Stewardship Science Academic Alliance (SSAA)
2. Minority Serving Institution Partnership Program (MSIPP) that includes the Tribal Education Partnership Program (TEPP)
3. Joint Program in High Energy Density Laboratory Plasmas (JPHEDLP)
4. Computational Science Graduate Fellowships (CSGF)
5. Predictive Science Academic Alliance Program (PSAAP)

Each program is highlighted in proceeding pages.

Academic Programs
Stewardship Science Academic Alliance

Description
The Stewardship Science Academic Alliances (SSAA) Program supports scientific academic research programs to develop the next generation of highly trained technical workers able to support its core mission and to ensure there is a strong community of technical peers, external to the NNSA national laboratories, capable of providing peer review and scientific competition to strengthen the basic fields of research relevant to the NNSA national security enterprise (NSE).

The Stewardship Science Academic Alliances (SSAA) Program funds both collaborative Centers of Excellence and smaller individual investigator research projects to conduct fundamental science and technology research of relevance to stockpile stewardship. Current technical areas include studies of materials under extreme conditions, low-energy nuclear science, high energy density physics, and radiochemistry. SSAA funding supports research at approximately 80 universities, including training of over 200 graduate students and post-doctoral researchers. A key element of both centers of excellence and individual investigator awards is the connection of students with the nuclear security enterprise. These opportunities are focused in technical fields critical to stewardship science, building a field of talented researchers and committed doctoral students sharing a common desire to advance science while impacting national security.

The SSAA Program also funds the Stewardship Science Graduate Fellowship (SSGF) and the Laboratory Residency Graduate Fellowship (LRGF) with the goal of addressing workforce needs by providing financial support and professional development opportunities to students pursuing a Ph.D. in fields of study that solve complex science and engineering problems critical to stewardship science.

Highlights of the FY 2021 Budget Request
Within FY 2021 budget request the SSAA program will focus on:
- A funding opportunity announcement for SSAA university research grants will solicit scientific research in areas crucial to the stockpile stewardship program, including Materials at Extreme Conditions, Low Energy Nuclear Science, and Radiochemistry. Other topics may be added as identified in a planned 2020 academic program review.
- Ongoing SSAA Centers of Excellence enter their third year of support and each center will have an on-site mid-term progress review.
- The SSGF and LRGF graduate fellowship programs will continue to provide support and hands on training for graduate students in areas relevant to stockpile stewardship, connecting these students with opportunities at the national laboratories, by placing a new annual cohort of fellows.
- The annual SSAA symposium brings together research teams supported by the SSAA, JPHEDLP, and NLUF programs. In addition to highlighting current research and encouraging collaboration, a focus on students includes activities such as poster competitions, student lunch with lab representatives, and “lab hour” highlighting lab directions and opportunities for students/graduates.

FY 2022 – FY 2025 Key Milestones
- Provide advanced experimental measurement techniques in areas of Materials Science, Hydrodynamics, Low-Energy Nuclear Science, and Radiochemistry via the SSAA program.
- Provide opportunities for intellectual challenge and collaboration by promoting scientific interactions between the academic community and scientists at the NNSA laboratories, via the SSAA program.
- Increase availability of unique experimental facilities sited at NNSA laboratories to the broader academic community, particularly for collaborations in areas of relevance to Stockpile Stewardship.
- Develop and maintain a long-term, recruiting pipeline to NNSA laboratories by increasing visibility of NNSA scientific activities to U.S. faculty and student communities.
- Document the hiring of various students into the NNSA/DOE and Federal workforce that have matriculated through various STEM consortium pipelines.

FY 2019 Accomplishments

- A competitive funding opportunity announcement for SSAA Centers of Excellence in the research area of materials under extreme conditions was posted in FY 2019. Review is underway with intent to award 1-2 new centers.
- In FY 2019 the SSAA program conducted competitive selection and awarded research grants in stewardship science, including 24 new and 14 continuation awards.
- The contract for management of the SSGF and LRGF Fellowships was re-awarded following a competitive solicitation announced in FY 2019.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Stewardship Science Academic Alliance **$26,000,000**	**Stewardship Science Academic Alliance** **$26,212,000**	**Stewardship Science Academic Alliance** **+$212,000**
• Supported the SSAA Program to develop the next generation of highly-trained technical workers able to support the NNSA core mission and to ensure there is a strong community of technical peers. • Supported SSGF and LRGF Fellowship programs: FY 20 third year of LRGF adds 4 new LRGF fellows, bringing total fellows to 12.	• SSAA moved from Science budget line to new Academic Programs budget line. This will enhance coordination among programs. • Support the SSAA Program to develop the next generation of highly-trained technical workers able to support the NNSA core mission and to ensure there is a strong community of technical peers. • Support SSGF and LRGF Fellowship programs, the fourth year of LRGF will bring the total LRGF fellows to the projected stable level of 16.	• Enable the program to be responsive to needs identified in laboratory feedback and 2020 academic program review.

Academic Programs
Minority Serving Institution Partnership

Description

NNSA MSIPP's mission is to create and foster a sustainable STEM-pipeline that prepares a diverse workforce of world class talent through strategic partnerships between Minority Serving Institutions and the NNSA Nuclear Security Enterprise (NSE). MSIPP supports Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs). MSIPP aligns investments in university capacity and workforce development with the NNSA mission to develop the needed skills and talent for the NSE's enduring technical workforce and to enhance research and education capacity at under-represented colleges and universities.

This alignment is defined by the following goals:

1. Strengthen and expand minority and tribal serving institutions' educational and/or research capacity in NNSA mission areas of interest.
2. Target collaborations between minority and tribal serving institution's and the (NSE) that increase interactions to provide minority and tribal serving institution's direct access to NSE resources.
3. Increase the number of MSI students who graduate with STEM degrees relevant to NNSA mission areas and who have had exposure to career opportunities within the NSE.
4. Increase the number of minority graduates and post-doctoral students hired into the NSE's technical and scientific workforce.

Highlights of the FY 2021 Budget Request

- Pursue consortium-based STEM grants that specifically target HBCUs, HSIs and TCUs and provide them the opportunity to build their STEM capacity and academic infrastructure with alignment to the NSE. As a result, the educational institutions will be in a sound position to become an intricate part of the NSE STEM pipeline transitioning students into the workforce.
- Increase student engagement and internship opportunities and confirm the hiring of various minority students into the NSE that have matriculated through various STEM consortium pipelines.

FY 2022 – FY 2025 Key Milestones

- Develop and maintain a long-term, recruiting pipeline to NNSA laboratories, plants and sites by increasing awareness of MSIPP and developing more partnerships between MSIs/TCUs and the NSE.
- Pursue consortium-based STEM grants that specifically target TCUs to provide the opportunity to build their capacity and infrastructure in STEM. As a result MSIPP will; grow the number of TCU partners, increase student opportunities, and position TCUs to become an intricate part of the NSE STEM recruitment pipeline.
- Partner with other federal agencies and/or programs to broaden the reach of the MSIPP with a goal of pursuing mission related MSI STEM projects that are of mutual interest that will further enhance the educational and/or research capacity at MSIs.

FY 2019 Accomplishments

- The MSIPP program conducted the second competitive solicitation for consortium-based STEM grants. Four new grants and one grant renewal were awarded for strategic partnerships between MSIs and the NSE which includes representation from HBCUs, HSIs, and TCUs. In addition, MSIPP awarded three continuation applications.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Minority Serving Institution Partnership **$25,000,000**	**Minority Serving Institution Partnership** **$25,000,000**	**Minority Serving Institution Partnership** **$0**
• Supported the MSIPP to develop new partnerships with Minority Serving Institutions and continue existing support to HBCUs, HSIs, and TCUs. Supports the MSIPP consortium based model focused on research and internships in STEM. Supports building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers.	• Support the MSIPP to continue existing partnerships with Minority Serving Institutions. Supports the MSIPP consortium based model focused on capacity building, research, student education programs and internships in STEM. Supports building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. As a result the educational institutions will be in a sound position to become an intricate part of the NSE STEM pipeline. • Synergies within the Academic programs offer opportunities to encourage connection between MSIPP and other academic partners.	• Formerly included scope from Tribal Education Partnership Program (TEPP) is being captured within an independent line in FY2021.
Tribal Education Partnership Program (TEPP) *$5,000,000*	*Tribal Education Partnership Program (TEPP)* *$5,000,000*	*Tribal Education Partnership Program (TEPP)* *$0*
• Support the TEPP under MSIPP to develop new partnerships with TCUs and continue existing support to TCU programs. Supports the MSIPP consortium based model focused on capacity building, research, student education programs and internships in STEM. Supports building educational/institutional infrastructure at TCUs and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. As a result the educational institutions will be in a sound position to become an intricate part of the NSE STEM pipeline.	• Support the TEPP under MSIPP to continue existing partnerships with TCUs. Supports building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. As a result the educational institutions will be in a sound position to become an intricate part of the NSE STEM pipeline transitioning students into the workforce. • Synergies within the Academic programs offer opportunities for connection between TEPP and other academic partners.	• TEPP will continue to support existing partnerships until award completion and will pursue budget revisions to ensure alignment.

Academic Programs
Joint Program in High Energy Density Laboratory Plasmas

Description
High energy-density (HED) states are central to many aspects of nuclear weapons, and maintaining a strong HED academic community in this unique field will be critical for future needs of a modern nuclear stockpile. The JPHEDLP is designed to steward the study of laboratory HED plasma physics by funding academic research of ionized matter in laboratory experiments where the stored energy reaches approximately 100 billion joules per cubic meter (i.e. pressures of approximately 1 million atmospheres). The program has three primary elements: individual investigator research grants, centers of excellence, and the National Laser User Facility Program.

Individual Investigator Grants: NNSA's Office of Experimental Sciences partners with the DOE's Office of Fusion Energy Sciences to issue an annual joint solicitation for HED Laboratory Plasmas research. The coordination across agencies enables the support of a strong and broad academic presence in HED science, leveraging common interests while assuring NNSA specific interests in this area remain vibrant. Competitively awarded research grants are selected through the joint solicitation conducted in coordination with the Office of Science.

Centers of Excellence: The Joint Program in HEDLP funding also supports the HED Centers of Excellence selected under the competitive SSAA Centers process. Centers of Excellence are an integrated multi-institutional collaborative effort focused on a central problem or theme. These Centers work closely with NSE scientists and maintain a core set of academic expertise in key technical areas.

National Laser User Facility (NLUF) Program: The primary purpose of the NLUF Program is to provide facility time access to NNSA unique tools to accomplish cutting edge science. In the pursuit of fundamental science advances, the innovative development of diagnostics and platforms by user facility partners have often proven to benefit NNSA experimental needs. Hands-on research experience to academic and industrial researchers using the OMEGA an OMEGA EP lasers as tools for conducting basic research experiments.

Highlights of the FY 2021 Budget Request
- Expanding opportunities for national collaboration in high energy density science research through the enhancement of existing grants and cooperative agreements as well as the establishment of new financial assistance awards.
- Offer solicitation annually with the intent to enhance flexibility, new researchers, and career opportunities.

FY 2022 – FY 2025 Key Milestones
- Provide research grants and cooperative agreements to fund individual investigators as well as research centers.
- Collect data to demonstrate that NSE workforce needs are understood and develop plan to meet these needs.

FY 2019 Accomplishments
- Executed a solicitation for new research grants, jointly managed with the Office of Science's Fusion Energy Science Program's High Energy Density Laboratory Plasmas sub-program, leading to 15 new awards, a 30% increase in the number of individual awards.
- Delivered world-leading scientific discoveries, published in preeminent scientific journals and media outlets.

Joint Program in High Energy Density Laboratory Plasmas

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Joint Program in High Energy Density Laboratory Plasmas $8,492,000	**Joint Program in High Energy Density Laboratory Plasmas $8,700,000**	**Joint Program in High Energy Density Laboratory Plasmas +$208,000**
• Supported academic grants and cooperative agreements, including support for several research Centers of Excellence in HED science and the National Laser Users Facility (NLUF) activity at the University of Rochester's Omega Laser Facility.	• JPHEDLP has moved from ICF budget line to the new Academic Programs budget line. This will enhance coordination among programs. • Supports academic grants and cooperative agreements, including support for several research Centers of Excellence in HED science.	• The increase will take on some of the funding of HED centers awarded through SSAA as well as enable additional grants or centers in HEDLP through the joint solicitation.

Academic Programs
Computational Science Graduate Fellowship

Description
For the DOE Computational Science Graduate Fellowship (CSGF) program, NNSA has a long-term goal to cultivate the next generation of scientists and engineers to support the ASC and DSW missions through ASC's academic alliance activities. These efforts establish academic programs for multidisciplinary simulation science and through graduate fellowships provide students the relevant experience for weapons code development through open science applications. The NNSA CSGF activity is managed by the Krell Institute and jointly funded with the DOE Office of Science's Advanced Scientific Computing Research program.

Highlights of the FY 2021 Budget Request
- Continue funding CSGF with DOE Office of Science.

FY 2022 – FY 2025 Key Milestones
- Making computational science careers more visible, encouraging talented students to enter the field to help expand the future generations of computational science leaders.
- Increasing diversity in scientists and engineers exploring disciplines that share a common interest.

FY 2019 Accomplishments
- Supported CSGF in collaboration with respective offices in DOE to help the program select exceptional students and provide benefits in fields that use high performance computing to solve complex science and engineering problems
- Held a successful annual CSGF Program Review that highlighted incoming and ongoing CSGF fellows' research presentations performed during the year.

Computational Science Graduate Fellowship

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Computational Science Graduate Fellowship **$2,000,000**	**Computational Science Graduate Fellowship** **$2,000,000**	**Computational Science Graduate Fellowship** **$0**
• Supported the CSGF to help ensure a supply of scientists and engineers trained to meet workforce needs related to DOE/NNSA in computational science.	• Support the next cohort of fellows. CSGF moved from ASC budget line to the new Academic Programs budget line. This will enhance coordination among programs. • Continued supporting the CSGF to help ensure a supply of scientists and engineers trained to meet workforce needs related to DOE/NNSA in computational science.	• Support the next cohort of fellows, some of whom will do summer practicums at NNSA Labs.

Academic Programs
Predictive Science Academic Alliance Program

Description
The Predictive Science Academic Alliance Program (PSAAP) consists of participation by leading U.S. universities, focusing on the development and demonstration of technologies and methodologies to support effective high performance computing in the context of science and engineering applications. The research performed by the universities in this program is discipline-focused to further predictive science and enabled by effective extreme scale computing. The predictive science that is a highlight of this program is based on verification and validation and uncertainty quantification for large-scale simulations.

PSAAP has a long-term goal to cultivate the next generation of scientists and engineers to support the ASC and DSW missions. These efforts establish academic programs for multidisciplinary simulation science and provide students the relevant experience for weapons code development through open science applications.

Highlights of the FY 2021 Budget Request
- Establish validated, large-scale, multi-disciplinary, simulation-based "Predictive Science" as a major academic applied research program.
- Perform second year objectives with PSAAP III academic alliance Centers.

FY 2022 – FY 2025 Key Milestones
- Facilitate discipline-focused research at the PSAAP III academic alliance Centers to achieve the program objective and demonstration problems.
- Engage U.S. academic community in making significant advances in predictive modeling and simulation technologies.

FY 2019 Accomplishments
- Engaged with Predictive Science Academic Alliance Program centers on technical topics and staff recruitment.
- Distributed the PSAAP III Funding Opportunity Announcement (FOA) to proper platforms for eligible institutions to apply and conducted technical merit reviews on their proposals.
- Executed one-year extensions for current PSAAP II Centers to continue completed demonstration performance on proposed technologies relevant to NNSA.

Predictive Science Academic Alliance Program

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Predictive Science Academic Alliance Program **$20,000,000**	**Predictive Science Academic Alliance Program** **$20,000,000**	**Predictive Science Academic Alliance Program** **$0**
• Extended current academic alliance Centers' cooperative agreements for one year • Supported PSAAP II Centers to train next generation of researchers working in complex, multi-discipline fields • Developed next generation of highly-trained technical employees to serve as a healthy recruitment pipeline for NNSA.	• Support the new PSAAP III centers in their second year to work on proposed research objectives relevant to NNSA. • Provide dedicated, appropriate ASC computing resources and user support to enable the PSAAP Centers to achieve their annual simulation demonstration milestones. • The PSAAP III Centers' involvement with predictive science research and consistency in performance of high performance computing will be continued with the FY2021 Budget Request. • Coordination among academic programs will continue to foster more development in addressing objectives and collaboration.	• PSAAP moved from ASC budget line to the new SRT&E Academic Programs budget line. This will enhance coordination among the funding programs. • Execute PSAAP III Centers' cooperative agreements.

Stockpile Research, Technology, and Engineering
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	286,202	286,202	400,045	525,845	+125,800
Minor Construction	N/A	N/A	0	0	4,000	6,800	+2,800
Total, Capital Operating Expenses	N/A	N/A	**286,202**	**286,202**	**404,045**	**532,645**	**+128,600**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	151,551	151,551	154,885	158,293	+3,408
NIF High Resolution, neutron-hardened VISAR, LLNL	5,700	0	1,200	1,200	2,500	2,000	-500
Energy upgrade to OTS Laser, LLNL	5,100	0	900	900	3,500	700	-2,800
Magnetized Targets, LLNL	7,500	1,500	3,600	3,600	900	800	-100
Time Resolved Magnetic Recoil Spectrometer, LLNL	6,575	175	500	500	1,500	2,000	+500
NIS Equator 90-213, LLNL	6,700	2,000	1,900	1,900	1,900	900	-1,000
Target LRU, LLNL	6,900	0	400	400	1,500	2,500	+1,000
Sierra (ATS-2) System, LLNL	170,500	150,500	11,000	11,000	6,800	2,200	-4,600
CTS-1, LLNL	42,550	36,550	6,000	6,000	0	0	0
CTS-2, LLNL	40,000	0	0	0	0	10,000	+10,000
El Capitan (ATS-4), LLNL	620,000	1,000	33,000	33,000	58,000	100,000	+42,000
Advanced Sources and Detector, LANL	1,061,355	62,895	50,000	50,000	115,160	179,752	+64,592
Trinity (ATS-1) system, LANL	187,000	177,000	5,000	5,000	5,000	0	-5,000
Crossroads (ATS-3) System, LANL	127,000	4,000	20,000	20,000	24,000	45,000	+21,000
Flash X-Ray, LANL	12,000	0	0	0	0	2,000	+2,000
Commodity Technology System (CTS) 1+, SNL	9,000	0	0	0	9,000	0	-9,000
Commodity Technology System (CTS) 2, SNL	9,000	0	0	0	0	9,000	+9,000
Bottom Loading Furnace, Y-12	39,051	0	1,151	1,151	15,400	10,700	-4,700
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**286,202**	**286,202**	**400,045**	**525,845**	**+125,800**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	0
HPC Staging Facility, LANL	5,000	0	0	0	0	400	+400
SCC Electrical Upgrades, LANL	15,000	0	0	0	0	0	0
U1a.03 Test Bed Facility Improvements, NNSS	16,000	0	0	0	4,000	6,400	+2,400
Thermal Spray Research Lab (TSRL) Replacement, SNL	13,550	0	0	0	0	0	0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**4,000**	**6,800**	**+2,800**
Total, Capital Summary	**N/A**	**N/A**	**286,202**	**286,202**	**404,045**	**532,645**	**+128,600**

Outyears for Stockpile Research, Technology, and Engineering

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	161,776	165,335	168,974	172,692	N/A
Minor Construction	11,200	11,060	16,490	0	N/A
Total, Capital Operating Expenses	**172,976**	**176,395**	**185,464**	**172,692**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	0	0	0	0	N/A
Magnetized Targets, LLNL	700	0	0	0	0
Time Resolved Magnetic Recoil Spectrometer, LLNL	1,500	900	0	0	0
Target LRU, LLNL	1,500	1,000	0	0	0
CTS-2, LLNL	10,000	10,000	10,000	0	0
El Capitan (ATS-4), LLNL	120,000	135,000	50,000	20,000	103,000
Advanced Sources and Detector, LANL	241,200	214,500	152,800	45,048	0
Crossroads (ATS-3) System, LANL	14,000	8,000	6,000	6,000	0
Flash X-Ray, LANL	5,000	5,000	0	0	0
Bottom Loading Furnace, Y-12	6,000	5,800	0	0	0
Total, Capital Equipment (including MIE)	**399,900**	**380,200**	**218,800**	**71,048**	**103,000**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	N/A
HPC Staging Facility, LANL	4,600	0	0	0	0
SCC Electrical Upgrades, LANL	1,000	10,000	4,000	0	0
U1a.03 Test Bed Facility Improvements, NNSS	5,600	0	0	0	0
Thermal Spray Research Lab (TSRL) Replacement, SNL	0	1,060	12,490	0	0
Total, Minor Construction Projects	**11,200**	**11,060**	**16,490**	**0**	**0**
Total, Capital Summary	**411,100**	**391,260**	**235,290**	**71,048**	**103,000**

Advanced Sources and Detectors (ASD) Major Item of Equipment (MIE)
LANL Lead (SNL, LLNL, NNSS, NRL support)
Project Data Sheet

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The most recent Department of Energy (DOE) approved CD for the project is CD-1, Approve Alternative Selection and Cost Range, which was approved on February 6, 2019, as part of the "Enhanced Capabilities for Subcritical Experiments (ECSE) at the Nevada National Security Site (NNSS), U1a Complex." The FY 2021 Request for the ASD MIE is $179,752,000. The Critical Decision CD-1 cost range for this project $500,000,000 - $1,100,000,000, based on an Independent Cost Review that included a 50% estimate of uncertainty on the to go estimate plus Management Reserve and Contingency of $334,855,000. CD-2/3 is expected in FY 2022 and CD-4 is projected for FY 2025. The ASD is a large programmatic diagnostic that will be used for subcritical experiments through application of a multi-pulse, single axis, Linear Induction Accelerator (LIA)-based radiographic system.

A certified Federal Project Director (FPD) has been assigned to this project.

Significant Changes:
The current point estimate for the project has increased from $792 million to $1.061 billion for the following reasons:

1. Solid State Pulsed Power (SSPP) was chosen as the power driver for the accelerator. This results in a single power architecture that will provide increased operational flexibility.
2. Power conditioning and additional heat removal capacity have been added to the project.
3. Increased management reserve/contingency as a prudent management practice at this stage of the project.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2020	9/25/2014	6/7/2018	2/6/2019	2Q FY 2022	4Q FY 2021	2Q FY 2022	4Q FY 2025
FY 2021	9/25/2014	6/7/2018	2/6/2019	2Q FY 2022	4Q FY 2021	2Q FY 2022	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-3A – Approve Long Lead Procurements
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Fabrication
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2020	4Q FY 2021	3Q FY 2021
FY 2021	4Q FY 2021	3Q FY 2021

Project Cost History

(Dollars in Thousands)

Fiscal Year	Total Cost
FY 2020	791,600
FY 2021	1,061,355

2. Project Scope and Justification

Scope

ECSE is a portfolio of work that constructs a new underground laboratory in Nevada and installs large modern diagnostic systems necessary to evaluate plutonium implosion system experiments in support of the current and future stockpile. The ASD MIE is one of these diagnostic systems that involves installation of a linear induction accelerator into the U1a Complex. The ASD MIE will provide the capability to conduct weapons-scale, radiographically diagnosed subcritical experiments using special nuclear material (SNM). The radiographic data is required to refine the modern predictive physics models used to certify the present and future stockpile. Radiography (x-ray imaging of dense objects) is the principal tool for diagnosing dynamic weapons-scale experiments and is the key diagnostic for the National Hydrodynamic Test Program at both Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL). Hydrodynamic tests are conducted at the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT) at LANL and at LLNL's Contained Firing Facility using the Flash X-Ray machine; in these tests, surrogate materials replace SNM in the experimental assembly. The surrogate tests explore many significant aspects of primary implosion physics, but cannot explore the unique behavior of plutonium. The ASD MIE Project, funded within the ECSE sub-program, addresses this need and complements other diagnostics already supporting the subcritical, scaled experiments program.

Justification

The stockpile is inherently moving away from the nuclear explosive testing database through aggregate influences of aging, modern manufacturing techniques, modern materials, and evolving design philosophies. In 2014, LANL and LLNL jointly identified that a capability gap is building to enable certification of these changes, which involves the evaluation of plutonium response. In 2016, the JASONs Defense Advisory Group identified the same gap in U.S. capability to carry out and diagnose such experiments. The ASD MIE, as part of ECSE, is designed to narrow this gap. Data from ECSE will help the validation of the W80-4 design and certification of the W87-1 Modification Program. ECSE delivery in the mid-2020s supports these efforts.

Key Performance Parameters (KPPs)

The KPPs and Initial Operational Capability (IOC) represent the minimum acceptable performance that the project must achieve. Achievement of the KPPs will be a prerequisite for approval of CD-4, Project Completion. KPPs will be included upon approval of the project. At a high level, the MIE must be able to generate the x-ray energies and multi-pulse capability necessary to diagnose late-time dynamics in plutonium implosion experiments.

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget	Obligations	Costs
Funding			
FY 2015	10,500	10,500	3,130
FY 2016	10,500	10,500	6,463
FY 2017	7,500	7,500	14,207
FY 2018	34,395	34,395	32,531
FY 2019	50,000	50,000	51,746
FY 2020	115,160	115,160	84,000
FY 2021	179,752	179,752	172,000
FY 2022	241,200	241,200	270,000
FY 2023	214,500	214,500	225,000
FY 2024	152,800	152,800	146,000
FY 2025	45,048	45,048	56,278
Grand Total	**1,061,355**	**1,061,355**	**1,061,355**

4. Details of Project Cost Estimate

Work Breakdown Structure Estimated Cost (Dollars in Thousands)

WBS #	WBS Title	Current Estimate	Previous Estimate
1.01	Project Management	85,600	76,000
1.02	Radiographic System	557,800	418,300
1.03	System Engineering and Requirements	14,100	37,000
1.04	System Integration at U1a	53,300	17,000
1.05	System Testing and Qualification at U1a	15,700	10,000
	Management Reserve/Contingency	334,855	233,300
	Total	**1,061,355**	**791,600**

5. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2025
Expected Useful Life	30 years
Expected Future Start of D&D of this capital asset	4Q FY 2055

6. Acquisition Approach

The four Management and Operations contractors at the Laboratories and sites (LANL, LLNL, SNL, and NNSS) have formed a multi-site team to execute the Project.

Infrastructure and Operations

Overview

The Infrastructure and Operations program maintains, operates, and modernizes the National Nuclear Security Administration (NNSA) infrastructure in a safe, secure, and cost-effective manner to support all NNSA programs. Infrastructure and Operations efforts provide a comprehensive approach to modernizing NNSA infrastructure while maximizing return on investment, enabling program results, and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools.

Operations of Facilities

The Operations of Facilities program provides the funding required to operate NNSA facilities in a safe and secure manner and is fundamental to achieving NNSA's plutonium, uranium, tritium, lithium, high explosives, and other mission objectives. This program includes essential support such as water and electrical utilities; safety systems; lease agreements; and activities associated with Federal, state, and local environmental, worker safety, and health regulations.

Safety and Environmental Operations

The Safety and Environmental Operations program provides for the Department's Nuclear Criticality Safety Program (NCSP), Nuclear Safety Research and Development (NSR&D), Packaging subprogram, Long Term Stewardship (LTS) subprogram and Nuclear Materials Integration (NMI) subprogram. These activities support safe, efficient operation of the nuclear security enterprise through the provision of safety data, nuclear material packaging, environmental monitoring, and nuclear material tracking.

Maintenance and Repair of Facilities

The Maintenance and Repair of Facilities program (Maintenance) provides direct-funded maintenance activities across the NNSA enterprise for the recurring day-to-day work required to sustain and preserve NNSA facilities and equipment in a condition suitable for their designated purpose. These efforts include predictive, preventive, and corrective maintenance activities to maintain facilities, property, assets, systems, roads, equipment, and vital safety systems.

Recapitalization

The Recapitalization program, comprised of the Infrastructure and Safety subprogram, the Capability Based Investments subprogram, and a new subprogram titled Planning for Programmatic Construction (Pre-CD-1), is key to modernizing NNSA's infrastructure. A sustained investment in Recapitalization is needed to address numerous obsolete support and safety systems; revitalize facilities that are beyond the end of their design life; and improve the reliability, efficiency, and capability of core infrastructure to meet mission requirements. The Recapitalization program modernizes NNSA infrastructure by prioritizing investments to improve the condition and extend the life of structures, capabilities, and systems thereby improving the safety and quality of the workplace. Recapitalization investments help achieve operational efficiencies and reduce safety, security, environmental, and program risk.

The Recapitalization program includes minor construction projects, capital equipment, planning, Other Project Costs (OPC) for Infrastructure and Operations funded mission enabling infrastructure and two programmatic line item construction projects, and deactivation and disposal of excess infrastructure.

Line Item Construction

Infrastructure and Operations line item construction projects are critical to revitalizing the infrastructure and program-specific capabilities that directly support the nuclear weapons programs. These projects will replace obsolete, unreliable facilities and infrastructure to reduce safety and program risk while improving responsiveness, capacity, and capabilities.

Highlights of the FY 2021 Budget Request

The FY 2021 Infrastructure and Operations Budget Request totals $4,383,577,000, which represents the acceleration of a long-term effort to modernize NNSA infrastructure. This request includes increases to subprograms and construction. The increase to Operations of Facilities supports pit production at LANL and additional leased space at Kansas City to meet Life Extension Program (LEP) schedules. The increase to Safety and Environmental Operations reflects the budget structure change to include scope (primarily Nuclear Materials Integration) funded in Strategic Materials Sustainment in FY 2020, increased efforts to address the groundwater contamination plume at Pantex, and additional funds for Packaging to

support pit production efforts at LANL. The increase to Maintenance and Repair of Facilities represents a significant increase in NNSA's attempt to improve the condition of its infrastructure. The request is necessary to support and increase maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet an increasing mission demand. The increase to Infrastructure and Safety Recapitalization supports pit production at LANL, meeting LEP schedules at Kansas City, and the NPR infrastructure modernization plan. The increase to Capability Based Investments Recapitalization supports growth in programmatic equipment recapitalization requirements. The Planning for Programmatic Construction (Pre-CD-1) subprogram increases transparency on the NNSA's annual funding need for programmatic modernization planning. The request also supports an increase in Programmatic Construction funding for the Uranium Processing Facility (UPF) per the project execution plan and efforts to phase out mission dependency in the existing aged facilities. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project; the U1a Complex Enhancements Project; the Lithium Processing Facility; the Tritium Finishing Facility; the High Explosive Science & Engineering Facility; Exascale Computing Facility Modernization project; TA-55 Reinvestment Project Phase III; HE Synthesis, Formulation, and Production project; and the Transuranic Liquid Waste Facility. The increase in Mission Enabling Construction is to support the transition to construction for Nevada 138kV Power Transmission System Replacement and two Emergency Operations Centers (EOCs) at the Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratories (SNL).

Major Outyear Priorities and Assumptions

Outyear funding levels for Infrastructure and Operations total $15,243,914,000 for FY 2022 through FY 2025. Outyear priorities will focus on supporting the pit production mission, life extension mission, and the Infrastructure Modernization Initiative (IMI) goal of reducing Deferred Maintenance (DM) and Repair Needs (RN) and continuing to modernize NNSA's infrastructure to reduce mission and safety risks through the application of an enterprise risk management methodology, with line item construction investments largely directed to uranium, plutonium, tritium, lithium, and high explosives infrastructure. NNSA will seek operational efficiencies by deactivating and dispositioning facilities that are no longer needed, thereby reducing operations, maintenance, and recapitalization requirements.

Infrastructure Modernization Initiative

The FY 2018 National Defense Authorization Act (NDAA) directed the creation of the IMI program, which the NNSA Administrator created in December 2017. The goal of the IMI is to reduce DM and RN by not less than 30 percent by 2025. The IMI will be carried out under the current budget structure via the Recapitalization: Infrastructure and Safety and Maintenance and Repair of Facilities programs. The initial plan was transmitted to Congress in September 2018.

As part of the IMI program, NNSA has deployed BUILDER, a system developed by the U.S. Army Corp of Engineers and recognized by the National Academy of Sciences as a best-in-class practice for infrastructure management. The BUILDER system uses comprehensive inventory, lifecycle, cost, and assessment data and risk-informed standards and policies to recommend repairs and replacements at the most opportune time, thus improving NNSA's ability to pinpoint and prioritize investments. Using BUILDER-based calculations provides a more accurate and transparent understanding of NNSA's infrastructure. Historical approaches had greatly underestimated the Replacement Plant Value (RPV) of NNSA's facilities (for example, RPV for Y-12's 9212 was historically $949 million and is now $4.6 billion). NNSA's new calculated RPV is $124.3 billion. The DM costs are tied to the RPV (it costs more to repair a more expensive facility); therefore, as expected, DM increased with the deployment of our new, more accurate, data-driven approach from $2.5 billion as of FY 2018 to $4.8 billion as of FY 2019. The overall physical condition of NNSA's infrastructure did not decline; in fact, the ratio of DM to RPV has decreased, which is an indication that infrastructure investments have been successful (Table 1).

Table 1

NNSA Deferred Maintenance (DM) as a Percentage of Replacement Plant Value (RPV)			
Metric	**FY 2017**	**FY 2018**	**FY 2019**
RN	$5.2B	$5.1B	$8.9B
DM	$2.5B	$2.5B	$4.8B
RPV	$52.4B	$55B	$124.3B
RN/RPV Ratio	9.92%	9.27%	7.16%
DM/RPV Ratio	4.80%	4.63%	3.85%

In response to GAO recommendations, the following information is provided to improve transparency in the budget. Table 2 below lists total DM at NNSA sites as well as the subset of DM on excess facilities and facilities to be excessed in 10 years.

Table 2

NNSA Deferred Maintenance (DM) as of FY 2019 (dollars in thousands)	
Total DM	4,784,703
DM on excess facilities	14,829
DM on facilities to be excessed in 10 years	380,792

Approximately 8 percent of NNSA DM is associated with facilities that are or will be excess in the next 10 years. As part of a prudent investment strategy, NNSA will intentionally not perform some of the maintenance and repair on facilities that are or soon will become excess. In addition, NNSA will eliminate DM on excess facilities via disposition.

NNSA annually screens excess facilities to identify the highest risks to mission, workers, the public, and the environment to support risk-informed decision making. Table 3 lists the highest-risk facilities.

Table 3

NNSA's Highest-Risk Excess Facilities[a]			
Site	**Facility**	**Year Built**	**Year Shut Down**
Y-12	Alpha 5, Building 9201-05	1944	1983
Y-12	Beta 4, Building 9204-04	1945	2007
Y-12	Building 9206	1944	1993
Y-12	Storage, Building 9720-22	1966	2012
Y-12	Warehouse/Industrial, Building 9720-17[b]	1956	2016
LLNL	Heavy Elements Facility, Building 251	1956	1995
LLNL	Livermore Pool-Type Reactor, Building 280	1956	1980
LLNL	MARS-E Beam, Building 175	1980	1999
LLNL	Rotating Target Neutron Source Facility, Building 292	1979	1987
LLNL	Pluto Project Testing and Fabrication Facility, Building 241	1960	2008
LANL	Ion Beam Facility, Building TA-3-0016	1953	1999
LANL	Plastics Building 16-0306	1954	2009

[a] The FY 2020 table included the Lab/Office Building 46-0001 at LANL, which was disposed of in August 2019.

[b] Facility contains radiological and/or hazardous contamination based on historical use.

Infrastructure and Operations
Funding (Non-Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Infrastructure and Operations				
Operating				
Operations of Facilities	870,000	900,000	1,014,000	+114,000
Safety and Environmental Operations	110,000	110,000	165,354	+55,354
Maintenance and Repair of Facilities	515,000	456,000	792,000	+336,000
Recapitalization				
Infrastructure and Safety	450,000	447,657	670,000	+222,343
Capability Based Investments	109,057	135,341	149,117	+13,776
Planning for Programmatic Construction (Pre-CD-1)	0	0	84,787	+84,787
Subtotal, Recapitalization	**559,057**	**582,998**	**903,904**	**+320,906**
Total, Operating	**2,054,057**	**2,048,998**	**2,875,258**	**+826,260**
Construction				
Programmatic Construction	985,842	1,087,444	1,386,319	+298,875
Mission Enabling Construction	47,953	15,000	122,000	+107,000
Total, Construction	**1,033,795**	**1,102,444**	**1,508,319**	**+405,875**
Total, Infrastructure and Operations	**3,087,852**	**3,151,442**	**4,383,577**	**+1,232,135**

Infrastructure and Operations
Funding (Comparable)

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Infrastructure and Operations				
Operating				
Operations of Facilities	870,000	900,000	1,014,000	+114,000
Safety and Environmental Operations	129,226	130,970	165,354	+34,384
Maintenance and Repair of Facilities	515,000	456,000	792,000	+336,000
Recapitalization				
Infrastructure and Safety	450,000	447,657	670,000	+222,343
Capability Based Investments	95,307	112,473	149,117	+36,644
Planning for Programmatic Construction (Pre-CD-1)	0	0	84,787	+84,787
Subtotal, Recapitalization	**545,307**	**560,130**	**903,904**	**+343,774**
Total, Operating	**2,059,533**	**2,047,100**	**2,875,258**	**+828,158**
Construction				
Programmatic Construction	1,032,842	1,137,444	1,386,319	+248,875
Mission Enabling Construction	47,953	15,000	122,000	+107,000
Total, Construction	**1,080,795**	**1,152,444**	**1,508,319**	**+355,875**
Total, Infrastructure and Operations	**3,140,328**	**3,199,544**	**4,383,577**	**+1,184,033**

Outyears for Infrastructure and Operations
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Infrastructure and Operations				
Operating				
Operations of Facilities	1,020,000	1,024,000	1,074,000	1,145,000
Safety and Environmental Operations	162,061	158,987	160,524	168,067
Maintenance and Repair of Facilities	795,000	798,000	800,000	803,000
Recapitalization				
Infrastructure and Safety	509,000	487,000	489,000	499,000
Capability Based Investments	146,066	148,504	151,204	152,182
Planning for Programmatic Construction (Pre-CD-1)	0	0	15,465	185,710
Subtotal, Recapitalization	**655,066**	**635,504**	**655,669**	**836,892**
Total, Operating	**2,632,127**	**2,616,491**	**2,690,193**	**2,952,959**
Construction				
Programmatic Construction	1,304,625	948,067	1,024,643	800,809
Mission Enabling Construction	8,000	110,000	70,000	86,000
Total, Construction	**1,312,625**	**1,058,067**	**1,094,643**	**886,809**
Total, Infrastructure and Operations	**3,944,752**	**3,674,558**	**3,784,836**	**3,839,768**

Infrastructure and Operations
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Infrastructure and Operations	
Operating	
Operations of Facilities: Increase to support 30 pits per year production at LANL and additional leased space at Kansas City to meet Life Extension Program (LEP) schedules.	**+114,000**
Safety and Environmental Operations: Reflects a budget structure change moving scope (primarily the Nuclear Materials Integration (NMI) program) from Strategic Materials Sustainment in Directed Stockpile Work (DSW). Additional increases support Long-Term Stewardship remedial activities associated with the Pantex groundwater contamination plume, which has migrated offsite and affected neighboring private properties. The installation of additional ground water remedial equipment and infrastructure on one of the offsite private properties, and ongoing equipment operations, is required to address the offsite groundwater impact, and thus meet the regulatory requirements noted in the 2018 Environmental Protection Agency (EPA) Five Year Review. Packaging increases to support pit production efforts at LANL.	**+34,384**
Maintenance and Repair of Facilities: Increase elevates funding above the FY 2019 level to address infrastructure risk and reduce deferred maintenance. The increase appears larger due to a one-year planned reduction in FY 2020 to reduce carryover balances. Increase supports current maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet an increasing mission demand. Additional funding provided to support 30 pits per year production at LANL and to implement the Nuclear Posture Review (NPR) infrastructure modernization plan.	**+336,000**
Recapitalization	
Infrastructure and Safety: Increase supports 30 pits per year production at LANL, meeting LEP schedules at Kansas City, new office and lab space, and the NPR infrastructure modernization plan.	**+222,343**
Capability Based Investments (CBI): The increase includes $23 million of new programmatic equipment recapitalization requirements at five sites that are being incorporated into a W87-1 LEP/CBI Interface Requirements Agreement (IRA). It also includes $2 million of growth in W80-4 LEP/CBI IRA commitments, and a $5 million increase to Kansas City National Security Campus (KCNSC) as programmatic equipment recapitalization as the site transitions from I&S to CBI funding. It also includes a shift of $7 million of recapitalization scope from Production Operations to CBI based on a recent clarification of programmatic equipment funding responsibilities.	**+36,644**

	FY 2021 Request vs FY 2020 Enacted
Planning for Programmatic Construction (Pre-CD-1): Supports a new subprogram to consolidate funding for the planning activities necessary to approve mission need and approve alternative selection and cost range for a portfolio of mission needs and related project proposals at multiple NNSA sites: The Power Sources Capability, SNL; Combined Radiation Effects Survivability Testing CREST, SNL; Next Generation LEP Component Fabrication Facility, LLNL; Kauai Test Facility Launch Sustainment, SNL-HI; Energetic Materials Characterization Facility, LANL. Examples of activities include the development of mission need and project requirements documents, cost estimates, analyses of alternatives, acquisition strategies, conceptual designs, and other important pre-CD-1 documentation.	**+84,787**
Total, Recapitalization	**+343,774**
Total, Operating	**+828,158**
Construction	
Programmatic Construction: Reflects an increase for U1a Complex Enhancements Project for mining and utility equipment; resumption of funding for the Transuranic Liquid Waste Facility and the TA-55 Reinvestment Project Phase-III at LANL after years of spending down carryover balances; and demolition of existing structures at the Lithium Processing Facility at Y-12. Funding also supports the design for the High Explosive Synthesis, Formulation, and Production at PX.	**+248,875**
Mission Enabling Construction: Reflects an increase for the transition to construction for Nevada National Security Site (NNSS) 138kV Power Transmission System Replacement, the LLNL EOC, and the SNL EOC.	**+107,000**
Total, Construction	**+355,875**
Total, Infrastructure and Operations	**+1,184,033**

Description

The Operations of Facilities program provides the funding required to operate NNSA facilities in a safe manner. Operations of Facilities is fundamental to achieving NNSA's plutonium, uranium, tritium, lithium, high explosives, and other mission objectives. It includes essential support such as water and electrical utilities, safety systems, lease agreements for facilities and land, emergency response services, and other critical systems. This program also provides resources for environment, safety, health, and quality (ESH&Q) costs associated with ensuring compliance with Federal, state, and local environmental, worker safety, and health regulations as well as applicable DOE Orders and Directives.

The Operations of Facilities program also funds waste management activities, including treatment, storage, and waste disposition of both hazardous and newly generated radiological wastes. It provides for the daily operations and staffing to ensure facilities, systems, equipment, and capabilities are available to meet mission requirements.

Starting in FY 2021, the program also supports the Safety Analytics, Forecasting, Evaluation, and Reporting (SAFER) platform that was developed as a data management capability to enable the conversion of currently available data (predominantly narrative reports) into useful information and visualizations for NNSA decision maker support. The platform was developed under the Nuclear Safety Research and Development program and has been scaled for enterprise-wide risk management applications. FY 2019-FY 2021 site allocations for the Operations of Facilities program are provided in Table 4 below.

Table 4

National Nuclear Security Administration Operations of Facilities Allocations by Site (Dollars in Thousands)							
Site	**FY 2019 Enacted**	**FY 2020 Enacted**	**FY 2021 Request**	**FY 2022 Request**	**FY 2023 Request**	**FY 2024 Request**	**FY 2025 Request**
Kansas City National Security Campus	82,000	78,000	110,000	110,000	107,000	107,000	110,000
Lawrence Livermore National Laboratory	77,000	75,000	80,000	82,000	85,000	88,000	91,000
Los Alamos National Laboratory	227,000	231,000	310,000	299,000	287,000	320,000	372,000
Nevada National Security Site	95,000	102,000	105,000	107,000	110,000	112,000	115,000
Pantex Plant	65,000	67,000	68,000	72,000	74,000	76,000	78,000
Sandia National Laboratories	119,000	130,000	126,000	128,000	130,000	133,000	136,000
Savannah River Site	92,000	93,000	92,000	96,000	100,000	103,000	106,000
Y-12 National Security Complex	104,000	99,000	109,000	114,000	116,000	118,000	119,000
Headquarters	9,000	25,000	14,000	12,000	15,000	17,000	18,000
TOTAL	**870,000**	**900,000**	**1,014,000**	**1,020,000**	**1,024,000**	**1,074,000**	**1,145,000**

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Operations of Facilities ($900,000,000)	**Operations of Facilities ($1,014,000,000)**	**Operations of Facilities (+$114,000,000)**
Supports base facility operations at: • KC in support of non-nuclear production. • LLNL to support plutonium, tritium and high explosive nuclear security enterprise missions. • LANL in support of plutonium production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations. • NNSS, including experimental capabilities. • Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the LEPs. • SNL, including environmental testing and microelectronics technologies facilities. • SRS, including tritium and other capabilities. • Y-12, for enriched and depleted uranium, lithium, and other special material operations.	Funding supports base facility operations at: • KC, supporting non-nuclear production. • LLNL, supporting plutonium, tritium and high explosive nuclear security enterprise missions. • LANL, supporting plutonium production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations. • NNSS, including experimental capabilities. • Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the LEPs. • SNL, including environmental testing and microelectronics technologies facilities. • SRS, including tritium and other capabilities. • Y-12, for enriched and depleted uranium, lithium, and other special material operations. • HQ, the SAFER platform to support enterprise-wide risk management applications.	• Increase to support 30 pits per year production at LANL and additional leased space at Kansas City to meet LEP schedules.

Description

The Safety and Environmental Operations program provides for the Department's Nuclear Criticality Safety Program (NCSP), the NNSA's Nuclear Safety Research and Development (NSR&D) subprogram, Packaging subprogram, Long Term Stewardship (LTS) subprogram, and Nuclear Materials Integration subprogram (NMI). Table 5 provides the funding breakout for these subprograms.

NCSP develops, maintains and disseminates the essential technical tools, training and data required to support safe, efficient fissionable material operations within DOE. This includes maintaining and operating the National Criticality Experiments Research Center (NCERC) at NNSS where critical and sub-critical experiments are conducted to provide tests of nuclear data, analytical codes, and to develop new measurement methods.

The NSR&D subprogram provides the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations. The NCSP and NSR&D subprograms are vital to ensuring nuclear safety is achieved across the NNSA enterprise.

The Packaging subprogram ensures safe transport of nuclear and radiological materials by providing off-site shipping container research and development, design, certification, recertification, test and evaluation, production and procurement, fielding and maintenance, decontamination, and disposal. It also provides off-site transportation authorization of shipping containers for nuclear materials and components supporting both the nuclear weapons program and nuclear nonproliferation and other mission objectives.

The LTS subprogram ensures environmental safety at remediated sites with residual contamination by conducting activities necessary to meet Federal and state environmental regulatory requirements identified in legally enforceable records of decision, cleanup agreements, and consent orders. The LTS subprogram operates and maintains remediation systems, maintains institutional and engineering controls, and monitors contaminant levels in the soil, groundwater, and surface water. LTS is required to meet environmental requirements associated with corrective actions at sites that are subject to the Resource Conservation and Recovery Act (RCRA) or cleanup requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The NMI subprogram maintains and operates the Nuclear Materials Management and Safeguards System (NMMSS), which tracks and accounts for nuclear materials at DOE and Nuclear Regulatory Commission-licensed sites, and the Nuclear Materials Inventory Assessment (NMIA) that manages use and demand of accountable nuclear materials by DOE and NNSA laboratories and production plants. In addition, NMI integrates management, consolidation and coordinates disposal of excess accountable nuclear materials. NMI ensures that both older, unclaimed materials as well as materials currently in use have a viable disposition path. NMI monitors demand and consumption of nuclear materials and identifies future shortages. NMI addresses these potential shortages through focused projects with National Laboratories and educational institutions. NMI collaborates with the counterterrorism and intelligences communities to ensure critical materials are available for the nuclear forensics community. NMI oversees and stewards nuclear materials managers at DOE/NNSA sites.

Table 5

National Nuclear Security Administration Safety and Environmental Operations Subprograms (Dollars in Thousands)							
Subprogram	**FY 2019 Enacted**	**FY 2020 Enacted**	**FY 2021 Request**	**FY 2022 Request**	**FY 2023 Request**	**FY 2024 Request**	**FY 2025 Request**
Nuclear Criticality Safety Program	26,887	28,474	29,126	29,648	29,926	30,318	30,947
Nuclear Safety Research and Development	6,003	4,954	3,704	3,782	3,861	3,942	4,025
Packaging	26,857	23,463	27,831	26,685	26,507	27,979	27,465
Long Term Stewardship	50,253	53,109	78,283	75,086	71,374	70,497	77,363
Nuclear Materials Integration[a]	19,226	20,970	26,410	26,860	27,319	27,788	28,267
TOTAL	**129,226**	**130,970**	**165,354**	**162,061**	**158,987**	**160,524**	**168,067**

[a] Nuclear Materials Integration was funded out of Strategic Materials Sustainment under Directed Stockpile Work in FY 2019 and FY 2020.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Safety and Environmental Operations ($130,970,000)	**Safety and Environmental Operations ($165,354,000)**	**Safety and Environmental Operations (+$34,384,000)**
Nuclear Criticality Safety Program ($28,474,000)	**Nuclear Criticality Safety Program ($29,126,000)**	**Nuclear Criticality Safety Program (+$652,000)**
• Provides technical infrastructure, expertise, and experimentation capabilities for the DOE encompassing the following technical elements: Nuclear Data, Analytical Methods, Training & Education, Information Preservation and Dissemination, and Integral Experiments. Integral experiments included the NCSP's NCERC to ensure criticality safety capabilities are adequate for the DOE mission.	• Provides technical infrastructure, expertise, and experimentation capabilities for the DOE encompassing the following technical elements: Nuclear Data, Analytical Methods, Training & Education, Information Preservation and Dissemination, and Integral Experiments. Integral experiments included the NCSP's NCERC to ensure criticality safety capabilities are adequate for the DOE mission.	• No significant changes.
Nuclear Safety Research and Development ($4,954,000)	**Nuclear Safety Research and Development ($3,704,000)**	**Nuclear Safety Research and Development (-$1,250,000)**
• Conduct projects to provide the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations.	• Conduct projects to provide the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations.	• Decrease reflects the completion of the first phase of the SAFER pilot development and transition to Operations of Facilities to scale up to enterprise level.
Packaging ($23,463,000)	**Packaging ($27,831,000)**	**Packaging (+$4,368,000)**
• Refurbish, recondition, maintain, and certify containers to ensure availability to support the nuclear weapons mission.	• Refurbish, recondition, maintain, replace and certify containers to ensure availability to support the nuclear weapons mission.	• Increase supports pit production efforts at LANL.
Long Term Stewardship ($53,109,000)	**Long Term Stewardship ($78,283,000)**	**Long Term Stewardship (+$25,174,000)**
• Continue to support LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, and SNL. • LTS required activities include: treating contaminated ground water; monitoring surface/ground water and soils; maintaining	• Continues to support LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, and SNL. • LTS required activities include: treating contaminated ground water (including the Pantex offsite groundwater contamination	• Increase reflects remedial activities associated with the Pantex groundwater contamination plume, which has migrated offsite and affected neighboring private properties. The installation of additional ground water remedial equipment and infrastructure on one of the offsite private properties, and ongoing equipment operations,

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
landfill remedies; performing CERCLA and RCRA 5-year remedy reviews of selected cleanup remedies; working with the Environmental Protection Agency regions and various states to meet post-completion regulatory cleanup and reporting requirements; and working in concert with other federal agencies, states, and affected stakeholders to execute LTS activities in a cost effective, compliant, and safe manner consistent with end states.	plume); monitoring surface/ground water and soils; maintaining landfill remedies; performing CERCLA and RCRA 5-year remedy reviews of selected cleanup remedies; working with the Environmental Protection Agency regions and various states to meet post-completion regulatory cleanup and reporting requirements; addressing potential vapor intrusion studies and remedial activities, and working in concert with other federal agencies, states, and affected stakeholders to execute LTS activities in a cost effective, compliant, and safe manner consistent with end states.	is required to address the offsite groundwater impact, and thus meet the regulatory requirements noted in the 2018 EPA Five Year Review.
Nuclear Materials Integration ($20,970,000)	**Nuclear Materials Integration (+$26,410,000)**	**Nuclear Materials Integration (+$5,440,000)**
• Maintain and operate the NMMSS for the United States Government. • Process sodium bonded fuels at INL originally used at SNL. • Continue activities to recover Pu-244 and other national asset isotopes from Mk-18a targets in storage at SRS. • Provide long-term forecasting, planning and analysis of materials. • Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA nuclear security enterprise. • Continue partnership with the NRC to operate and maintain NMMSS. • Continue activities to remove plutonium-bearing mixed oxide fuel.	• Maintain and operate the NMMSS for the United States Government. • Process sodium bonded fuels at INL originally used at SNL. • Plan and implement activities to recover Pu-244 from the Mk-18a target assemblies at SRS. • Treatment, consolidation, and disposal of inactive actinides no longer needed for nuclear security missions at ORNL, LANL, and Y-12. • Assume responsibility for ensuring program direction and management of nuclear materials is effectively executed at each of the site offices. • Provide long-term forecasting, planning and analysis of materials. • Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA nuclear security enterprise. • Continue activities to remove plutonium-bearing mixed oxide fuel.	• The increase reflects the reallocation of $5 million from the MR&R program to NMI to continue support for the Material Managers at the sites currently provided to NMI.

Description

The Maintenance and Repair of Facilities program provides direct-funded maintenance activities across the NNSA enterprise for the recurring day-to-day work required to sustain and preserve NNSA facilities and equipment in a condition suitable for their designated purpose. These efforts include predictive, preventive, and corrective maintenance activities to maintain facilities, property, assets, systems, roads, equipment, and vital safety systems. This program also funds maintenance of excess facilities (including high-risk excess facilities) necessary to minimize the risk posed by those facilities prior to disposition.

Maintenance and Repair of Facilities is prioritized within an enterprise risk management framework based on mission needs; probability of failure of a system or a component; and risk determination with regard to safety, security, and environmental requirements. Investments focus on those structures, systems, and components that are considered essential to the national security mission. FY 2019-FY 2025 Infrastructure and Operations site allocations for direct-funded maintenance are provided in Table 6 below.

This program also funds the Roof Asset Management Program (RAMP) and the Cooling and Heating Asset Management Program (CHAMP). RAMP provides a dedicated approach to managing roofing assets through a single prioritized list of roofing needs across the nuclear security enterprise. The benefits of this approach enable the implementation of standard industry processes and best practices in the management of the roofing portfolio at a corporate level. Efficiencies are achieved by centralized procurement through leveraged buying power and long-term solutions instead of short-term repairs. The successful RAMP methodology has been expanded to other common components/systems under the Asset Management Program (AMP). NNSA implemented CHAMP pilots in FY 2016, with full implementation of the program in FY 2017. Other systems will be analyzed as possible AMPs to achieve additional efficiencies.

Table 6

National Nuclear Security Administration
Infrastructure and Operations Direct Funded Maintenance and Repair of Facilities Allocations by Site
(Dollars in Thousands)

Site	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Kansas City National Security Campus	29,000	24,000	34,000	34,000	34,000	35,000	35,000
Lawrence Livermore National Laboratory	24,000	16,000	36,000	36,000	36,000	36,000	37,000
Los Alamos National Laboratory	97,000	82,000	153,000	159,000	165,000	175,000	179,000
Nevada National Security Site	34,000	38,000	65,000	65,000	65,000	65,000	65,000
Pantex Plant	96,000	82,000	125,000	125,000	125,000	125,000	125,000
Sandia National Laboratories	11,000	19,000	46,000	46,000	46,000	46,000	46,000
Savannah River Site	34,500	31,000	55,000	56,000	56,000	56,000	56,000
Y-12 National Security Complex	100,000	95,000	132,000	133,000	133,000	134,000	134,000
Enterprise Acquisitions*	89,500	69,000	146,000	141,000	138,000	128,000	126,000
TOTAL	**515,000**	**456,000**	**792,000**	**795,000**	**798,000**	**800,000**	**803,000**

* The Maintenance and Repair of Facilities allocation under “Enterprise Acquisitions” includes funding for Asset Management Programs, which achieve economies of scale and maintenance standardization for critical building systems that are common across the enterprise (e.g. roofs, HVAC) and to quickly respond to emergent unforeseeable issues. Funding is distributed to the sites during execution, which is consistent with industry best practices.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Maintenance and Repair of Facilities ($456,000,000)	**Maintenance and Repair of Facilities ($792,000,000)**	**Maintenance and Repair of Facilities (+$336,000,000)**
• KCNSC: maintenance of equipment and tenant improvement equipment. • LLNL: maintenance activities at Contained Firing Facility, Superblock, HEAF, machine shops, and waste management facilities. • LANL: maintenance activities at PF-4, CMR, DARHT, LANSCE, Beryllium, waste management, radiological laboratory, and tritium facilities. • NNSS: funded maintenance of JASPER, BEEF, DAF, and U1a. • Pantex: Bays and Cell maintenance, emerging requirements, and support for high explosives activities. • SNL: maintenance activities at MESA, METF, and Tonopah. • SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems. • Y-12: maintenance for uranium and lithium operations. • Enterprise-wide: RAMP and CHAMP centralized procurement activities to increase buying power and accelerate repairs of systems/components that are common across the NNSA enterprise. • Provides for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition.	• KCNSC: maintenance of equipment and tenant improvement equipment. • LLNL: maintenance activities at Contained Firing Facility, Superblock, HEAF, machine shops, and waste management facilities. • LANL: maintenance activities at PF-4, CMR, DARHT, LANSCE, Beryllium, waste management, radiological laboratory, and tritium facilities. • NNSS: funded maintenance of JASPER, BEEF, DAF, and U1a. • Pantex: Bays and Cell maintenance, emerging requirements, and support for high explosives activities. • SNL: maintenance activities at MESA, METF, and Tonopah. • SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems. • Y-12: maintenance for uranium and lithium operations. • Enterprise-wide: RAMP and CHAMP centralized procurement activities to increase buying power and accelerate repairs of systems/components that are common across the NNSA enterprise. • Provides for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition.	• Increase supports current maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet an increasing mission demand. Additional funding provided to support 30 pits per year production at LANL and to implement the Nuclear Posture Review (NPR) infrastructure modernization plan.

Description

The Recapitalization program, key to modernizing NNSA infrastructure, prioritizes investments to improve the condition and extend the design life of the structures, capabilities, and/or systems. The Infrastructure and Safety (I&S) subprogram improves the reliability, sustainability, productivity, and efficiency of NNSA's infrastructure to reduce overall operating costs. It also reduces safety, environmental, and program risk associated with facilities and systems that are often well beyond their design life. The Capability Based Investments (CBI) subprogram is an investment strategy for managing risks in existing capabilities by prioritizing investments to upgrade and improve the reliability, efficiency, and capability of programmatic equipment and associated infrastructure to meet mission requirements.

The I&S subprogram includes costs for minor construction projects, capital equipment, projects that are expensed, and Other Project Costs (OPC) for mission enabling infrastructure line item construction projects. I&S also funds deactivation and disposal of excess infrastructure, including stabilization and risk reduction activities at high-risk excess facilities, resulting in surveillance and maintenance cost avoidance and reduced risk to workers, the public, the environment, and programs. Recapitalization projects incorporate energy conservation measures to the greatest extent practicable in support of sustainability and energy performance improvements.

The CBI subprogram implements multi-year projects and strategies to sustain, enhance, or replace key programmatic capabilities through focused investments supporting core programmatic requirements across the enterprise. These investments address needs beyond any single facility, campaign, or weapon system and are essential to achieving program mission objectives. Over the years, these science and manufacturing capabilities have been lost or degraded due to aging, broken, or outdated equipment and supporting systems. To support ongoing and future Defense Programs (DP) weapons activities, CBI invests in projects to reduce risk to the mission and ensure needed capabilities are available for LEPs and other mission work.

CBI projects include minor construction projects, capital equipment projects, and some projects that are expensed. The CBI subprogram also funds OPCs for two programmatic line item projects at LANL.

The Planning for Programmatic Construction subprogram consolidates the early planning activities necessary to reach CD-1 in the DOE Capital Acquisition Process for a portfolio of project proposals that are under evaluation by the NNSA. Each of these proposals will require funding in this line to complete the following deliverables prior to achieving Critical Decision 0, Approval of Mission Need: a Mission Need Statement, a CD-0 Rough Order of Magnitude Estimate, and a Program Requirements Document. In addition, projects with an estimated cost greater than $750 million require an Independent Cost Review and nuclear facilities require a safety-in-design document. Post-approval of the Mission Need, a Project Data Sheet is developed to be used for requesting project engineering and design funds. Following Mission Need Approval, funding for the following deliverables are required prior to achieving Critical Decision 1, Approval of Alternative Selection and Cost Range: Acquisition Strategy, Preliminary Project Execution Plan with a Tailoring Strategy (if required), Risk Management Plan, development of a Conceptual Design, Conceptual Design Report, an Analysis of Alternatives, Preliminary Hazard Analysis Report, Integrated Safety Management Plan, establishment of a Quality Assurance Program, National Environmental Policy Act Strategy, Environmental Compliance Strategy, updated Project Data Sheet, and Preliminary Security Vulnerability Assessment. In addition, projects with an estimated cost greater than $100 million require an Independent Cost Estimate and/or an Independent Cost Review. Furthermore, projects with an estimate cost greater than $750 million require the following: a Design Management Plan, a Technology Readiness Assessment, and a Technology Maturation Plan if necessary. Finally, nuclear facilities require the following: Code of Record, Safety Design Strategy, Independent Project Review, Conceptual Safety Design Report, and a Safety Review Letter.

The NNSA will complete the activities listed above (as appropriate based on the outcome of each step in the acquisition process) for the mission needs and project proposals described in the table below using the funding request in the Planning for Programmatic Construction (Pre-CD-1) line:

Project Proposals for Evaluation in 2021 (Planning for Programmatic Construction (Pre-CD-1))		
Site	**Project Proposal**	**Preliminary Mission Need Description**
SNL	Power Sources Capability	Power Sources (PS) is a unique capability to the Nuclear Security Enterprise (NSE) that requires a complex, highly-specialized operational environment to develop and provide primary, thermal, and conversion batteries with stringent reliability and performance requirements. All legacy, modernization programs, and future planned nuclear weapon systems require PS capabilities for lifecycle activities. Weapon delivery schedules are at risk due to failing and inadequate facilities at SNL along with an increasingly unreliable supplier base that negatively impact the development and production of PS products.
SNL	Combined Radiation Effects Survivability Testing (CREST)	The CREST Project will provide an advanced radiation environmental test capability to fill a mission gap for R&D, qualification, and certification data in combined survivability/threat environments as described in the NPR. The existing capability can test for the effects of a combination of neutron, gamma, and blast radiation environments but cannot produce the required damaging synergistic effects as a function of time. In addition, existing operations do not provide sufficient capacity to meet mission needs. The current facility was built almost 60 years ago, does not meet modern codes or standards, and maintenance downtime is limiting operational capacity. These deficiencies in the existing capability pose significant risk to DP's missions and programs. The demand is expected to increase significantly as the NNSA Stockpile Life Extension Plan (SLEP) is implemented.
LLNL	Next Generation LEP R&D Component Fabrication Facility	LLNL fabricates Nuclear Explosive Package device components to meet Design Agency (DA) functions such as integrated weapon experiments, hydrodynamic and environmental Stockpile to Target sequence experiments, sub-assembly testing, and evaluations to inform weapon annual assessments and Life Extension program (LEP) certification. Experiments designed to validate the evolving physical understanding of these systems pushes the ability to manufacture components beyond those required by normal production activities with high-precision machining and part inspection of classified parts that include radiological materials. DP LEP and stockpile demands on existing machine shops have exceeded LLNL's current fabrication capacities. As the stockpile modernization programs drive major increases in experimentally based development work, it is critical that manufacturing support also be made available to match the added demand.
SNL-HI	Kauai Test Facility Launch Sustainment	KTF provides key development, test, and evaluation capabilities essential to nuclear deterrence and broader national security missions. Utilization of KTF capabilities is expected to increase in order to support the HOT SHOT program. HOT SHOT provides a test platform with a high-risk tolerance for new technologies that can duplicate many of the combined launch environments needed to qualify components, technologies, and subsystems. This supports NNSA's goal to accelerate development cycles and shorten the duration of future weapons modernization programs. Current challenges at KTF include: erosion of facility materials due to their age and tropical environment; degradation of the semi-trailer cargo boxes converted to offices to support launch staff; continued reliability of available clean power during launch sequence facilitates continued growth of the complex; and accumulation of shade/debris in the fallout protection canopy that creates fire hazards.
LANL	Energetic Materials Characterization Facility	A full range of high explosive (HE) capabilities are essential to on-going and future support of the nation's nuclear weapons stockpile. EMC capabilities include explosive synthesis and formulation, analytical chemistry and physical characterization, sensitivity and safety testing, mechanical characterization and thermal analysis, and energetic materials engineering and manufacturing. The EMC work currently is done in 18 separate structures at TA-09 and TA-22, built between 1948 and 1962, prone to sudden and unexpected failures, and that do not meet current design and safety

Project Proposals for Evaluation in 2021 (Planning for Programmatic Construction (Pre-CD-1))		
Site	**Project Proposal**	**Preliminary Mission Need Description**
		standards. LANL's ability to support these mission needs is increasingly compromised by facility-related failures and inefficiencies.
SNL	Heterogeneous Integration Facility	Trusted and strategic radiation-hardened microelectronics are required to ensure the safety, security, reliability, and effectiveness of the Nation's nuclear deterrent. NNSA's directive to Sandia to extend MESA's capabilities through at least 2040 requires sustained investments in operations, tools, equipment, facilities, and infrastructure. Sandia is working with NNSA to develop and fund an ongoing investment strategy to address some of these needs through an Extended Life Program (ELP). However, the limitations of the existing facilities (e.g., floor loading limits, vertical space, and aging infrastructure), together with the current trends in industry tools and products (increasing size and weight and higher cleanroom space requirements) results in residual risks that cannot be fully mitigated through the ELP.

Tables 7 and 8 show the plans for Recapitalization projects to be executed with FY 2021 funding based on the status of enterprise infrastructure as of February 2020. This plan may need to be updated before the FY 2021 execution year to respond to changing infrastructure conditions and requirements.

Table 7

National Nuclear Security Administration Infrastructure and Safety Planned FY 2021 Recapitalization Projects - As of February 2020		
Site	**Project Name**	**FY 2021 Allocation ($K)**
KCNSC	Building 2 Additional Clean Room Line Room Modifications	525
	Building 2 Inspection & Non-Destructive Testing Revitalization (Minor Construction)	3,647
	Building 2 Assembly & Electrical Fabrication (AEF) Gas Transfer Revitalization (Minor Construction)	3,371
	Building 2 Electronics, Testing, Machining, & Surfaces Revitalization (Minor Construction)	8,688
	Building 23 Tool Room & Model Shop Machining Revitalization (Minor Construction)	12,694
	Building 23 Inspection, Mechanical Assembly, & Testing Installation (Minor Construction)	6,553
	Building 23 Classified Space Conversion & Electrical Testing, Weld Lab, & Mechanical Assembly Buildout Portfolio (Minor Construction)	13,440
Subtotal, Kansas City National Security Campus		**48,918**
LLNL	New Nondestructive Evaluation Building (Minor Construction)	13,500
	Building 321 Radiological & Material Characterization Capabilities Revitalization - Design (Minor Construction)	1,500
	Building 239 High Energy X-ray Radiography Capability Revitalization (Minor Construction)	6,750
	Building 321N Variable Air Control Replacement (Minor Construction)	6,500
	Building 321 Air Handling Unit & Electrical Replacements & Upgrade (Minor Construction)	6,400
	New Weapons LEP Office Building (Minor Construction)	16,150
	Buildings 832 & 836 Environmental Test & Materials Storage Facilities Upgrades (Minor Construction)	8,200
Subtotal, Lawrence Livermore National Laboratory		**59,000**
LANL	TA-15-0534 DARHT Vessel Prep Facility HVAC Upgrade (Minor Construction)	1,828
	New TA-15 DARHT Hydro Vessel Repair Facility (Minor Construction)	2,800
	TA-15 DARHT Electrical Circuit Upgrade (Minor Construction)	13,909

National Nuclear Security Administration Infrastructure and Safety Planned FY 2021 Recapitalization Projects - As of February 2020		
Site	**Project Name**	**FY 2021 Allocation ($K)**
	PF-4 Area 200 Facility Wet Vacuum Replacement	6,384
	PF-4 High Pressure Water Supply Feed Separation (Minor Construction)	10,227
	TA-53-0003 (LANSCE) Fire Suppression System in Accelerator Tunnel Installation – Sectors F & H	1,966
	LANSCE 805 Low Level Radio Frequency & Cavity Field Control Replacement	11,800
	PF-4 Power and Communications Systems Upgrade (Minor Construction)	10,713
	CMR Initial Projects to Prepare for Closure Portfolio	1,560
	TA-41 Disposition (41-0004, 41-0007)	20,770
Subtotal, Los Alamos National Laboratory		**81,957**
NNSS	New DAF Water Storage Tank (Minor Construction)	8,000
	New U1a Mission Technical Support Facility (Minor Construction)	12,550
	New U1a Refuge Station Build-Out (Minor Construction)	6,000
	New Mercury Building 23-462 (Minor Construction)	12,550
	Disposition Buildings 01-101 & 01-102	1,300
Subtotal, Nevada National Security Site		**40,400**
PX	Bay & Cell RAMS, FDS, & Lead-In Improvements Portfolio	40,267
	New Advanced Fabrication Facility (Minor Construction)	16,000
	East Interconnect Replacement	10,000
Subtotal, Pantex Plant		**66,267**
SNL	SNL/CA Building C919 Site Main Switchyard Controls System Replacement (Minor Construction)	2,000
	SNL/CA Liquid Effluent Control System (LECS) Upgrade for C941, C942, & C943 (Minor Construction)	1,500
	Building 894 Dehumidifier Replacements (Minor Construction)	9,000
	Building 894 Fire Suppression System Upgrade (Minor Construction)	1,700
	TA-1 Substation 35 Replacement – Design/Long-Lead (Minor Construction)	3,500
	TA-IV District Chilled Water Expansion – Design (Minor Construction)	1,500
	High-G Surveillance & Testing Capability Addition (WETL/Pantex) – Design (Minor Construction)	600
	KAFB Redundant Gas Line Replacement	3,650
	New Explosives Manufacturing Science and Technology (EMSAT) Facility (Minor Construction)	16,000
Subtotal, Sandia National Laboratories		**39,450**
SRS	HANM Obsolete Oxygen Monitor Replacement Portfolio	5,395
	Reservoir Finishing Relocation from 234-H to 233-H (Minor Construction)	3,900
	233-H 70 Ton Process Chiller System Replacement	6,611
	234-7H Fire Suppression Installation in Hoods (Minor Construction)	750
	236-H Disposition	4,400
Subtotal, Savannah River Site		**21,056**
Y-12	Building 9215/9998 Complex Criticality Accident Alarm System (CAAS) Replacement	15,600
	Development Facility Acquisition and Modification (Minor Construction)	16,000
	Building 9720-05 CAAS Replacement – Design	1,253
	Building 9702-05 Supply & Exhaust Fans Replacement	7,704
	Building 9215 Supply Fan SF-205 Revitalization (Minor Construction)	5,223
	Building 9995 Elevator #2 Revitalization (Minor Construction)	3,792

National Nuclear Security Administration Infrastructure and Safety Planned FY 2021 Recapitalization Projects - As of February 2020		
Site	**Project Name**	**FY 2021 Allocation ($K)**
	Building 9201-03 Elevator #1 Revitalization (Minor Construction)	2,189
	Failed Utility & Power Pole Replacements (Grids A2, A3, B2, F2, & F3)	4,304
	Building 9212 North Potable Water Laterals Replacement (Minor Construction)	3,510
	Building 9998 Supply Fan H2-1 Revitalization	3,887
	Building 9204-2E Transformers 814 & 815 Replacement (Minor Construction)	6,560
	Building 9204-2 Concrete Floor Revitalization – Wet Chemistry Areas	3,000
	Building 9401-03 (Steam Plant) Abatement	3,080
	Building 9723-14 Disposition	3,700
	Building 9201-05 Ancillary Facility Disposition (9416-14, 9803, 9811-03, 9976, 9983-HF, 9622, 9404-20, 9422-13)	4,000
Subtotal, Y-12 National Security Complex		**83,802**
	Planning, Assessments, & Infrastructure Management Tools	**61,407**
	Standardized Acquisition & Recapitalization (STAR) Office & Light Lab Initiative (Minor Construction)	**164,000**
	Construction Other Project Costs (OPC)	**3.743**
Grand Total, Infrastructure and Safety		**670,000**

Table 8

Capabilities Based Investments Planned FY 2021 Recapitalization Projects - As of February 2020		
Site	**Project Name**	**FY 2021 Allocation ($K)**
KC	MeV CT System	2,290
	Development Laboratory Modernization	750
	Special Application Machining Modernization	2,200
	Gas Transfer Systems Production Modernization	500
	Rubber & Plastics Production Modernization	1,060
	Analytic Lab Equipment	1,000
	Assembly and Electrical Fabrication Equipment	3,770
	LDI Laser	1,430
Subtotal, Kansas City National Security Campus		**13,000**
LLNL	Applied Material Engineering Consolidation	8,000
	LEP Equipment Capabilities Replacement Project	7,400
	Stockpile to Target Sequence Environmental Capabilities	3,730
	Expanded Flash X-Ray System	2,200
	Detonation and Dynamic Diagnostic Deployment	1,300
	Site 300 Firing and Control System Modernization	500
	Vulnerability and Hardening Test Capability	5,300
	Static and Dynamic Enhanced Radiography	2,000
Subtotal, Lawrence Livermore National Laboratory		**30,430**
LANL	DARHT Reliability Capability Upgrades	540
	Uranium Foundry Modernization	5,110
	Fabricate pRad Outer Vessel	4,080
	Optics Room Equipment at DARHT	3,250
	PF-4 Trolley Bucket Replacement	2,530
Subtotal, Los Alamos National Laboratory		**15,510**
NNSS	HXR Synchrotron Radiation Source	1,500
	Material Test Lab Upgrade	1,600
	Area 6 Equipment	2,500
	U1a Diagnostics Control Connectivity	3,000
	NDSE Digital Recorder Capability	1,000
	U1a Critical Diagnostic Capability Modernization	1,120
Subtotal, Nevada National Security Site		**10,720**
PX	Install 2 each CMMs 12-86/12-116	650
	Install 2 CMMs - 12-52	150
	Replace Environmental Chambers (4), skids and controllers 12-94	2,000
	Refresh SNM Component Requalification Facility (SNMCRF) 12-116	2,330
	Mass Spectrometer Replacement - 12-21	3,000
	Refresh Vacuum Chamber - Bay 16	2,500
Subtotal, Pantex Plant		**8,130**
SNL	Major Environmental Test Facilities Upgrades	2,010
	High-G Surveillance Testing Centrifuge (WETL, at Pantex)	4,800
	Ongoing Experimental Test Capabilities Sustainment	9,600
Subtotal, Sandia National Laboratories		**16,410**
SRS	Function Test Station Laser Replacement	950
	FTS Programmable Controller System Upgrade	750
	Additional Programmatic Equipment Recapitalization - Mass Spec #1	4,000
	Replace Film Radiography in Finishing Gloveboxes, FL 4&5	1,800

Capabilities Based Investments Planned FY 2021 Recapitalization Projects - As of February 2020		
Site	**Project Name**	**FY 2021 Allocation ($K)**
Subtotal, Savannah River Site		**7,500**
Y-12	Metal Fabrication	4,500
	15 MeV Linatron	4,000
	CT Part Positioners	4,000
	Nuclear Magnetic Resonance (NMR)	1,600
	Establish Electropolishing Capability	2,500
	Vapor Degreaser/ Ultrasonic Cleaning Station	2,500
	Microwave Digestion Equipment	300
Subtotal, Y-12 National Security Complex		**19,400**
	Programmatic Construction Line Item Other Project Costs (OPCs) TA-55 and TLW at LANL	3,000
	Corporate Reserves, Taxes and Assessments	4,474
	CBI Planning, Design, Program Management	20,543
Grand Total, Capability Based Investments		**149,117**

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Infrastructure and Safety ($447,657,000)	**Infrastructure and Safety ($670,000,000)**	**Infrastructure and Safety (+$222,343,000)**
• Provides funds for needed investments in obsolete/aging facilities and infrastructure to improve safety, reliability, and working conditions.	• Table 7 contains the current FY 2021 project plan as of February 2021. The table includes advanced funding for design of several complex, high priority projects for future year execution. Recapitalization funds are allocated in accordance with planned priorities but retain the flexibility to adjust efforts to address emerging changes in priorities and unplanned failures.	• Increase supports 30 pits per year production at LANL, meeting LEP schedules at Kansas City, new office and lab space, and the NPR infrastructure modernization plan.
Capability Based Investments ($112,473,000)	**Capability Based Investments ($149,117,000)**	**Capability Based Investments (+$36,644,000)**
• CBI continues to provide targeted, strategic investments for life-extension and modernization of enduring requirements needed to sustain Defense Program's capabilities. • CBI will fund OPCs for several ongoing line item construction projects, and for development of several new programmatic line item projects.	• Table 8 contains the current FY 2021 project plan as of February 2020. Recapitalization funds are allocated in accordance with planned priorities but retain the flexibility to adjust efforts to address emerging changes in priorities and unplanned programmatic equipment failures.	• The increase includes $23 million of new programmatic equipment recapitalization requirements at five sites that are being incorporated into a W87-1 LEP/CBI Interface Requirements Agreement (IRA). It also includes $2 million of growth in W80-4 LEP/CBI IRA commitments, and a $5 million increase to KCNSC as programmatic equipment recapitalization at that site transitions from I&S to CBI funding. It also includes a shift of $7 million of recapitalization scope from Production Operations to CBI based on a recent clarification of programmatic equipment funding responsibilities.
Planning for Programmatic Construction (Pre-CD-1) ($0)	**Planning for Programmatic Construction (Pre-CD-1) ($84,787,000)**	**Planning for Programmatic Construction (Pre-CD-1) (+$84,787,000)**
• Not applicable.	• Table lists the seven project proposals that will have pre-CD-1 and pre-CD-0 planning activities performed in 2021. Note that only the Power Sources and CREST project proposals are expected to reach CD-1 review in 2021. The	• Supports a new subprogram to and consolidates funding for the planning activities necessary to approve mission need and approve alternative selection and cost range for a portfolio of potentially important mission needs and related

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	other projects listed will perform pre-CD-0 activities with follow-on activities in future years. • The NNSA will evaluate these project proposals to determine the best approach to support modernization planning necessary to produce, develop, and test weapons materials and components.	project proposals at multiple NNSA sites: The Power Sources Capability, SNL; CREST, SNL; Next Generation LEP Component Fabrication Facility, LLNL; Kauai Test Facility Launch Sustainment, SNL-HI; Energetic Materials Characterization Facility, LANL. Examples of activities include the development of mission need and project requirements documents, cost estimate, funding for analysis of alternatives, acquisition strategies, conceptual designs, and other important pre-CD-1 documentation.

The Construction subprogram plays a critical role in revitalizing the nuclear security enterprise including the nuclear weapons manufacturing and research and development infrastructure. Investments from this subprogram will improve the responsiveness and utility of the infrastructure and its technology base. The subprogram is focused on two primary objectives: (1) identification, planning, and prioritization of the projects supporting national security objectives, particularly the weapons programs, and (2) development and execution of these projects within approved cost and schedule baselines. Table 8 shows the breakout of funding by line item.

The UPF at Y-12 consists of processing capabilities for enriched uranium casting, oxide production, and salvage and accountability operations. The UPF project includes a Main Process Building (MPB), a Salvage and Accountability Building (SAB), a Mechanical Electrical Building (MEB), Process Support Facilities (PSF), and various other support facilities. Constructing multiple facilities allows each facility to be designed and constructed with a level of safety and security appropriate for the hazards of each operation. FY 2021 funding will be used for construction of the MPB, SAB, and PSF subprojects. NNSA is committed to constructing UPF for no more than $6,500,000,000 by the end of 2025. UPF has been on budget and on schedule for seven consecutive years. This commitment is predicated on receiving consistent and stable funding as requested to support the approved project baseline.

Under the CMRR project, FY 2021 construction funding supports the RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI1) subprojects, which both received baseline approval in FY 2017. Pre-conceptual design activities for the next two subprojects, PF-4 Equipment Installation, Phase 2 (PEI2) and the Re-categorization of RLUOB to Hazard Category 3 (RC3) are planned to continue in FY 2021.

FY 2021 funding for the Transuranic Liquid Waste Facility (TLW) at LANL will be used to complete construction. The project is reviewing the completed design and safety basis documents. The TLW project replaces the obsolete TRU liquid waste treatment capability by establishing a more reliable TLW processing facility designed to treat 29,000 liters of liquid TRU wastewater per year. The existing TRU liquid waste capability is part of the RLWTF that was constructed in 1963. The inability to replace the existing and degraded facility that treats liquid waste generated at the Plutonium Facility (PF)-4 in a timely manner poses significant risks of shutting down PF-4 operations, negatively impacting pit production milestones and other PF-4 missions.

FY 2021 funding for the TA-55 Reinvestment Project, Phase 3 (TRP-III) at LANL will be used to support the design and construction of the fire-alarm panels replacement at Plutonium Facility (PF)-4. Due to the age of the existing fire alarm systems, spare-parts are no longer easily available. The fire-alarm panels support the critical operations and safety systems within PF-4, and if not replaced in a timely manner, could severely impact pit production milestones and other PF-4 missions.

FY 2021 funding for the Tritium Finishing Facility (TFF) project at the Savannah River Site will be used to start the preliminary design and engineering. The TFF project relocates critical capabilities currently housed in the 60-year old H-Area Old Manufacturing (HAOM) facility. The infrastructure of this building has deteriorated and is well beyond expected end-of-life. These critical capabilities, housed in deteriorating facilities, create a substantial risk to the enduring Tritium Mission. Infrastructure failures, mainly electrical systems, have increased the frequency of production delays and led to increased safety, security, maintenance and operating costs. The new facilities, within the TFF project, will be built to the new and more stringent construction standards currently in effect throughout the DOE and NNSA complex.

FY 2021 funding is requested for the Lithium Processing Facility (LPF) project at the Y-12 National Security Complex. The LPF is replacing the lithium operations capabilities that have historically been performed in 9204-2. The LPF will include purification and processing operations in a new facility built to current standards so lithium production operations in 9204-2 can be ceased.

FY 2021 funding is requested to continue construction of the U1a Complex Enhancements Project (UCEP) at NNSS. This project will deliver a new underground laboratory that will enable new experimental and diagnostic capabilities and an increased operational cadence of subcritical weapons experiments using plutonium.

FY 2021 funding is requested to support the construction of the High Explosive Science and Engineering (HE S&E) Facility at Pantex. The HESE facility will replace 15 facilities at Pantex (average age of 68 years). Pantex is maintaining these structures to meet production schedules for the B61 Mod 12, W88 Alt 370, and W80-4 Life Extension Programs (LEPs) in addition to typical rebuilds, Joint Test Assembly (JTA) production work, and core surveillance. As these facilities have exceeded their design life and increase risk to day-to-day operations (i.e., modern equipment covered with tarps daily to prevent damage from leaking roofs), NNSA has begun funding extended life programs to ensure no disruption to main charge production capacity at HE Pressing Facility. HESE will serve as the scientific and engineering hub to support a) HE testing required to produce War Reserve (WR) HE main charges and boosters for all nuclear weapons programs and b) to perform HE core surveillance of the nuclear weapons stockpile.

FY 2021 funding is requested to also support the High Explosives Synthesis, Formulation, and Production (HESFP) Facility. The HESFP facility will replace WWII-era facilities (60 years old – average age) used for HE formulation and packaging operations. Pantex maintains these facilities to meet production and development schedules for current and future LEPs and to manufacturing HE mock materials for Joint Test Assemblies. Costs to maintain these facilities are significant and continue to increase as structures, systems, and components age and fail. HESFP will establish production-scale synthesis, formulation, and blending operations.

FY 2021 funding is requested for the Exascale Computing Facility Modernization (ECFM) project. The purpose of the ECFM project is to provide capable facilities and infrastructure to site an exascale-class system at the Lawrence Livermore National Laboratory in FY 2023. The project will modify the existing high performance computing center (Building 453) at LLNL to accommodate the increased infrastructure demands of exascale computing platforms, to include upgrades to the electrical and mechanical capabilities of the facility. The existing cooling tower complex will be expanded by 18,000 tons of capacity, including required piping and pumps. The existing electrical system will be upgraded to allow for an additional 40 MW of power for high performance computing, including the required feeders for mechanical and data systems, secondary electrical panels and feeders, and substation transformers, switchgear, switches, and bussing.

FY 2021 funding supports the construction of the 138kV Power Transmission System Replacement project at NNSS. The existing 138kV Power Transmission System was originally constructed in 1963 of wooden creosote poles and cross members and aerial conductors in a loop configuration, which is approximately 100 miles in length. The power transmission system is well beyond the useful design life. The impact of the high desert environment has severely degraded the reliability of the system. As a result, the system will continue to be a liability to mission focus due to continued deterioration and unscheduled outages. In January 2017, NNSA replaced the most vulnerable 1.7 mile section of this system only weeks before a storm destroyed portions of the old section, avoiding impacts to the mission. This project replaces and upgrades the highest risk 23-mile segment of the system from Mercury to near U1a to provide the NNSS with highly reliable power and communications to the mission corridor. This project will support current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, Homeland Security, and other Federal partners. DOE and NNSA specific activities supported by this project are: defense experimentation and stockpile stewardship; environmental and waste management; nuclear nonproliferation; nuclear emergency response; and the National Criticality Experiments Research Center.

Requested FY 2021 funding also supports the construction of two Emergency Operations Centers (EOCs), one at Lawrence Livermore National Laboratory and the other at Sandia National Laboratories in New Mexico. The EOCs will provide modern, centrally located facilities outside the proximity of potential hazard areas in order to protect NNSA sites and the surrounding communities during an emergency situation.

50 US Code 2746 requires that if the estimated cost of completing a conceptual design for a construction project exceeds $5,000,000, the Secretary shall submit to Congress a request for funds for the conceptual design before submitting a request for funds for the construction project. NNSA anticipates that the estimated cost to complete the conceptual design

for the Combined Radiation Effects Survivability Testing (CREST) Complex at Sandia will exceed the $5,000,000 threshold: Combined Radiation Effects Survivability Testing Complex at Sandia:

The rough-order of magnitude cost estimate to complete the conceptual design is between $3,000,000 and $6,000,000 for the project.

Table 9

National Nuclear Security Administration Infrastructure and Operations Construction by Line-item (dollars in thousands)							
Project	**FY 2019 Enacted**	**FY 2020 Enacted**	**FY 2021 Request**	**FY 2022 Request**	**FY 2023 Request**	**FY 2024 Request**	**FY 2025 Request**
Programmatic Construction							
25-D-XXX, Applied Technologies Laboratory, Y-12	0	0	0	0	0	0	10,422
24-D-XXX, Energetic Materials Characterization Facility, LANL	0	0	0	0	0	22,973	35,740
24-D-XXX, Kauai Test Facility Launch Sustainment, SNL-HI	0	0	0	0	0	1,767	9,430
24-D-XXX, Next Generation LEP R&D Component Fabrication Facility, LLNL	0	0	0	0	0	10,858	31,123
24-D-XXX, Combined Radiation Effects Survivability Testing, SNL	0	0	0	0	0	49,950	64,730
22-D-XXX, Power Sources Capability, SNL	0	0	0	12,600	46,400	62,500	23,100
21-D-510, HE Synthesis, Formulation, and Production, PX	0	0	31,000	20,000	54,000	60,395	12,000
18-D-690, Lithium Processing Facility, Y-12	19,000	32,000	109,405	221,902	226,012	260,770	261,312
18-D-680, Material Staging Facility, PX	24,000	0	0	0	0	0	0
18-D-650, Tritium Finishing Facility, SRS	0	27,000	27,000	27,000	55,000	85,000	120,000
18-D-670, Exascale Class Computer Cooling Equipment, LANL	24,000	0	0	0	0	0	0
18-D-620, Exascale Computing Facility Modernization Project, LLNL	23,000	50,000	29,200	0	0	0	0
17-D-640, U1a Complex Enhancements Project, NNSS	20,000	35,000	160,600	135,000	123,000	0	0
15-D-302, TA-55 Reinvestment Project, Phase 3, LANL	0	0	30,000	30,000	30,000	30,000	34,475
15-D-301, HE Science & Engineering Facility, PX	0	80,000	43,000	0	0	0	0
07-D-220-04, Transuranic Liquid Waste Facility, LANL	0	0	36,687	0	0	0	0
06-D-141, Uranium Processing Facility, Y-12	703,000	745,000	750,000	620,000	300,000	164,589	0
04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL	219,842	168,444	169,427	238,123	113,655	275,841	198,477
Subtotal, Programmatic Construction	**1,032,842**	**1,137,444**	**1,386,319**	**1,304,625**	**948,067**	**1,024,643**	**800,809**

National Nuclear Security Administration Infrastructure and Operations Construction by Line-item (dollars in thousands)							
Project	**FY 2019 Enacted**	**FY 2020 Enacted**	**FY 2021 Request**	**FY 2022 Request**	**FY 2023 Request**	**FY 2024 Request**	**FY 2025 Request**
Mission Enabling Construction							
23-D-xxx, Electrical Power Capacity Upgrade, LANL	0	0	0	0	50,000	70,000	86,000
22-D-xxx, Network Communication Center, LLNL	0	0	0	8,000	60,000	0	0
19-D-670, 138kV Power Transmission System Replacement, NNSS	0	6,000	59,000	0	0	0	0
16-D-515, Albuquerque Complex Project	47,953	0	0	0	0	0	0
15-D-612, Emergency Operations Center, LLNL	0	5,000	27,000	0	0	0	0
15-D-611, Emergency Operations Center, SNL	0	4,000	36,000	0	0	0	0
Subtotal, Mission Enabling Construction	**47,953**	**15,000**	**122,000**	**8,000**	**110,000**	**70,000**	**86,000**
Total, Infrastructure and Operations: Construction	**1,080,795**	**1,152,444**	**1,508,319**	**1,312,625**	**1,058,067**	**1,094,643**	**886,809**

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Construction ($1,152,444,000)	**Construction ($1,508,319,000)**	**Construction (+$355,875,000)**
Programmatic Construction ($1,137,444,000)	**Programmatic Construction ($1,386,319,000)**	**Programmatic Construction (+$248,875,000)**
• Continues the preliminary design of the LPF at Y-12 and the TFF at SRS. • Start construction of the HE S&E Facility at Pantex. • Continue construction of the UCEP at NNSS, UPF at Y-12, and CMRR at LANL.	• Continues construction at HE S&E Facility at PX, U1a Complex Enhancements Project (UCEP) at NNSS, UPF at Y-12, CMRR at LANL, and Exascale Computing Facility Modernization at LLNL. • Resumes funding of the Transuranic Liquid Waste Facility (TLW) and the TA-55 Reinvestments Project (TRP III) at LANL • Continues demolition of existing structures at Lithium Processing Facility (LPF), Y-12. • Start preliminary design of the HE Synthesis, Formulation & Production (HESF&P) at PX. • Continues preliminary design of the TFF at SRS.	• Reflects an increase for UCEP for mining and utility equipment; resumption of funding for the TLW Facility and the TRP III at LANL; and demolition of existing structures at the LPF at Y-12. • Funding also supports the start and completion of preliminary design for the HESF&P at PX.
Mission Enabling Construction ($15,000,000)	**Mission Enabling Construction ($122,000,000)**	**Mission Enabling Construction (+$107,000,000)**
• Initiate design of the 138kV Power Transmission System Replacement project at NNSS and the EOCs at LLNL and SNL.	• Start construction of the 138kV Power Transmission System Replacement project at NNSS and the EOCs at LLNL and SNL.	• Reflects an increase for the transition to construction for NNSS 138kV Power Transmission System Replacement, the LLNL EOC, and the SNL EOC.

Infrastructure and Operations
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	54,080	44,075	51,850	66,080	+14,230
Minor Construction	N/A	N/A	236,366	237,474	215,146	255,825	+40,679
Total, Capital Operating Expenses	N/A	N/A	**290,446**	**281,549**	**266,996**	**321,905**	**+54,909**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	49,770	39,765	44,950	50,000	+5,050
Capability Based Investments							
Reestablish HE Development Machining Capabilities, PX	5,938	5,328	610	610	0	0	0
Replace Lujan Target, LANL	8,000	4,300	3,700	3,700	0	0	0
Expanded Flash X-Ray System , LLNL	5,200	0	0	0	3,000	2,200	-800
Fabricate pRad Outer Vessel, LANL	9,050	0	0	0	3,900	4,080	+180
High-G Surveillance Testing Centrifuge (WETL, Pantex), SNL	9,700	0	0	0	0	4,800	+4,800
Electropolish Equipment, Y-12	6,000	0	0	0	0	2,500	+2,500
Vapor Degreasing/Ultrasonic Cleaning Station, Y-12	6,000	0	0	0	0	2,500	+2,500
Debonding Equipment, Y-12	16,000	0	0	0	0	0	0
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**54,080**	**44,075**	**51,850**	**66,080**	**+14,230**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	98,501	98,659	51,196	33,378	-17,818
Infrastructure and Safety							
Building 23 Tenant Improvements, KCNSC	7,500	4,601	399	399	2,500	0	-2,500
Building 2 Assembly & Electrical Fabrication (AEF) & Machining Revitalization, KCNSC	5,656	0	0	0	5,656	0	-5,656
Building 2 Low Humidity Production Revitalization, KCNSC	14,865	0	0	0	14,865	0	-14,865
Building 23 Classified Space Conversion & Electrical Testing, Weld Lab, & Mechanical Assembly Buildout Portfolio, KCNSC	13,440	0	0	0	0	13,440	+13,440
Building 23 Inspection, Mechanical Assembly, & Testing Installation, KCNSC	7,281	0	0	0	728	6,553	+5,825
Building 23 Tool Room & Model Shop Machining Revitalization, KCNSC	12,694	0	0	0	0	12,694	+12,694
Building 2 Electronics, Testing, Machining, & Surfaces Revitalization, KCNSC	8,688	0	0	0	0	8,688	+8,688
Building 151 High Level Radiochemistry Laboratories Revitalization Portfolio, LLNL	15,050	700	7,550	7,550	6,800	0	-6,800
Building 321 Chiller Reliability & Safety Exhaust System Redundancy Revitalization, LLNL	9,000	0	0	0	800	0	-800
Building 239 High Energy X-ray Radiography Capability Revitalization, LLNL	7,500	0	0	0	750	6,750	+6,000
New Joining Capabilities & Vapor Deposition Facility (B225), LLNL	18,000	0	1,900	1,900	16,100	0	-16,100
New Nondestructive Evaluation Building, LLNL	15,000	0	0	0	1,500	13,500	+12,000
Building 391 Sustainable Chilled Water & Heating Hot Water System Upgrade, LLNL	6,400	0	0	0	6,400	0	-6,400
New Weapons LEP Office Building, LLNL	17,940	0	0	0	1,790	16,150	+14,360
Building 321A Radiological & Material Characterization Capabilities Revitalization, LLNL	11,500	0	0	0	0	1,500	+1,500
Buildings 832 & 836 Environmental Test & Materials Storage Facilities Upgrades, LLNL	8,200	0	0	0	0	8,200	+8,200

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Building 321 Air Handling Unit & Electrical Upgrades, LLNL	6,400	0	0	0	0	6,400	+6,400
New Polymers & Engineering Facility (B223), LLNL	16,500	14,500	2,000	2,000	0	0	0
Building 341 Mechanical Test Capability Consolidation Revitalization, LLNL	12,500	0	12,500	12,500	0	0	0
S200 & S300 Low Pressure Air System Upgrade, LLNL	5,100	0	5,100	5,100	0	0	0
2200 Block Utilities Modernization & Expansion, LLNL	6,375	5,600	775	775	0	0	0
Bldg 235 & Ancillary Synthesis Chemistry Laboratories Revitalization with Fume Hood Upgrades, LLNL	5,400	857	0	0	4,543	0	-4,543
Building 322 Plating Shop Utility & Safety Systems Revitalization, LLNL	5,000	0	5,000	5,000	0	0	0
PF-4 Safety Systems Crit Safety (2 Over 1) Upgrades, LANL	10,400	0	0	0	10,400	0	-10,400
New TA-16 HE Shipping & Receiving Transfer Facility, LANL	7,932	0	0	0	7,932	0	-7,932
TA-55 Building 400 RLUOB Secondary Fire Pump Installation, LANL	6,143	0	870	870	5,273	0	-5,273
TA-16-260 Pressing, Machining & Testing Facility Upgrades, LANL	15,700	0	1,960	1,960	13,740	0	-13,740
New TA-15 DARHT Hydro Vessel Repair Facility, LANL	16,491	0	0	0	0	2,800	+2,800
PF-4 High Pressure Water Supply Feed Separation, LANL	10,227	0	0	0	0	10,227	+10,227
TA-15 DARHT Electrical Circuit Upgrade, LANL	13,909	0	0	0	0	13,909	+13,909
PF-4 Power & Communications Systems Upgrade, LANL	16,000	0	0	0	5,287	10,713	+5,426
TA-16 Fire Suppression Upgrades, LANL	5,000	1,400	3,600	3,600	0	0	0
TA-40-23 Electrical, Mechanical Revitalization, LANL	5,100	1,100	4,000	4,000	0	0	0
U1a Potable & Fire Water System Upgrade, NNSS	9,000	0	0	0	9,000	0	-9,000
New Mercury Building 23-461, NNSS	15,000	0	3,000	3,000	12,000	0	-12,000
New Mercury Building 23-462, NNSS	13,500	0	0	950	0	12,550	+12,550
Mercury Modernization Utility Upgrades, NNSS	7,000	1,000	6,000	6,000	0	0	0
DAF Electrical Substations Upgrade, NNSS	7,500	5,500	2,000	2,000	0	0	0
New DAF Water Storage Tank, NNSS	8,000	0	0	0	0	8,000	+8,000
New U1a Mission Technical Support Facility, NNSS	13,500	0	950	950	0	12,550	+12,550
New U1a Refuge Station Build-out, NNSS	6,000	0	0	0	0	6,000	+6,000
Area 6 to U1a Water Supply Line Replacement, NNSS	5,500	500	5,000	5,000	0	0	0
New U1a Air Supply Borehole, NNSS	8,500	5,700	2,800	2,800	0	0	0

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Building 12-37 Secondary Electrical Feed Installation, PX	16,300	2,000	14,300	14,300	0	0	0
New Advanced Fabrication Facility, PX	17,000	0	0	0	1,000	16,000	+15,000
234-7H Exhaust Ventilation System Installation, SRS	10,000	0	10,000	10,000	0	0	0
20th Street & G Avenue Intersection Relocation, SNL	9,856	7,250	2,606	2,606	0	0	0
Building 858N SiFab Bulk Chemical Distribution System Upgrade, SNL	5,300	0	0	0	5,300	0	-5,300
New Explosives Manufacturing Science & Technology (EMSAT) Facility, SNL	17,500	0	0	0	1,500	16,000	+14,500
SNL/CA Potable Water Distribution System Revitalization, SNL	9,900	0	0	0	9,900	0	-9,900
Building 894 Dehumidifier Replacements, SNL	9,000	0	0	0	0	9,000	+9,000
New Radiation Protection Instrumentation Calibration Facility, SNL	8,500	0	0	0	8,500	0	-8,500
TA-I Substation 35 Replacement, SNL	10,000	0	0	0	0	3,500	+3,500
TA-IV District Chilled Water Expansion, SNL	18,250	0	0	0	0	1,500	+1,500
New SNL/CA Data Center Replacement Facility, SNL	14,700	1,300	13,400	13,400	0	0	0
TA-IV District Chilled Water System Upgrades, SNL	16,000	1,900	14,100	14,100	0	0	0
High-G Surveillance Testing Capability Addition (WETL Pantex), SNL	5,500	0	0	0	0	600	+600
Building 9215 North Fire Water Laterals Replacement, Y-12	5,629	0	5,629	5,629	0	0	0
Building 9215 O-Wing MCC Replacements (NFEM), Y-12	6,579	2,300	4,279	4,279	0	0	0
Building 9215 P-Wing MCC Replacement (NFEM), Y-12	6,637	2,300	4,337	4,337	0	0	0
Building 9204-2E 816 MCC Replacement (NFEM), Y-12	6,033	2,398	3,635	3,635	0	0	0
Building 9204-2E 815 MCC Replacement (NFEM), Y-12	5,975	0	175	175	5,800	0	-5,800
Building 9215 Switchgear & Transformer 253 Replacement, Y-12	5,886	0	0	0	5,886	0	-5,886
Building 9215 Supply Fan SF-205 Revitalization, Y-12	5,223	0	0	0	0	5,223	+5,223
Building 9204-2E Transformers 814 & 815 Replacement, Y-12	6,560	0	0	0	0	6,560	+6,560
Production Development Facility Acquisition and Revitalization, Y-12	16,000	0	0	0	0	16,000	+16,000

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capability Based Investments							
Modify Unloading Station B, SRS	4,630	4,630	1,150	0	0	0	0
Replace Film Radiography in Finishing Gloveboxes, FL 4/5 Glovebox, SRS	6,510	0	0	0	0	1,800	+1,800
Total, Minor Construction Projects	**N/A**	**N/A**	**237,516**	**237,474**	**215,146**	**280,185**	+40,679
Total, Capital Summary	**N/A**	**N/A**	**291,596**	**281,549**	**266,996**	**346,265**	**+54,909**

Outyear Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	82,970	60,000	66,000	70,000	N/A
Minor Construction	3,000	4,000	5,000	6,000	N/A
Total, Capital Operating Expenses	**85,970**	**64,000**	**71,000**	**76,000**	**N/A**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	55,000	60,000	65,000	70,000	N/A
Capability Based Investments					
Fabricate pRad Outer Vessel, LANL	1,070	0	0	0	0
High-G Surveillance Testing Centrifuge (WETL, Pantex), SNL	3,900	0	1,000	0	0
Electropolish Equipment, Y-12	3,500	0	0	0	0
Vapor Degreasing/Ultrasonic Cleaning Station, Y-12	3,500	0	0	0	0
Debonding Equipment, Y-12	16,000	0	0	0	0
Total, Capital Equipment (including MIE)	**82,970**	**60,000**	**66,000**	**70,000**	**N/A**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	3,000	4,000	5,000	6,000	N/A
Infrastructure and Safety					
Building 321 Chiller Reliability & Safety Exhaust System Redundancy Revitalization, LLNL	8,200	0	0	0	0
Building 321A Radiological & Material Characterization Capabilities Revitalization, LLNL	10,000	0	0	0	0
New TA-15 DARHT Hydro Vessel Repair Facility, LANL	13,691	0	0	0	0
TA-I Substation 35 Replacement, SNL	6,500	0	0	0	0
TA-IV District Chilled Water Expansion, SNL	16,750	0	0	0	0
High-G Surveillance Testing Capability Addition (WETL Pantex), SNL	3,900	0	1,000	0	0
Capability Based Investments					
Replace Film Radiography in Finishing Gloveboxes, FL 4/5 Glovebox, SRS	4,710	0	0	0	0
Total, Minor Construction Projects	**3,000**	**4,000**	**5,000**	**6,000**	**0**
Total, Capital Summary	**85,970**	**64,000**	**71,000**	**76,000**	**N/A**

Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Programmatic							
21-D-510 HE Synthesis, Formulation, and Production, PX							
TEC	177,395	0	0	0	0	31,000	+31,000
OPC	62,605	0	5,000	5,000	10,000	0	-10,000
TPC, 21-D-510 HE Synthesis, Formulation, and Production, PX	**240,000**	**0**	**5,000**	**5,000**	**10,000**	**31,000**	**+21,000**
18-D-690, Lithium Processing Facility, Y-12							
TEC	1,545,000	0	19,000	19,000	32,000	99,405	+67,405
OPC[b]	100,000	10,424	0	0	1,000	10,000	+9,000
TPC, 18-D-690, Lithium Processing Facility, Y-12	**1,645,000**	**10,424**	**19,000**	**19,000**	**33,000**	**109,405**	**+76,405**
18-D-680, Material Staging Facility, PX							
TEC	695,000	5,200	24,000	24,000	0	0	0
OPC	19,000	0	0	0	4,000	0	-4,000
TPC, 18-D-680, Material Staging Facility, PX	**714,000**	**5,200**	**24,000**	**24,000**	**4,000**	**0**	**-4,000**
18-D-670, Exascale Class Computer Cooling Equipment, LANL							
TEC	47,882	23,882	24,000	24,000	0	0	0
OPC	5,905	2,925	1,000	1,000	1,373	607	-766
TPC, 18-D-670, Exascale Class Computer Cooling Equipment, LANL	**53,787**	**26,807**	**25,000**	**25,000**	**1,373**	**607**	**-766**
18-D-650, Tritium Finishing Facility, SRS							
TEC	562,300	0	0	0	27,000	27,000	0
OPC[c]	77,700	7,700	0	0	2,000	2,000	0
TPC, 18-D-650, Tritium Finishing Facility, SRS	**640,000**	**7,700**	**0**	**0**	**29,000**	**29,000**	**0**

[a] Prior Year OPCs have been updated from the FY 2020 Congressional Justification Budget to reflect actuals.

[b] Lithium Processing Facility OPCs are funded under Lithium Sustainment in FY 2020, and are included in the line item for FY 2021 and the outyears.

[c] Tritium Finishing Facility OPCs are funded under Tritium Sustainment in FY 2020 and the outyears. 18-D-650 became Tritium Finishing Facility in FY 2020.

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
18-D-620, Exascale Computing Facility Modernization Project, LLNL							
TEC	105,200	3,000	23,000	23,000	50,000	29,200	-20,800
OPC	6,000	4,000	0	0	0	1,000	+1,000
TPC, 18-D-620, Exascale Computing Facility Modernization Project, LLNL	**111,200**	**7,000**	**23,000**	**23,000**	**50,000**	**30,200**	**-19,800**
17-D-640, U1a Complex Enhancements Project, NNSS							
TEC	507,200	33,600	20,000	20,000	35,000	160,600	+125,600
OPC[b]	19,309	6,309	0	0	0	0	0
TPC, 17-D-640, U1a Complex Enhancements Project, NNSS	**526,509**	**39,909**	**20,000**	**20,000**	**35,000**	**160,600**	**+125,600**
15-D-302, TA-55 Reinvestment Project Phase III, LANL							
TEC	190,731	36,257	0	0	0	30,000	+30,000
OPC	47,466	8,784	1,804	1,804	2,000	2,000	0
TPC, 15-D-302, TA-55 Reinvestment Project Phase III, LANL	**238,197**	**45,041**	**1,804**	**1,804**	**2,000**	**32,000**	**+30,000**
15-D-301, HE Science & Engineering Facility, PX							
TEC	135,272	12,272	0	0	80,000	43,000	-37,000
OPC	60,225	2,740	0	0	130	3,750	+3,620
TPC, 15-D-301, HE Science & Engineering Facility, PX	**195,497**	**15,012**	**0**	**0**	**80,130**	**46,750**	**-33,380**
07-D-220, Radioactive Liquid Waste Treatment Facility Upgrade, LANL							
TEC[c]	106,306	106,306	0	0	0	0	0
OPC	19,945	19,645	300	300	0	0	0
TPC, 07-D-220, Radioactive Liquid Waste Treatment Facility Upgrade, LANL	**126,251**	**125,951**	**300**	**300**	**0**	**0**	**0**

[a] Prior Year OPCs have been updated from the FY 2020 Congressional Justification Budget to reflect actuals.

[b] U1a Complex Enhancements Project OPCs are funded under Enhanced Capabilities for Subcritical Experiments within Assessment Science.

[c] In FY 2017, $2,669,265.19 of prior year funding was reprogrammed into Radioactive Liquid Waste Treatment Facility to support the Low Level Liquid Waste Facility subproject.

	(Dollars in Thousands)						
	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
07-D-220-04, Transuranic Liquid Waste Facility, LANL							
TEC[b]	129,536	92,849	0	0	0	36,687	+36,687
OPC	14,464	524	1,000	1,000	1,710	1,000	-710
TPC, 07-D-220-04, Transuranic Liquid Waste Facility, LANL[c]	**144,000**	**93,373**	**1,000**	**1,000**	**1,710**	**37,687**	**+35,977**
06-D-141, Uranium Processing Facility, Y-12							
TEC	6,121,337	3,122,768	701,980	701,980	740,000	718,500	-21,500
OPC	378,663	94,643	1,020	1,020	5,000	31,500	+26,500
TPC, 06-D-141, Uranium Processing Facility, Y-12	**6,500,000**	**3,217,411**	**703,000**	**703,000**	**745,000**	**750,000**	**+5,000**
04-D-125, Chemistry and Metallurgy Research Replacement, LANL							
TEC	TBD	1,289,107	144,842	144,842	114,844	93,787	-21,057
OPC	TBD	175,933	92,177	92,177	53,600	75,640	+22,040
TPC, 04-D-125, Chemistry and Metallurgy Research Replacement, LANL	**TBD**	**1,465,040**	**237,019**	**237,019**	**168,444**	**169,427**	**+983**
Total Programmatic Construction Projects							
TEC	10,323,160	4,725,241	956,822	956,822	1,078,844	1,269,179	190,335
OPC	811,282	333,627	102,301	102,301	80,813	127,497	46,684
TPC Programmatic Construction Construction Projects	**11,134,442**	**5,058,868**	**1,059,123**	**1,059,123**	**1,159,657**	**1,396,676**	**237,019**

[a] Prior Year OPCs have been updated from the FY 2020 Congressional Justification Budget to reflect actuals.

[b] Reflects rescission of $28,013 in FY 2017; In FY 2018, reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

[c] In FY 2017, AY 2016 funding of $1,153,000 was reprogrammed from Transuranic Liquid Waste Facility project into Radioactive Liquid Waste Treatment Facility to support the Low Level Liquid Waste Facility subproject.

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Mission Enabling							
23-D-xxx, Electrical Power Capacity Upgrade, LANL							
TEC	293,000	0	0	0	0	0	0
OPC	7,000	575	463	463	2,616	1,382	-1,234
TPC, 23-D-xxx, Electrical Power Capacity Upgrade, LANL	**300,000**	**575**	**463**	**463**	**2,616**	**1,382**	**-1,234**
22-D-xxx, Network Communication Center, LLNL							
TEC	TBD	0	0	0	0	0	0
OPC	TBD	0	0	0	1,450	90	-1,360
TPC, 22-D-xxx, Network Communication Center, LLNL	**TBD**	**0**	**0**	**0**	**1,450**	**90**	**-1,360**
19-D-670, 138kV Power Transmission System Replacement, NNSS							
TEC	65,000	0	0	0	6,000	59,000	+53,000
OPC	4,700	1,464	500	500	66	90	+24
TPC, 19-D-670, 138kV Power Transmission System Replacement, NNSS	**69,700**	**1,464**	**500**	**500**	**6,066**	**59,090**	**+53,024**
18-D-660, Fire Station, Y-12							
TEC	28,000	28,000	0	0	0	0	0
OPC	5,830	4,649	92	92	87	1,002	+915
TPC, 18-D-660, Fire Station, Y-12	**33,830**	**32,649**	**92**	**92**	**87**	**1,002**	**+915**
17-D-630, Expand Electrical Distribution System, LLNL							
TEC	31,000	31,000	0	0	0	0	0
OPC	2,800	2,050	450	450	300	0	-300
TPC, 17-D-630, Expand Electrical Distribution System, LLNL	**33,800**	**33,050**	**450**	**450**	**300**	**0**	**-300**

[a] Prior Year OPCs have been updated from the FY 2020 Congressional Justification Budget to reflect actuals.

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
16-D-515, Albuquerque Complex Project							
TEC	169,000	121,047	47,953	47,953	0	0	0
OPC[b]	5,700	3,065	389	389	1,808	438	-1,370
TPC, 16-D-515, Albuquerque Complex Project	**174,700**	**124,112**	**48,342**	**48,342**	**1,808**	**438**	**-1,370**
15-D-613, Emergency Operations Center, Y-12							
TEC	28,919	28,919	0	0	0	0	0
OPC	5,482	4,016	725	725	0	741	+741
TPC, 15-D-613, Emergency Operations Center, Y-12	**34,401**	**32,935**	**725**	**725**	**0**	**741**	**+741**
15-D-612, Emergency Operations Center, LLNL							
TEC	32,000	0	0	0	5,000	27,000	+22,000
OPC	3,200	2,200	0	0	400	0	-400
TPC, 15-D-612, Emergency Operations Center, LLNL	**35,200**	**2,200**	**0**	**0**	**5,400**	**27,000**	**+21,600**
15-D-611, Emergency Operations Center, SNL							
TEC	40,000	0	0	0	4,000	36,000	+32,000
OPC	2,500	1,155	806	806	200	0	-200
TPC, 15-D-611, Emergency Operations Center, SNL	**42,500**	**1,155**	**806**	**806**	**4,200**	**36,000**	**+31,800**
Total Mission Enabling Construction Projects							
TEC	686,919	208,966	47,953	47,953	15,000	122,000	107,000
OPC	37,212	19,174	3,425	3,425	6,927	3,743	-3,184
TPC Mission Enabling Construction Projects	**724,131**	**228,140**	**51,378**	**51,378**	**21,927**	**125,743**	**+103,816**
Total All Construction Projects							
TEC	11,010,079	4,934,207	1,004,775	1,004,775	1,093,844	1,391,179	+297,335
OPC	848,494	352,801	105,726	105,726	87,740	131,240	43,500
TPC All Construction Projects	**11,858,573**	**5,287,008**	**1,110,501**	**1,110,501**	**1,181,584**	**1,522,419**	+340,835

[a] Prior Year OPCs have been updated from the FY 2020 Congressional Justification Budget to reflect actuals.

[b] In FY 2015, $190,000 in OPCs for the Albuquerque Complex Project were funded within the NNSA Federal Salaries and Expenses appropriation.

Outyear Construction Projects Summary

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
Programmatic					
25-D-XXX, Applied Technology Laboratory, Y-12					
TEC	0	0	0	6,927	TBD
OPC	0	0	0	3,495	TBD
TPC, 25-D-XXX, Applied Technology Laboratory, Y-12	**0**	**0**	**0**	**10,422**	**TBD**
24-D-XXX, Energetic Materials Characterization Facility, LANL					
TEC	0	0	8,836	27,046	TBD
OPC	0	0	14,137	8,694	TBD
TPC, 24-D-XXX, Energetic Materials Characterization Facility, LANL	**0**	**0**	**22,973**	**35,740**	**TBD**
24-D-XXX, Kauai Test Facility Launch Sustainment, SNL-HI					
TEC	0	0	910	8,995	TBD
OPC	0	0	857	435	TBD
TPC, 24-D-XXX, Kauai Test Facility Launch Sustainment, SNL-HI	**0**	**0**	**1,767**	**9,430**	**TBD**
24-D-XXX, Next Generation LEP R&D Component Fabrication Facility, LLNL					
TEC	0	0	8,384	29,578	TBD
OPC	0	0	2,474	1,545	TBD
TPC, 24-D-XXX, Next Generation LEP R&D Component Fabrication Facility, LLNL	**0**	**0**	**10,858**	**31,123**	**TBD**
24-D-XXX, Combined Radiation Effects Survivability Testing, SNL					
TEC	0	0	18,360	43,800	TBD
OPC	0	0	31,590	20,930	TBD
TPC, 24-D-XXX, Combined Radiation Effects Survivability Testing, SNL	**0**	**0**	**49,950**	**64,730**	**1,135,320**

	(Dollars in Thousands)				
	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
22-D-XXX, Power Sources Capability, SNL					
TEC	11,500	45,600	61,600	22,000	TBD
OPC	1,100	800	900	1,100	TBD
TPC, 22-D-XXX, Power Sources Capability, SNL	**12,600**	**46,400**	**62,500**	**23,100**	**175,400**
21-D-510 HE Synthesis, Formulation, and Production, PX					
TEC	20,000	54,000	60,395	12,000	0
OPC	500	500	7,500	20,000	19,105
TPC, 21-D-510 HE Synthesis, Formulation, and Production, PX	**20,500**	**54,500**	**67,895**	**32,000**	**19,105**
18-D-690, Lithium Processing Facility, Y-12					
TEC	219,539	223,255	252,999	252,114	487,418
OPC	2,363	2,757	7,771	9,198	16,397
TPC, 18-D-690, Lithium Processing Facility, Y-12	**221,902**	**226,012**	**260,770**	**261,312**	**503,815**
18-D-680, Material Staging Facility, PX					
TEC	0	0	0	0	665,800
OPC	0	0	0	0	15,000
TPC, 18-D-680, Material Staging Facility, PX	**0**	**0**	**0**	**0**	**680,800**
18-D-670, Exascale Class Computer Cooling Equipment, LANL					
TEC	0	0	0	0	0
OPC	0	0	0	0	0
TPC, 18-D-670, Exascale Class Computer Cooling Equipment, LANL	**0**	**0**	**0**	**0**	**0**
18-D-650, Tritium Finishing Facility, SRS					
TEC	27,000	55,000	85,000	120,000	221,300
OPC	2,000	3,000	3,000	6,000	52,000
TPC, 18-D-650, Tritium Finishing Facility, SRS	**29,000**	**58,000**	**88,000**	**126,000**	**273,300**

	(Dollars in Thousands)				
	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
17-D-640, U1a Complex Enhancements Project, NNSS					
TEC	135,000	123,000	0	0	0
OPC	0	3,000	10,000	0	0
TPC, 17-D-640, U1a Complex Enhancements Project, NNSS	**135,000**	**126,000**	**10,000**	**0**	**0**
15-D-302, TA-55 Reinvestment Project Phase III, LANL					
TEC	30,000	30,000	30,000	34,475	0
OPC	3,000	11,000	11,808	4,000	3,070
TPC, 15-D-302, TA-55 Reinvestment Project Phase III, LANL	**33,000**	**41,000**	**41,808**	**38,475**	**3,070**
15-D-301, HE Science & Engineering Facility, PX					
TEC	0	0	0	0	0
OPC	3,000	20,405	30,200	0	0
TPC, 15-D-301, HE Science & Engineering Facility, PX	**3,000**	**20,405**	**30,200**	**0**	**0**
07-D-220-04, Transuranic Liquid Waste Facility, LANL					
TEC	0	0	0	0	0
OPC	3,000	4,000	3,230	0	0
TPC, 07-D-220-04, Transuranic Liquid Waste Facility, LANL	**3,000**	**4,000**	**3,230**	**0**	**0**
06-D-141, Uranium Processing Facility, Y-12					
TEC	566,500	203,000	68,589	0	0
OPC	53,500	97,000	96,000	0	0
TPC, 06-D-141, Uranium Processing Facility, Y-12	**620,000**	**300,000**	**164,589**	**0**	**0**
04-D-125, Chemistry and Metallurgy Research Replacement, LANL					
TEC	223,334	105,026	211,325	144,406	TBD
OPC	14,789	8,629	64,516	54,071	TBD
TPC, 04-D-125, Chemistry and Metallurgy Research Replacement, LANL	**238,123**	**113,655**	**275,841**	**198,477**	**TBD**
Total Programmatic Construction Projects					
TEC	1,232,236	838,638	804,169	694,539	TBD
OPC	84,889	151,334	286,212	136,270	TBD
TPC Programmatic Construction Projects	**1,317,125**	**989,972**	**1,090,381**	**830,809**	**TBD**

	(Dollars in Thousands)				
	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
Mission Enabling					
23-D-XXX, Electrical Power Capacity Upgrade, LANL					
TEC	0	50,000	70,000	86,000	87,000
OPC	90	90	244	0	1,540
23-D-XXX, Electrical Power Capacity Upgrade, LANL	**90**	**50,090**	**70,244**	**86,000**	**88,540**
22-D-XXX, Network Communication Center, LLNL					
TEC	8,000	60,000	0	0	TBD
OPC	90	90	62	0	TBD
TPC, 22-D-XXX, Network Communication Center, LLNL	**8,090**	**60,090**	**62**	**0**	**TBD**
19-D-670, 138kV Power Transmission System Replacement, NNSS					
TEC	0	0	0	0	0
OPC	90	2,490	0	0	0
	90	**2,490**	**0**	**0**	**0**
TPC, 19-D-670, 138kV Power Transmission System Replacement, NNSS					
15-D-612, Emergency Operations Center, LLNL					
TEC	0	0	0	0	0
OPC	600	0	0	0	0
TPC, 15-D-612, Emergency Operations Center, LLNL	**600**	**0**	**0**	**0**	**0**
15-D-611, Emergency Operations Center, SNL					
TEC	0	0	0	0	0
OPC	0	339	0	0	0
TPC, 15-D-611, Emergency Operations Center, SNL	**0**	**339**	**0**	**0**	**0**
Total Mission Enabling Construction Projects					
TEC	8,000	110,000	70,000	86,000	TBD
OPC	870	3,009	306	0	TBD
TPC Mission Enabling Construction Projects	**8,870**	**113,009**	**70,306**	**86,000**	**TBD**
Total All Construction Projects					
TEC	1,240,236	948,638	874,169	780,539	TBD
OPC	85,759	154,343	286,518	136,270	TBD
TPC All Construction Projects	**1,325,995**	**1,102,981**	**1,160,687**	**916,809**	**TBD**

21-D-510 High Explosive Synthesis, Formulation, and Production (HESFP) Facility
Pantex Plant, Amarillo, Texas
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the High Explosive Synthesis, Formulation, and Production (HESFP) Facility is $31,000K. Out year funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B. The cost range for the project at Critical Decision-0 (CD-0) was $96,000K to $240,000K, CD-1 review/approval is scheduled for 4Q FY 2020.

Significant Changes:
This project is a new start for the FY 2021 budget year.

The most recent DOE O 413.3B approved CD-0, *Approve Mission Need*, which was approved on January 18, 2019, with a Rough Order of Magnitude cost range of $96,000K to $240,000K and CD-4 date of 4Q FY 2025. As required by DOE Order 413.3B, an independent Analysis of Alternatives (AoA) was completed and approved on June 28, 2019. Based on the results, the Department Project Management Executive, with concurrence from the AoA Steering Committee, selected the Pantex Plant to be the location for a single synthesis, formulation and blending facility using current batch process for synthesis. Conceptual Design completed December 2019, and CD-1 Schedule and Cost Range are in development, with Independent Project Review scheduled 4Q FY 2020 to support 4Q FY 2020 CD-1 Approval.

A Federal Project Director has been assigned to this project and has reviewed and approved this CPDS.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2021	01/18/2019	12/31/2019	4Q FY 2020	4Q FY 2022	1Q FY 2022	4Q FY 2022	4Q FY 2026	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The schedules are estimates and consistent with the high end of the schedule ranges.

Project Cost History[a,b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2021	31,000	146,395	177,395	42,605	20,000	62,605	240,000

2. Project Scope and Justification

Scope

The project will build a single synthesis & formulation facility, and a blending facility using the current batch process for synthesis at the Pantex Plant. These structures will replace the aging facilities in Zones 11 and 12 with new facilities in Zone 11 that better support program requirements and meet current codes and standards. The total new facility square footage, based upon the completed Conceptual Design, is expected to be 75,000-80,000 square feet.

The project will also complete D&D of obsolete facilities including the current formulation facilities 12-019 (east side) and 12-062, and current HE packaging & staging facilities including 11-042, to better support the Pantex high explosive mission. There are currently no plans to repurpose any of these formulation or packaging & staging related facilities.

Justification

To ensure the viability of the nation's nuclear deterrent, NNSA needs to modernize and scale its War Reserve high explosive material production capabilities to meet stockpile requirements. Currently, NNSA relies on a single, external Department of Defense vendor, BAE Holston, for large-scale synthesis, formulation, and blending for high explosive products. In the past, Holston has had failures in production resulting in late deliveries. Pantex provides some formulation, blending, and pilot-scale synthesis. Pantex synthesis capabilities are currently unable to provide adequate redundancy in case there are issues with Holston deliveries. Current facilities for formulation and blending at Pantex are aging and in order to meet delivery targets for high explosive products in the nuclear weapon stockpile, NNSA requires a sufficient and timely supply base for HE products.

The primary benefits from mitigating the risks gaps are as follows:

- Enable the NNSA to meet near and long-term HE material needs for the stockpile by constituting a supply base that brings to bear all the needed capabilities and capacities.
- Eliminates risks associated with aging facilities for synthesis, formulation, blending, and packaging/staging.
- Improve the controls systems for formulation and allow for higher confidence in repeatability between batches, as well as better recording and documentation to allow for knowledge and data capture for future generations.
- Reduce or eliminate single points of failure in the HE materials supply chain.
- Provide flexibility and agility to meet future mission needs.
- Avoid heightened and deferred maintenance costs in existing facilities.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Funds appropriated under this data sheet may be used to provide independent assessments for planning and execution of this project, and contracted support services to the federal project team for oversight and support.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.

[b] The FY 2021 numbers are estimates and consistent with the high end values of the cost ranges.

Preliminary Key Performance Parameters (KPPs)

The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Material Process[a]	Threshold (pounds/year)	Objective (pounds/year)
Formulation	25,000	50,000
Synthesis	25,000	50,000

3. **Financial Schedule**[b]

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2021	31,000	31,000	25,000
FY 2022	0	0	6,000
Total, Design	31,000	31,000	31,000
Construction			
FY 2022	20,000	20,000	18,000
FY 2023	54,000	54,000	55,000
FY 2024	60,395	60,395	60,000
FY 2025	12,000	12,000	13,395
Total, Construction	146,395	146,395	146,395
Total Estimated Costs			
FY 2021	31,000	31,000	25,000
FY 2022	20,000	20,000	24,000
FY 2023	54,000	54,000	55,000
FY 2024	60,395	60,395	60,000
FY 2025	12,000	12,000	13,395
Total, TEC	**177,395**	**177,395**	**177,395**
Other Project Costs			
OPC, except D&D			
FY 2019	5,000	5,000	1,000
FY 2020	10,000	10,000	5,000
FY 2021	0	0	1,500

[a] Preliminary Key Performance Parameters will be developed as part of the CD-1 approval.

[b] The project has not yet been approved for CD-2, and therefore has not been baselined. Out year funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	500	500	1,000
FY 2023	500	500	500
FY 2024	7,500	7,500	9,000
FY 2025	10,000	10,000	14,000
FY 2026	9,105	9,105	10,605
Total OPC, except D&D	42,605	42,605	42,605
OPC D&D			
FY 2025	10,000	10,000	8,000
FY 2026	10,000	10,000	12,000
Total, OPC D&D	20,000	20,000	20,000
Total Other Project Costs			
FY 2019	5,000	5,000	1,000
FY 2020	10,000	10,000	5,000
FY 2021	0	0	1,500
FY 2022	500	500	1,000
FY 2023	500	500	500
FY 2024	7,500	7,500	9,000
FY 2025	20,000	20,000	22,000
FY 2026	19,105	19,105	22,605
Total, OPC	**62,605**	**62,605**	**62,605**
Total Project Costs (TPC)			
FY 2019	5,000	5,000	1,000
FY 2020	10,000	10,000	5,000
FY 2021	31,000	31,000	26,500
FY 2022	20,500	20,500	25,000
FY 2023	54,500	54,500	55,500
FY 2024	67,895	67,895	69,000
FY 2025	32,000	32,000	35,395
FY 2026	19,105	19,105	22,605
Grand Total	**240,000**	**240,000**	**240,000**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	28,000	N/A	N/A
Federal Design Review Support	1,000	N/A	N/A
Contingency	2,000	N/A	N/A
Total, Design	31,000	N/A	N/A
Construction			
Site Work	5,000	N/A	N/A
Equipment	4,895	N/A	N/A
Construction	100,000	N/A	N/A
Federal Support	1,500	N/A	N/A
Contingency	35,000	N/A	N/A
Total, Construction	146,395	N/A	N/A
Total Estimated Cost	177,395	N/A	N/A
Contingency, TEC	*37,000*	*N/A*	*N/A*
Other Project Cost (OPC)			
OPC except D&D			
Analysis of Alternatives	1,000	N/A	N/A
Conceptual Design	4,800	N/A	N/A
Start-up	16,000	N/A	N/A
Equipment Move	9,605	N/A	N/A
Contingency	11,200	N/A	N/A
Total, OPC except D&D	42,605	N/A	N/A
OPC D&D			
Demolition	10,000	N/A	N/A
Utility Relocation	8,000	N/A	N/A
Contingency	2,000	N/A	N/A
Total, OPC D&D	20,000	N/A	N/A
Total, OPC	**62,605**	**N/A**	**N/A**
Contingency, OPC	*13,200*	*N/A*	*N/A*
Total Project Cost	**240,000**	**N/A**	**N/A**
Total Contingency (TEC+OPC)	***50,200***	***N/A***	***N/A***

5. Schedule of Appropriations Requests[a]

(Dollars in Thousands)

Request Year	Type	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY2025	Out Year	Total
FY 2021	TEC	0	0	31,000	20,000	54,000	60,395	12,000	N/A	177,395
	OPC	5,000	10,000	0	500	500	7,500	20,000	19,105	62,605
	TPC	5,000	10,000	31,000	20,500	54,500	67,895	32,000	19,105	240,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4QFY 2025
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	4QFY 2075

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Cost		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	$39.0	N/A	$1,952

7. D&D Information

The new area being constructed in this project replaces existing facilities. The project scope includes D&D of obsolete facilities including the current formulation facilities 12-019 (east side) and 12-062, and current HE packaging & staging facilities including 11-042, to better support the Pantex high explosive mission. There are currently no plans to repurpose any of these formulation or packaging & staging related facilities. There are some active utilities (minor number, but critical function) routed through the existing facilities listed that may require relocation prior to obsolete facility D&D.

8. Acquisition Approach

The conceptual design was led by the M&O contractor utilizing a subcontracted Architectural and Engineering firm. The Acquisition Strategy will be developed for the acquisition of the design and construction of the facility as part of the CD-1 approval in FY 2020.

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Out year funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

19-D-670, 138 kV Power Transmission System Replacement
Nevada National Security Site (NNSS), Nevada
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the 19-D-670, 138 kV Power Transmission System (PTS) Replacement project is $59,000K. The current Total Project Cost (TPC) range is $42,000K to $90,000K. The project is not currently funded at the high-end range of the Critical Decision-1 (CD-1) estimate because the completed Hill 200 power transmission line replacement project cost history provides confidence in the point estimate. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

The project will design and construct a 138 kV PTS in the NNSS Mission Corridor, Mercury, Nevada. The PTS will replace and upgrade approximately 23 miles of the degraded existing PTS and upgrade the co-located fiber optic lines to meet the mission requirements for reliable power and communications distribution in the NNSS Mission Corridor. The proposed PTS project will be executed to allow continued operations of current mission critical facilities. This project supports current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, the Department of Homeland Security, and other Federal partners.

Significant Changes:
This project is not a new start. The most recent DOE Order 413.3B critical decision (CD) is CD-1, Approve Alternative Selection and Cost Range, approved on September 28, 2018, with a preliminary cost range of $42,000K to $90,000K and a projected CD-4 of 4Q FY 2023. The $69,700K TPC request is based upon the CD-1 reconciled point estimate and is consistent with the power transmission line cost experience of the completed Hill 200 project.
A Federal Project Director has been assigned to this project.

The acquisition approach has changed from design-bid-build to design-build. Although the design schedule has experienced a delay due to the altered strategy, the completion date forecast remains unchanged because of the consolidated approach.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	1/18/2017	12/21/2017	4Q FY2018	1Q FY2020	4Q FY2019	1Q FY2020	4Q FY2022	4Q FY2022
FY 2020	1/18/2017	12/21/2017	9/28/2018	2Q FY2021	4Q FY2020	2Q FY2021	4Q FY2023	4Q FY2023
FY 2021	1/18/2017	12/21/2017	9/28/2018	1Q FY2021	2Q FY2021	1Q FY2021	4Q FY2023	4Q FY2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History[a]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	6,000	59,000	65,000	4,000	6,000	10,000	75,000
FY 2020	6,000	79,300	85,300	2,300	2,400	4,700	90,000
FY 2021	6,000	79,300	85,300	2,300	2,400	4,700	90,000

2. Project Scope and Justification

Scope

The project scope is to design and build a new PTS for the Mission Corridor at the NNSS. This segment of the system traverses approximately 23 miles between the Mercury Switching Center and the Tweezer Substation. The project includes replacement of the existing power transmission line, installation of a new higher-capacity fiber optic cable, new taller support poles, and the demolition of the existing power line and poles. The final scope, schedule, and cost will be baselined when CD-2/3 is approved.

Justification

This project supports current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, Homeland Security, and other Federal partners. DOE and NNSA specific activities supported by this project are: defense experimentation and stockpile stewardship; environmental and waste management; nuclear nonproliferation; nuclear emergency response; and criticality experiments and research.

Replacement of the 138 kV Power Transmission System will provide the NNSS with highly reliable power and communications to mission critical facilities such as the Device Assembly Facility. The reliability of the existing system will constitute a risk to mission as system components continue to deteriorate, resulting in unscheduled outages that will impact the mission of Stockpile Stewardship operations. The existing system was originally constructed in 1963 (57 years of age) and is well beyond its useful design life. The system carries the site's fiber optic backbone, which enables vital communications and data transmission across the NNSS. Therefore, replacement of the system will provide the NNSS with more reliable power and communications, enabling continued success at executing the site's vital national security mission.

This project provides the following benefits:

- Restore reliability for the 138kV PTS that provides power to vital mission facilities at the Nevada National Security Site
- Mitigates the risk of losing mission critical data from Stockpile Stewardship experiments; this data represents significant federal investment of dollars, man-hours, and special nuclear material
- Improves the reliability and capability of security, safety, and emergency management/response systems
- Provides uninterrupted communications and data transmission in support of normal site operations

An Independent Analysis of Alternatives was conducted after CD-0 in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. Multiple alternatives were analyzed; the highest ranked alternative was to construct a new 138 kV Power Transmission System.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Funds appropriated under this data sheet may be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

In accordance with DOE Order 413.3B, KPPs will be finalized at approval of CD-2, *Approve Performance Baseline*.

Performance Measure	Threshold	Objective
Component Service Life	New components shall have the following minimum service life: Conductors - 35 years, Insulators - 50 years, Poles - 60 years	N/A
Prevent Single Failure	The new Power Transmission System will maintain the current loop configuration that incorporates three interconnection points from the off-site utility grid. The NNSS Power Transmission System will be sectionalized such that no single failure of the system will result in a loss of load	N/A
Natural Phenomenon	In accordance ASCE/SEI 7-10, the design will meet the following design categories for essential structures: Seismic Design Category 2; Extreme Wind Design Category 2; Flood Design Category 2; Extreme Precipitation (includes ice) Design Category 2	N/A
Electrical	The Power Transmission System configuration will support: Voltage - 138 kV, Power capacity of at least 35 MW.	N/A
Fiber Optic Cabling - communications requirements	The fiber optic system co-located with the Power Transmission System conductor shall provide single mode 144 strand fiber optic cable compatible with all 1,510 nm wave length equipment.	N/A

3. Project Cost and Schedule

Financial Schedule[a]

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	6,000	6,000	3,000
FY 2021	0	0	3,000
Total Design	6,000	6,000	6,000
Construction			
FY 2021	59,000	59,000	11,800
FY 2022	0	0	23,600
FY 2023	0	0	23,600
Total Construction	59,000	59,000	59,000
Total Estimated Costs (TEC)			
FY 2020	6,000	6,000	3,000

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2021	59,000	59,000	14,800
FY 2022	0	0	23,600
FY 2023	0	0	23,600
Total TEC	65,000	65,000	65,000
Other Project Costs			
FY 2017	550	550	158
FY 2018	914[a]	914[a]	1,201
FY 2019	500	250	56
FY 2020	66	316	175
FY 2021	90	90	80
FY 2022	90	90	80
FY 2023	90	90	550
Total OPC, except D&D	2,300	2,300	2,300
OPC D&D			
FY 2023	2,400	2,400	2,400
Total, OPC	4,700	4,700	4,700
Total Project Costs (TPC)			
FY 2017	550	550	158
FY 2018	914	914	1,201
FY 2019	500	250	56
FY 2020	6,066	6,316	3,175
FY 2021	59,090	59,090	14,880
FY 2022	90	90	23,680
FY 2023	2,490	2,490	26,550
Grand Total	69,700	69,700	69,700

[a] Actual appropriation allocated and obligated to the project in FY 2018 was $914K. This has been corrected from the FY 2020 data sheet.

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	4,800	4,800	N/A
Contingency	1,200	1,200	N/A
Total, Design	6,000	6,000	N/A
Construction			
Site Work	900	900	N/A
Equipment	0	0	N/A
Construction	49,100	49,100	N/A
Federal Support	800	800	N/A
Contingency	8,200	8,200	N/A
Total, Construction	59,000	59,000	N/A
Total Estimated Cost	65,000	65,000	N/A
Contingency, TEC	9,400	9,400	N/A
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	550	550	N/A
Analysis of Alternatives	175	175	N/A
Conceptual Design	265	265	N/A
Other OPC Costs	860	860	N/A
Start-up	0	0	N/A
Contingency	450	450	N/A
Total, OPC except D&D	2,300	2,300	N/A
OPC D&D			
Demolition	1,900	1,900	N/A
Contingency	500	500	N/A
Total, OPC D&D	2,400	2,400	N/A
Total OPC	4,700	4,700	N/A
Contingency, OPC	950	950	N/A
Total Project Cost	69,700	69,700	N/A
Total Contingency (TEC+OPC)	10,350	10,350	N/A

5. Schedule of Appropriations Requests[a]

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2019	TEC	6,000	54,000	0	0	0	0	0	60,000
	OPC	1,900	500	500	7,100	0	0	0	10,000
	TPC	7,900	54,500	500	7,100	0	0	0	70,000
FY 2020	TEC	0	6,000	59,000	0	0	0	0	65,000
	OPC	1,964	66	90	90	2,490	0	0	4,700
	TPC	1,964	6,066	59,090	90	2,490	0	0	69,700
FY 2021	TEC	0	6,000	59,000	0	0	0	0	65,000
	OPC	1,964	66	90	90	2,490	0	0	4,700
	TPC	1,964	6,066	59,090	90	2,490	0	0	69,700

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2023
Expected Useful Life	50
Expected Future Start of D&D of this capital asset	2073

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	4.5	4.6	180.9	180.9

7. D&D Information

Portions of the existing 23 mile PTS section will be demolished after the replacement power line is energized and accepted. Some poles will remain in place for environmental reasons as indigenous animals have nested on these structures.

8. Acquisition Approach

The acquisition approach is Design-Build. Approaches under consideration are an interagency agreement with the Department of Energy's Western Area Power Administration or a Firm Fixed Price contract made directly with the M&O Contractor.

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

18-D-690, Lithium Processing Facility[a]
Y-12 National Security Complex, Oak Ridge, Tennessee
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the Lithium Processing Facility (LPF) project is $109,405K. The project's current Total Project Cost (TPC) range is $955,000k to $1,645,000k. This FY 2021 Construction Project Data Sheet (CPDS) reflects data from the Critical Decision (CD)-1 approved December 31, 2019.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2020 CPDS and does not include a new start for the budget year.

Critical Decision (CD) CD-0, *Mission Need*, was approved in June 2015. The Project Management Executive approved CD-1, *Approve Alternative Selection and Cost Range*, on December 31, 2019. LPF includes the construction of a new 134,000 square foot (SF) non-nuclear facility. The preferred location for this construction is the current Biology Complex facility currently under demolition at Y-12 in Oak Ridge, Tennessee.

Consistent with NNSA's increased emphasis on project management rigor, and to ensure high confidence in the estimates, the CD-2 and CD-3 will be combined and approved upon completion of the 90% design. An independent cost review (ICR) and independent project review (IPR) were performed in April and August 2019 respectively. The updated CD-1 cost range and schedule for the project reflects both new CD milestone dates and cost estimates. Previous cost and schedule estimates were based on pre-conceptual information. Since that time an Alternative of Analysis (AOA) was conducted, the conceptual design completed, and a project risk register was produced. Through this process the requirements, systems, and other facility inputs were further developed resulting in the cost estimate range to grow. Primary factors for the cost increase included an increase in required building size from 100,000 SF to 134,000 SF, the refinement of process equipment requirements, and the further definition of project risks. The CD-1 estimate was based on the June 2019 DOE Independent Cost Review (ICR) which concluded that the project point estimate was reasonable and the schedule met recommended best practices. The project CD-4 date changed from the 3rd Quarter FY 2027 to the 4th Quarter FY 2031 based on a better understanding of the requirements.

FY 2021 funds will be used for preliminary design activities.

A Level 3 Project Management Career Development Program (PMCDP) qualified Federal Project Director (FPD) has been assigned to this project and has approved this CPDS. The FPD is a candidate for Level 4 and will achieve this certification within 1 year of his appointment. Appropriated project funding under this data sheet may be used to provide independent assessment of the planning and execution, and for contracted support services to the federal project team for oversight and support.

Preliminary and final design, construction and Other Project costs (OPC) will be executed through line item funding specifically appropriated for the project starting in FY 2021. Prior to FY 2021, OPCs were funded from Capability Based Investments and Lithium Sustainment, except in FY 2018 where funding appropriated under the project funded conceptual design.

[a] The project, formerly known as the Lithium Production Capability project, has been renamed to better reflect planned activities within the facility.

Critical Milestone History

Fiscal Quarter or Date[a]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	06/10/2015	01/19/2018	2Q FY 2019	1Q FY 2021	2Q FY 2022	1Q FY 2021	N/A	2Q FY 2027
FY 2020	06/10/2015	02/28/2019	3Q FY 2019	2Q FY 2022	2Q FY 2022	2Q FY 2022	N/A	3Q FY 2027
FY 2021	06/10/2015	02/28/2019	12/31/2019	3Q FY 2024	3Q FY 2024	3Q FY 2024	N/A	4Q FY 2031

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable).
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete –Completion of D&D work
CD-4 – Approve Start of Operations or Project Complete

Fiscal Year	CD-3A
FY 2019	N/A
FY 2020	4Q FY 2021
FY 2021	4Q FY 2022

CD-3A – Site Preparation – demolishing existing structures, engineered fill, access roads, and utilities to clear and prepare the site for new construction or refurbishment of existing buildings and procuring critical equipment.

Project Cost History[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	120,000	530,000	650,000	70,000	0	70,000	720,000
FY 2020	125,000	525,000	650,000	70,000	0	70,000	720,000
FY 2021	384,000	1,161,000	1,545,000	100,000	0	100,000	1,645,000

The project will seek to procure long lead capital equipment and prepare the construction site prior to approval of the project baseline at CD-2.

2. Project Scope and Justification

Scope

The LPF project will construct a new facility to relocate lithium operations and processes currently in Y-12's Building 9204-2 into a safe, reliable, modern building. LPF will be approximately 134,000 SF in size. It will be designed with space for lithium process equipment, shipping and receiving areas, in-process storage areas, and technical and administrative support areas. The scope includes long-lead procurements as well as site preparation activities. The LPF project plans to pursue approval of a CD-3A for the long lead scope and site preparation. The project cost estimate and funding profile may be revised in future budget requests prior to CD-2 to account for improved definition of the design, schedule, and/or risks.

[a] Project schedules are estimates until the project baseline is approved at CD-2.
[b] Project costs are estimates until the project baseline is approved at CD-2.

Justification

Lithium is an essential element for the refurbishment and modernization of the nuclear weapons stockpile. To support Defense Programs missions, Y-12 maintains capabilities and facilities for the production of lithium components. In addition to supporting Defense Programs missions, lithium capabilities support international agreements, the NNSA Nuclear Smuggling Detection and Deterrence program, the Department of Homeland Security Countering Weapons of Mass Destruction Office, and the Department of Energy (DOE) Office of Science Isotope Business Office.

Production work for lithium and related nonnuclear special materials vital to canned subassemblies is performed in Building 9204-2, which was built in 1943. The facility is oversized for today's mission, is costly to operate, has many operating issues, and has exceeded its expected life. Despite short-term investments to sustain capabilities, conditions in Building 9204-2 remain poor, in part due to a significant amount of deferred maintenance. In addition, the Senate Armed Service Committee in the National Defense Authorization Act of Fiscal Year 2015, acknowledged that: "Portions of the concrete ceiling above equipment that supplies components to the stockpile are spalling as the rebar inside the 60-plus-year-old concrete has corroded due to a desiccant used in the air handling system. Such working conditions are unacceptable if not dangerous." In order to ensure continuity of lithium capabilities, reduce annual operating costs, and increase process efficiencies using safer, more modern, agile, and responsive processes, a new facility must be built.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*. Consistent with DOE O 413.3B, earned value information for the LPF design effort will be reported in the Project Assessment and Reporting System (PARS II). Funding specifically appropriated for the LPF project may also be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction of the LPF.

Preliminary Key Performance Parameters (KPPs)

The threshold KPPs represent the minimum acceptable performance that the project must achieve. These thresholds are presented with increased detail in the classified Project Requirements Document (PRD). Achievement of the threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The objective KPPs, also detailed in the PRD, represent the desired project performance.

Performance Measure[a]	Threshold	Objective
Demonstrate capacity to process and produce sufficient lithium material and manufacture sufficient lithium components to meet projected weapons program demands	Threshold Performance Parameters are identified in the Classified Project Requirements Document	Objective Performance Parameters are identified in the Classified Project Requirements Document

[a] Key Performance Parameters will be approved upon approval of the project baseline.

3. Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018[a]	0	0	0
FY 2019	19,000	19,000	6,570
FY 2020	32,000	19,000	15,000
FY 2021	85,000	85,000	75,000
FY 2022	150,000	150,000	145,000
FY 2023	93,000	106,000	137,000
FY 2024	5,000	5,000	5,430
Total Design	384,000	384,000	384,000
Construction			
FY 2021	14,405	14,405	0
FY 2022	68,902	68,902	15,000
FY 2023	130,012	117,012	100,000
FY 2024	245,770	245,770	190,000
FY 2025	245,312	245,312	350,000
FY 2026	251,000	251,000	260,000
FY 2027	147,000	147,000	150,000
FY 2028	40,000	40,000	50,000
FY 2029	13,599	26,599	30,000
FY 2030	5,000	5,000	10,000
FY 2031	0	0	6,000
Total Construction	1,161,000	1,161,000	1,161,000
Total Estimated Costs (TEC)			
FY 2018	0	0	0
FY 2019	19,000	19,000	6,570
FY 2020	32,000	19,000	15,000
FY 2021	99,405	99,405	75,000
FY 2022	218,902	218,902	160,000
FY 2023	223,012	223,012	237,000
FY 2024	250,770	250,770	195,430
FY 2025	245,312	245,312	350,000
FY 2026	251,000	251,000	260,000

[a] The FY 2020 data sheet noted that NNSA used the $5 million appropriated in line-item 18-D-690 in FY 2018 for OPCs, but reflected that budget authority in Design. For clarity, that budget authority is now reflected in OPCs.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2027	147,000	147,000	150,000
FY 2028	40,000	40,000	50,000
FY 2029	13,599	26,599	30,000
FY 2030	5,000	5,000	10,000
FY 2031	0	0	6,000
Total TEC	**1,545,000**	**1,545,000**	**1,545,000**
Other Project Costs (OPC)			
FY 2015 [a]	497	497	88
FY 2016	247	247	637
FY 2017	4,680	4,680	572
FY 2018	5,000 [b]	3,661	4,527
FY 2019	0	0	3,261
FY 2020	1,000	1,000	1,000
FY 2021	10,000	10,000	10,000
FY 2022	3,000	3,000	3,000
FY 2023	3,000	3,000	3,000
FY 2024	10,000	10,000	8,000
FY 2025	16,000	16,000	16,000
FY 2026	20,000	20,000	10,000
FY 2027	22,000	22,000	20,739
FY 2028	4,576	5,915	19,176
Total OPC	**100,000**	**100,000**	**100,000**
Total Project Costs (TPC)			
FY 2015	497	497	88
FY 2016	247	247	637
FY 2017	4,680	4,680	572
FY 2018	5,000	3,661	4,527
FY 2019	19,000	19,000	9,831
FY 2020	33,000	20,000	16,000
FY 2021	109,405	109,405	85,000
FY 2022	221,902	221,902	163,000
FY 2023	226,012	226,012	240,000
FY 2024	260,770	260,770	203,430
FY 2025	261,312	261,312	366,000

[a] OPC funding in FY 2015-2017 was funded out of Capability Based Investments.

[b] The FY 2020 data sheet noted that NNSA used the $5 million appropriated in line-item 18-D-690 in FY 2018 for OPCs, but reflected that budget authority in Design. For clarity, that budget authority is now reflected in OPCs.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2026	271,000	271,000	270,000
FY 2027	169,000	169,000	170,739
FY 2028	44,576	45,915	69,176
FY 2029	13,599	26,599	30,000
FY 2030	5,000	5,000	10,000
FY 2031	0	0	6,000
Grand Total	**1,645,000**	**1,645,000**	**1,645,000**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC))			
Design			
Design	273,000	97,085	N/A
Federal Support	18,000	5,000	N/A
Other Costs	0	16,203	N/A
Contingency	93,000	6,712	N/A
Total, Design	384,000	125,000	N/A
Construction			
Site Work	25,045	10,300	N/A
Equipment	417,939	200,000	N/A
Construction	434,018	270,560	N/A
Federal Support	28,000	15,000	
Project Management	66,628	10,000	N/A
Contingency	189,370	19,140	N/A
Total, Construction	1,161,000	525,000	N/A
Total Estimated Cost	**1,545,000**	**650,000**	N/A
Contingency, TEC	*282,370*	*25,852*	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	23,389	0	N/A
Conceptual Planning	7,085	3,250	N/A
Conceptual Design	4,218	5,824	N/A
Federal Support	0	5,000	
Other OPC Costs (Startup, ES&H, etc.)	47,698	45,319	N/A
Contingency	17,610	10,607	N/A
Total, OPC	**100,000**	**70,000**	N/A
Contingency, OPC	17,610	10,607	N/A
Total Project Cost	**1,645,000**	**720,000**	N/A
Total Contingency (TEC+OPC)	***299,980***	***36,459***	N/A

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Out Years	Total
FY 2019	TEC	0	19,000	32,000	26,200	125,900	201,600	150,000	0	95,300	650,000
	OPC	7,119	3,250	1,000	1,000	1,000	1,000	9,000	0	46,631	70,000
	TPC	7,119	22,250	33,000	27,200	126,900	202,600	159,000	0	141,931	720,000
FY 2020	TEC	5,000	19,000	32,000	26,200	125,900	191,600	217,728	0	32,572	650,000
	OPC	5,424	3,250	1,000	1,000	1,000	1,000	12,236	0	44,690	70,000
	TPC	10,424	22,250	33,000	27,200	126,900	192,600	229,964	0	77,132	720,000
FY 2021	TEC	0	19,000	32,000	99,405	218,902	223,012	250,770	245,312	456,599	1,545,000
	OPC	10,424	0	1,000	10,000	3,000	3,000	10,000	16,000	46,576	100,000
	TPC	10,424	19,000	33,000	109,405	221,902	226,012	260,770	261,312	503,175	1,645,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	FY 2031
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	FY 2081

Related Funding requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	37	73	1,855	3,666

7. D&D Information

The preferred location for the new facility is the existing Biology Complex; however, the costs to D&D the existing facilities at this location are not included in the costs of this construction project. Building 9204-2 houses operations in addition to lithium production, and the plan for the transition of those operations to other facilities is yet to be decided. Once all capabilities have been moved out of Building 9204-2, final D&D of existing facilities will be the responsibility of the DOE Office of Environmental Management.

8. Acquisition Approach

The LPF Project may be executed through several acquisition strategies, to include firm-fixed-price design-bid-build and design-build contracts, and cost-plus design-build contracts. Contracts for design and construction management will be awarded by the Y-12 site M&O contractor. As allowed by Order 413.3B, Change 5, the project scope may be phased into smaller subprojects with phased CD-2/3 approvals and CD-3A for site preparation and long lead procurements.

18-D-650, Tritium Finishing Facility[a]
Savannah River Site, Aiken, South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the Tritium Finishing Facility (TFF) Project is $27,000K. The current preliminary cost range is $305,000k to $640,000k.

Significant Changes:
The TFF Project at the NNSA Savannah River Site requested line item funding in FY 2018 and FY 2019. Funding was not provided to the project in FY 2018, but $10,000K was provided within the Infrastructure and Operations, Recapitalization program in FY 2019 to "advance plans" for the project. The $10,000K is not included in the TFF project, but will be used to perform two small preparatory upgrade projects in Building 234-7H that advance the plans for TFF. The FY 2021 request of $27Mwill support project design and engineering. The most recent Critical Decision (CD) is CD-1, approved December 20 2019.

CD-0, Approve Mission Need, was completed in 2015. The critical milestone dates and project costs have been adjusted to account for the delayed CD-1 milestone, which was initially anticipated in March 2018. The CD-4 range is 4Q FY 2029 - 4Q FY 2031.

During the CD-1 process, the project has identified a subproject construction execution approach that includes but is not limited to a site preparation and warehouse construction subproject. The acquisition approach will be refined as design matures. The scope, schedule and cost information for each sub-project will be defined in future submissions of this datasheet.

A Federal Project Director has been appointed.

The TFF subproject is described below:

Site Preparation & Warehouse Construction (18-D-650-01): A subproject will be requested for dismantlement and removal of structures, systems and components, re-establishing warehouse space and site preparation to reduce project schedule and subsequent cost.

Critical Milestone History

Fiscal Quarter or Date[b]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	06/10/2015	01/28/2017	2Q FY 2018	4Q FY 2022	2Q FY 2022	4Q FY 2022	N/A	4Q FY 2027
FY 2019	06/10/2015	01/28/2017	3Q FY 2018	2Q FY 2023	2Q FY 2022	2Q FY 2023	N/A	4Q FY 2029
FY 2020	06/10/2015	01/28/2017	4Q FY 2019	2Q FY 2024	4Q FY 2023	2Q FY 2024	N/A	4Q FY 2031
FY 2021	06/10/2015	01/28/2017	12/20/2019	1Q FY 2024	1Q FY 2024	1Q FY 2024	N/A	4Q FY 2031

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2/3 Site Preparation Subproject – demolishing existing structures, relocating fence, access roads, warehouse space, and utilities to clear and prepare the site for new construction or refurbishment of existing buildings.

[a] The former Tritium Production Capability has been renamed to the Tritium Finishing Facility that better defines the facilities activities.
[b] The schedules are only estimates until the project baseline is approved. Dates listed correspond to the high end of the schedule range.

CD-4 – Site Preparation Subproject complete
CD-2/3 – Approve Performance Baseline; Approve Start of Construction
Final Design Complete – Estimated/Actual date the project design will be/was complete (d) **D&D Complete** –D&D will not be performed as part of this project, due to the nature of decontaminating tritium process systems
CD-4 – Approve Start of Operations or Project Complete

Fiscal Quarter or Date

Fiscal Year	CD-3A	
FY 2018	1Q FY 2020	
FY 2019	1Q FY 2020	
FY 2020	1Q FY 2022	
FY 2021	3Q FY 2021	

CD-3A – Long Lead Procurement of critical equipment

Project Cost History

(Dollars in Thousands)[a]

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	76,000	349,000	425,000	74,000	0	74,000	499,000
FY 2019	76,000	425,042	501,042	74,000	0	74,000	575,042
FY 2020	79,000	464,829	543,829	75,000	0	75,000	618,829
FY 2021	80,000	482,300	562,300	77,700	0	77,700	640,000

With the exception of the Site Preparation Subproject, which will receive its own CD-2/3, no construction will be performed until the project performance baseline has been validated and CD-2/3 has been approved. The project will initiate a CD-3A request for long-lead procurement of a mass spectrometer and glovebox-type items. A subproject will be requested for dismantlement and removal of structures, systems and components, re-establishing warehouse space and site preparation to reduce project schedule and subsequent cost.

2. Project Scope and Justification

Scope
The TFF project will construct two new buildings to relocate tritium and deuterium processes currently in H-Area Old Manufacturing into safe, reliable, modern buildings. The first, hardened building (estimated at 15,000 +/-50% square feet) will house nuclear equipment processes, and the second (estimated at 5,000 +/-50% square feet) will house non-nuclear process equipment. To make room for the new buildings, existing warehouses will be demolished and replaced. Additional scope for the project includes project design, safety basis development, and relocation of utilities, fences, and an access road. The TFF project also includes modifications to Building 249-H and renovations to Building 234-7H to house additional processes and equipment.

Justification
The NNSA Stockpile Stewardship mission and the Tritium-related missions require the specific capability of providing tritium and deuterium-filled reservoirs to the Department of Defense, a capability that must be ensured well into the foreseeable future. These capabilities include, but are not limited to, receipt, inspection, inter loading, pre-loading, metallography, surveillance, container storage, packaging, and shipping. These critical capabilities are currently housed in a 60-year-old building, H-Area Old Manufacturing. The infrastructure of the building has deteriorated and is well beyond expected end-of-life. Critical capabilities are now housed in areas that create a substantial risk to the enduring Tritium mission. Infrastructure failures have increased, leading to increased safety, security, maintenance and operating costs.
The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements for CD-1

[a] The costs are only estimates until the project performance baseline is approved.

have been met. The project funding profile may be revised in future budget requests prior to CD-2 to account for improved definition of the design, schedule, and risks.

Funds appropriated under this data sheet may be used to provide independent assessments of the planning and execution of this project and for contracted support services to the federal project team for oversight and support. Funding specifically appropriated for this line item will be used only for Total Estimated Cost (TEC) work.

Preliminary Key Performance Parameters (KPPs)

The threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
Demonstrate the operational capability of inert loading at a capacity rate that can meet the annualized threshold requirement based on an assumed 40 weeks of equipment availability per year.	Classified	Classified
Demonstrate the operational capability of the pre-loading process at a capacity rate that can meet the annualized threshold requirement based on 40 weeks of equipment availability per year.	Classified	Classified

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	27,000	27,000	13,000
FY 2021	27,000	27,000	26,000
FY 2022	16,000	16,000	20,000
FY 2023	10,000	10,000	16,000
FY 2024	0	0	5,000
Total, Design	80,000	80,000	80,000
Construction			
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	11,000	11,000	11,000
FY 2023	45,000	45,000	23,000
FY 2024	85,000	85,000	80,000

[a] Key Performance Parameter (KPP) will be approved upon approval of the project baseline.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2025	120,000	120,000	137,000
FY 2026	97,000	97,000	97,000
FY 2027	73,000	73,000	50,000
FY 2028	39,300	39,300	35,000
FY 2029	12,000	12,000	25,000
FY 2030	0	0	19,300
FY 2031			5,000
Total, Construction	482,300	482,300	482,300
Total Estimated Cost			
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	27,000	27,000	13,000
FY 2021	27,000	27,000	26,000
FY 2022	27,000	27,000	31,000
FY 2023	55,000	55,000	39,000
FY 2024	85,000	85,000	85,000
FY 2025	120,000	120,000	137,000
FY 2026	97,000	97,000	97,000
FY 2027	73,000	73,000	50,000
FY 2028	39,300	39,300	35,000
FY 2029	12,000	12,000	25,000
FY 2030	0	0	19,300
FY 2031	0	0	5,000
Total, TEC	562,300	562,300	562,300
Other Project Cost (OPC)			
FY 2015[a]	1,700	1,700	1,700
FY 2016[a]	3,300	3,300	3,300
FY 2017[a]	1,700	1,700	1,000
FY 2018[a]	0	0	0
FY 2019	1,000	1,000	1,700
FY 2020	2,000	2,000	1,500
FY 2021	2,000	2,000	2,000
FY 2022	2,000	2,000	1,700
FY 2023	3,000	3,000	1,700
FY 2024	3,000	3,000	2,800
FY 2025	6,000	6,000	7,300
FY 2026	10,000	10,000	10,000
FY 2027	8,000	8,000	8,000
FY 2028	16,000	16,000	15,000

[a] Other Project Costs changes reflect a reconciliation of activities during those years.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2029	18,000	18,000	10,000
FY 2030	0	0	8,000
FY 2031	0	0	2,000
Total, OPC	77,700	77,700	77,700
Total Project Cost (TPC)			
FY 2015	1,700	1,700	1,700
FY 2016	3,300	3,300	3,300
FY 2017	1,700	1,700	1,000
FY 2018	0	0	0
FY 2019	1,000	1,000	1,700
FY 2020	29,000	29,000	14,500
FY 2021	29,000	29,000	28,000
FY 2022	29,000	29,000	32,700
FY 2023	58,000	58,000	40,700
FY 2024	88,000	88,000	87,800
FY 2025	126,000	126,000	144,300
FY 2026	107,000	107,000	107,000
FY 2027	81,000	81,000	58,000
FY 2028	55,300	55,300	50,000
FY 2029	30,000	30,000	35,000
FY 2030	0	0	27,300
FY 2031	0	0	7,000
Total, TPC	640,000	640,000	640,000

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design (including escalation)	56,500	48,000	N/A
Safety Basis	4,000	4,000	N/A
Federal Support	3,000	3,000	N/A
Project and Design Management	9,500	9,500	N/A
Contingency	7,000	14,500	N/A
Total, Design	80,000	79,000	N/A
Construction			
Site Work	12,500	12,500	N/A
Facility Demolition	4,000	4,000	N/A
Construction (including escalation)	396,800	363,635	N/A
Safety Basis Documents	6,000	6,000	N/A
Federal Support	8,000	8,000	N/A
M&O Support	5,000	5,000	N/A
Contingency	50,000	65,694	N/A
Total, Construction	482,300	464,829	N/A
Total Estimated Cost	562,300	543,829	N/A
Contingency, TEC	57,000	80,194	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	N/A
Conceptual Planning	3,700	4,900	N/A
Analysis of Alternative	800	832	N/A
Conceptual Design	3,200	3,200	N/A
NEPA & Permit	500	500	N/A
Federal Support	3,000	3,000	N/A
Safeguard & Security	1,000	1,000	N/A
ES&H	12,500	12,500	N/A
Contractor Support	6,000	3,000	N/A
Startup	38,000	36,500	N/A
Contingency	9,000	9,568	N/A
Total, OPC except D&D	**77,700**	**75,000**	**N/A**
Contingency, OPC	9,000	9,568	N/A
Total Project Cost	640,000	618,829	N/A
Total Contingency (TEC +OPC)	66,000	89,762	N/A

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Outyears	Total
FY 2018	TEC	0	25,505	49,500	13,000	22,000	0	0	N/A	308,195	425,000
	OPC	10,100	3,000	3,000	3,000	3,000	0	0	N/A	51,900	74,000
	TPC	10,100	28,505	52,500	16,000	25,000	0	0	N/A	360,095	499,000
FY 2019	TEC	6,800	27,000	27,000	13,000	30,000	45,000	200,000		152,242	501,042
	OPC	10,100	3,000	3,000	3,000	3,000	3,000	3,000	N/A	45,900	74,000
	TPC	16,900	30,000	30,000	16,000	33,000	48,000	203,000	N/A	198,142	575,042
FY 2020	TEC	0	0	27,000	13,000	30,000	44,909	166,500		262,420	543,829
	OPC	7,600	3,000	2,000	2,000	2,000	3,000	3,000	N/A	52,400	75,000
	TPC	7,600	3,000	29,000	15,000	32,000	47,909	169,500	N/A	314,820	618,829
FY 2021	TEC	0	0	27,000	27,000	27,000	55,000	85,000	120,000	221,300	562,300
	OPC	7,700	0	2,000	2,000	2,000	3,000	3,000	6,000	52,000	77,700
	TPC	7,700	0	29,000	29,000	29,000	58,000	88,000	126,000	273,000	640,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2031
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2082

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	4.9	4.9	2,478	2,478

7. D&D Information

Because the existing facility contains tritium, the facility cannot be decommissioned and demolished for another 70 years. The approximate area of warehouses to be demolished to clear the site for the new building is listed here.

D&D Description	Square Feet
1. New area being constructed by this project on the Savannah River Site	20,000 – 30,000
2. Area on the Savannah River Site to be D&D by this project	10,000
3. Area on the Savannah River Site to be transferred, sold, and/or D&D outside the project including area previously "banked"	0

D&D Description	Square Feet
4. Area on other sites to be D&D by this project	0
5. Area on other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
6. Total area eliminated (add boxes 2, 3, 4, and 5)	10,000

8. Acquisition Approach

The Acquisition Strategy was approved by the Deputy Administrator for Defense Programs (NA-10) on December 20, 2019. Based on lessons learned on other capital asset projects executed across the complex, the recommended approach for M&O design/construction projects is to segregate capital asset projects from other operational scope. Consistent with the Deputy Secretary's September 12, 2018 memorandum, *Improving Acquisition Management,* the TFF acquisition will "maximize the use of objective performance measures that focus on outcomes which balance considerations of cost control, schedule achievement, and technical performance" and ensure fee payments are "aligned with contractual end objectives and mission accomplishment".

The existing M&O contract will be modified to incorporate a new Contract Line Item (CLIN) for NNSA Capital Asset Construction Projects. This construction CLIN will include generalized terms and conditions to allow capital asset projects to be performed using contract types such as: Cost-Plus-Incentive-Fee (CPIF), Fixed-Price-Incentive-Fee (FPIF) and Fixed-Price with Economic Price Adjustment (FP-EPA) at the Sub-CLIN level. Sub-CLINs will be negotiated separately for each project. The advantage to this CLIN/Sub-CLIN approach is that additional Sub-CLINs can be negotiated and added as other NNSA capital asset construction project needs are identified.

The Sub-CLIN established for the TFF project will include the following:

- Separate work scopes for each Critical Decision (CD).
- Separate fee types for each CD that may include a combination of Incentive and Milestone Fees related to cost and schedule performance depending on the specific project phase.

It is anticipated the M&O contractor will award competitive subcontracts for various portions of the work. Although the design and construction work will require both the architect/engineering and construction firms with AMSE NQA-1 capability; significant portions of the construction work are commercial in nature and NNSA anticipates competition from qualified firms for construction. Due to expiration of the current M&O contract on September 30, 2022 (if EM exercises both one year option periods), the TFF subcontracts will be assignable to the successor M&O contractor.

18-D-620, Exascale Computing Facility Modernization (ECFM)
Lawrence Livermore National Laboratory, Livermore, California
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request of $29,200K for the Exascale Computing Facility Modernization (ECFM) Project at the Terascale Simulation Facility (B453) at the Lawrence Livermore National Laboratory (LLNL) in Livermore, California will be used for construction. At Critical Decision (CD)2/3, the Total Project Cost (TPC) was $111,200K with a projected CD-4 approval of 2Q FY 2023.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the FY 2020 CPDS and does not include a new start for the budget year. The most recent DOE Order 413.3B Critical Decision for the project was CD-2/3, Approved Performance Baseline and start of Construction, which was signed by the Project Management Executive on December 19, 2019. The overall CD-2/3 Total Project Cost is now $111,200K. Additionally, the load bearing steel columns and foundation and wall improvements to increase the floor load limits are no longer required to be added as structural analysis shows the building's current structure is capable of supporting the required computing rack load of up to 7,500 lbs. The CPDS was updated to reflect the approval of CD-2/3 and baseline schedule and achievement of the load bearing capability Key Performance Parameter. The revised CD-4 date includes schedule reserve not included in previous data sheets.

This project is linked to the Exascale Computing Project. This project will ensure that LLNL will have a facility capable of housing an exascale-class high performance computing machine.

A Federal Project Director has been assigned to this Project.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	4/28/2017	5/10/2017	1QFY2018	4QFY2018	4QFY2018	1QFY2019	N/A	3QFY2021
FY 2019	4/28/2017	5/10/2017	2QFY2018	2QFY2019	2QFY2019	2QFY2019	N/A	4QFY2022
FY 2020	4/28/2017	5/10/2017	5/29/2018	1QFY2020	3QFY2019	1QFY2020	N/A	4QFY2022
FY 2021	4/28/2017	5/10/2017	5/29/2018	12/19/2019	5/20/2019	12/19/2019	N/A	2QFY2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
CD-3A – Long Lead Procurements and Site Preparation
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	CD-3A
FY 2018	N/A
FY 2019	N/A
FY 2020	3QFY2019
FY 2021	6/21/2019

CD-3A – Long Lead Procurements and Site Preparation: Approve Performance Baseline and Start of Construction

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	3,000	92,000	95,000	12,000	0	12,000	107,000
FY 2019	15,000	101,000	116,000	9,000	0	9,000	125,000
FY 2020	15,000	101,000	116,000	9,000	0	9,000	125,000
FY 2021	7,855	97,345	105,200	6,000	0	6,000	111,200

2. Project Scope and Justification

Scope

The proposed project will modify Building 453 (B453) at LLNL to accommodate the increased infrastructure demands of exascale computing platforms. Commissioned in 2004, B453 has been capable of housing the largest, most advanced classified systems to date but requires upgrades to the electrical and mechanical capabilities for the new systems. B453 provides the approximately 20,000 ft^2 of necessary floor space. The existing cooling tower complex will be expanded by 18,000 tons of capacity, including required piping and pumps. Lastly, the existing electrical system will be upgraded to allow for an additional 40 MW of power for High Performance Computing, including the required feeders for mechanical and data systems; secondary electrical panels and feeders; and substation transformers, switchgear, switches, and bussing.

Justification

The NNSA requires vastly more powerful computers to address increasingly challenging certification requirements associated with meeting the Stockpile Stewardship Program mission as the nuclear weapons stockpile ages. These next-generation computers will require unprecedented electrical power and cooling. In addition, compact architectures will demand higher rack densities that will exert floor weights substantially beyond current systems. Supporting future generations of computing systems will therefore impose requirements on NNSA facilities that exceed their current thresholds in terms of power, water, and structural floor loads.

NNSA has a mission need to acquire infrastructure capable of meeting the projected structural, electrical, and mechanical requirements for the new generation of computers. Along with the necessity of expanding system capacity prior to the delivery of next generation computing systems, prudent risk management calls for an infrastructure necessary to accommodate new computer designs having increased requirements across an array of factors, including number of processors per system, density of processors per rack, and new approaches to power and cooling.

Funds appropriated under this data sheet may be used for contracted support services to the Federal Program Manager and the Federal Project Director to conduct independent assessments of the planning and execution of this Project required by DOE O 413.3B and to conduct technical reviews of design and construction documents.

The Project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. As allowed by DOE O 413.3B, work will be phased to improve overall efficiency. NNSA will use a Design-Bid-Build on a firm-fixed base approach for this project. OPCs are included in the ASC program within Stockpile Research, Technology, and Engineering.

Key Performance Parameters (KPPs)

The KPPs represent the acceptable performance that the project must achieve. Achievement of the KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs represent the desired project performance.

Performance Measure	Objective	Status
Provide adequate square footage to site exascale class computers systems and related systems.	20,000 square feet	Completed: Selection of B453 provides the square footage and satisfies this KPP
Increase power capacity to meet exascale systems demand.	85 MW	
Increase mechanical liquid-cooling water capacity to meet exascale systems demand.	18,000 tons	
Increase the load carrying capability of the computer floor to accommodate heavier computer racks.	315 lbs./ft2	Completed: Structural analysis shows B453 structural capacity satisfies this KPP

3. Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	3,000	3,000	670
FY 2019	4,855	4,855	4,855
FY 2020	0	0	1,165
FY 2021	0	0	1,165
Total, Design	**7,855**	**7,855**	**7,855**
Construction			
FY 2019	18,145	18,145	0
FY 2020	50,000	50,000	55,000
FY 2021	29,200	29,200	35,000
FY 2022	0	0	6,000
FY 2023	0	0	1,345
Total, Construction	**97,345**	**97,345**	**97,345**
Total Estimated Costs			
FY 2018	3,000	3,000	670
FY 2019	23,000	23,000	4,855
FY 2020	50,000	50,000	56,165
FY 2021	29,200	29,200	36,165
FY 2022	0	0	6,000
FY 2023	0	0	1,345
Total, TEC	**105,200**	**105,200**	**105,200**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2017	2,000	2,000	1,350

	Budget Authority (Appropriations)	Obligations	Costs
FY 2018	2,000	2,000	1,732
FY 2019	0	0	483
FY 2020	0	0	400
FY 2021	1,000	1,000	1,035
FY 2022	1,000	1,000	965
FY 2023	0	0	35
Total OPC, except D&D	**6,000**	**6,000**	**6,000**
OPC D&D			
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2017	2,000	2,000	1,350
FY 2018	2,000	2,000	1,732
FY 2019	0	0	483
FY 2020	0	0	400
FY 2021	1,000	1,000	1,035
FY 2022	1,000	1,000	965
FY 2023	0	0	35
Total, OPC	**6,000**	**6,000**	**6,000**
Total Project Costs (TPC)			
FY 2017	2,000	2,000	1,350
FY 2018	5,000	5,000	2,402
FY 2019	23,000	23,000	5,338
FY 2020	50,000	50,000	56,565
FY 2021	30,200	30,200	37,200
FY 2022	1,000	1,000	6,965
FY 2023	0	0	1,380
Grand Total	**111,200**	**111,200**	**111,200**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	4,600	7,000	4,600
Project Management	1,500	4,300	1,500
Federal Support	0	500	0
Contingency	1,755	3,200	1,755
Total, Design	7,855	15,000	7,855
Construction			
Site Work	3,000	0	3,000
Equipment	17,000	0	17,000
Construction	50,325	75,800	50,325
Construction Management	12,000	3,600	12,000
Federal Support	420	1,600	420
Contingency	14,600	20,000	14,600
Total, Construction	97,345	101,000	97,345
Total Estimated Cost	105,200	116,000	105,200
Contingency, TEC	16,355	23,200	16,355
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	200	3,500	200
Conceptual Design	1,282	1,500	1,282
Federal Support	500	500	500
Contractor Support	1,200	2,200	1,200
Security	0	0	0
Other OPC Costs	1,918	0	1,918
Contingency	900	1,300	900
Total, OPC	6,000	9,000	6,000
Contingency, OPC	900	1,300	900
Total Project Cost	111,200	125,000	111,200
Total Contingency (TEC+OPC)	17,255	24,500	17,255

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
FY 2018	TEC	0	3,000	40,000	44,000	8,000	0	0	95,000
	OPC	2,000	2,000	3,000	3,000	2,000	0	0	12,000
	TPC	2,000	5,000	43,000	47,000	10,000	0	0	107,000
FY 2019	TEC	0	3,000	23,000	50,000	27,000	13,000	0	116,000
	OPC	2,000	2,000	0	0	3,000	2,000	0	9,000
	TPC	2,000	5,000	23,000	50,000	30,000	15,000	0	125,000
FY 2020	TEC	0	3,000	23,000	50,000	27,000	13,000	0	116,000
	OPC	2,000	2,000	0	0	3,000	2,000	0	9,000
	TPC	2,000	5,000	23,000	50,000	30,000	15,000	0	125,000
FY 2021	TEC	0	3,000	23,000	50,000	29,200	0	0	105,200
	OPC	2,000	2,000	0	0	1,000	1,000	0	6,000
	TPC	2,000	5,000	23,000	50,000	30,200	1,000	0	111,200

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2Q FY2023
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	28.1	28.1	1,405	1,405

7. D&D Information

There is no new square footage being constructed with this Project.

8. Acquisition Approach

The ASC Program has completed an analysis to determine the best value for the government in terms of the Acquisition Strategy. The Program worked with the U.S. Army Corps of Engineers and the LLNL Management & Operating (M&O) contractor to determine which strategy provides the best value at the least risk for the execution, design and construction management of this project. The selected Acquisition Strategy is to execute a design-bid-build contract on firm-fixed base that will be awarded by the M&O Contractor.

17-D-640, U1a Complex Enhancements Project (UCEP)
Nevada National Security Site (NNSS), Mercury, Nevada
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the U1a Complex Enhancements Project (UCEP) is $160,600K. The most recent approved critical decision for UCEP was CD-2/3 for Subproject 17-D-640-010, Enhanced Capabilities for Subcritical Experiments (ECSE) Access and Life Safety Infrastructure approved on March 27, 2019. The design of Subproject 17-D-640-020, ECSE Laboratory and Support Infrastructure continues to mature as the requirements (power, cooling, etc.) are fully defined. As a result, the Total Project Cost (TPC) has increased to a range of $245M to $526.5M, and a CD-4 *Approve Start of Operations or Project Completion* remains scheduled for 4QFY 2025. Further changes to the estimate/schedule may occur when design is completed and CD-2 is obtained for Subproject 020.

A Federal Project Director at the appropriate level has been assigned to this project.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2020 CPDS and does not include a new start for the budget year. CD-2/3 for 17-D-640-010: ECSE Access and Life Safety Infrastructure was approved on March 27, 2019.

Following are the changes from the previous version:
1. Included additional electrical and mechanical equipment to support experiment area
2. Included additional mining to provide space for added utility equipment
3. Included additional design funds to account for the mining and utility increases
4. Added a large diameter borehole for ventilation and power
5. Included capability for multiple shift work to meet the needed project completion date
6. Increased contingency for 17-D-640-020 to $144M as a result of Monte Carlo risk analysis
7. Total Project Cost range upper end increased from $174.8M to $526.5M
8. CD-2/3 was moved from 2Q FY 2020 to 1Q FY 2021 to incorporate the development of the Preliminary Documented Safety Analysis
9. Added a CD-3A for 17-D-640-020: ECSE Laboratory and Support Infrastructure for Site Preparation (demolition, borehole)

Critical Milestone History
17-D-640: Total Project

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1Q FY 2017	1Q FY 2019	2Q FY 2019	3Q FY 2019	N/A	3Q FY 2022
FY 2018	9/25/2014	8/13/2015	3Q FY 2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2019	9/25/2014	8/13/2015	08/09/2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2020	9/25/2014	8/13/2015	08/09/2017	2Q FY 2020	4Q FY 2019	2Q FY 2020	N/A	4Q FY 2025
FY 2021	9/25/2014	8/13/2015	08/09/2017	1Q FY 2021	3Q FY 2020	1Q FY 2021	N/A	4Q FY 2025

17-D-640-010: ECSE Access and Life Safety Infrastructure

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1QFY2017	3QFY2017	4QFY2017	4QFY2017	N/A	2QFY2019
FY 2018	9/25/2014	8/13/2015	3QFY2017	2QFY2018	1QFY2018	2QFY2018	N/A	3QFY2020
FY 2019	9/25/2014	8/13/2015	08/09/2017	2QFY2019	3QFY2018	2QFY2019	N/A	2QFY2021
FY 2020	9/25/2014	8/13/2015	08/09/2017	2QFY2019	7/11/2018	2QFY2019	N/A	4QFY2023
FY 2021	9/25/2014	8/13/2015	08/09/2017	03/27/2019	7/11/2018	03/27/2019	N/A	4QFY2023

17-D-640-020: ECSE Laboratory and Support Infrastructure

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1QFY2017	1QFY2019	2QFY2019	3QFY2019	N/A	3QFY2022
FY 2018	9/25/2014	8/13/2015	3QFY2017	4QFY2019	2QFY2019	4QFY2019	N/A	2QFY2023
FY 2019	9/25/2014	8/13/2015	08/09/2017	4QFY2019	2QFY2019	4QFY2019	N/A	2QFY2023
FY 2020	9/25/2014	8/13/2015	08/09/2017	2QFY2020	4QFY2019	2QFY2020	N/A	4QFY2025
FY 2021	9/25/2014	8/13/2015	08/09/2017	1QFY2021	3QFY2020	1QFY2021	N/A	4QFY2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout
Separate documentation will be submitted for combined CD-2/3 for each subproject

17-D-640-020: ECSE Laboratory and Support Infrastructure

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2021	1QFY2021	3QFY2020

CD-3A – Site Preparation

Project Cost History

17-D-640: Total Project

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	14,200	137,300	151,500	7,109	N/A	7,109	158,609
FY 2018	14,200	137,300	151,500	7,109	N/A	7,109	158,609
FY 2019	19,900	131,600	151,500	7,109	N/A	7,109	158,609
FY 2020	14,856	148,144	163,000	11,809	N/A	11,809	174,809
FY 2021	38,916	468,284	507,200	19,309	N/A	19,309	526,509

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	2,700	23,940	26,640	981	N/A	981	27,621
FY 2018	2,700	23,940	26,640	981	N/A	981	27,621
FY 2019	8,400	38,240	46,640	981	N/A	981	47,621
FY 2020	3,356	44,784	48,140	1,981	N/A	1,981	50,121
FY 2021	3,356	44,784	48,140	1,981	N/A	1,981	50,121

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	11,500	113,360	124,860	6,128	N/A	6,128	130,988
FY 2018	11,500	113,360	124,860	6,128	N/A	6,128	130,988
FY 2019	11,500	93,360	104,860	6,128	N/A	6,128	110,988
FY 2020	11,500	103,360	114,860	9,828	N/A	9,828	124,688
FY 2021	35,560	423,500	459,060	17,328	N/A	17,328	476,388

2. Project Scope and Justification

Scope

UCEP will perform mining and provide the supporting structures, systems and components necessary to deploy the large Major Items of Equipment (MIE) diagnostic systems and experiments. The existing U1a Complex orthogonal U1a.100 and U1a.104 drifts will be used to minimize the need for new mining.

17-D-640-010 includes the design, mining, fabrication, construction, installation, and commissioning of the underground areas and systems in the U1a Complex to provide accessibility, a refuge station, adequate ventilation, and construction power for the ensuing subproject 17-D-640-020. This subproject is required to support any significant construction activity in the eastern portion of the U1a Complex. While driven by the same mission in the ECSE subprogram, it is a subproject that can be designed and completed separately from the other subproject.

17-D-640-020 includes the design, mining, fabrication, construction, installation and commissioning of the ECSE Area and systems to provide MIE diagnostic/detector alcove drifts and mechanical equipment drifts. Also included are safety basis and readiness activities. The project underground scope includes an experimental room with containment plugs for experiment execution, process control system, safety interlock system, diagnostic clean rooms and diagnostic infrastructure, and ancillary systems (overhead handling systems, power, cooling, ventilation, process water and oil, instrument air, spill mitigation, and shielding). This subproject includes a CD-3A for site preparation. Site preparation includes demolition and the installation of a borehole for ventilation and power.

Justification

DOE Order 413.3B Critical Decision (CD), *CD-0 Approve Mission Need* was approved on September 25, 2014, for the "Enhanced Capabilities for Subcritical Experiments (ECSE) at the Nevada National Security Site, U1a Complex." On November 4, 2015, the intersection of the U1a.100 and U1a.104 Drifts within the U1a Complex at the Nevada National Security Site was determined to be the only viable location for ECSE. The enhancements to the U1a Complex included in this Line Item will provide the drifts and the supporting structures, systems, and components necessary for the deployment of the MIEs to diagnose the subcritical hydrodynamic integrated weapons experiments using plutonium.

NNSA plans long-term investments supporting plutonium science at the NNSS. NNSS is the only site in the United States for experiments combining high explosives and plutonium, a core capability for NNSA's Stockpile Stewardship Program.

Funds appropriated under this data sheet may be used for contracted support services to the Federal Program Manager and the Federal Project Director to conduct independent assessments of the planning and execution of this project required by DOE O 413.3B and to conduct technical reviews of design and construction documents.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. As allowed by DOE O 413.3B, work will be phased to improve overall efficiency.

OPCs are funded out of the Enhanced Capabilities for Subcritical Experiments subprogram under Stockpile Research, Technology, and Engineering.

Key Performance Parameters (KPPs)

The KPPs represent the minimum acceptable performance that the project must achieve.

Performance Measure	Completion Criteria
17-D-640-010: Ventilation and power sufficient to allow concurrent excavation for two headings east of the U1a.01 Drift	Documented in UCEP Subproject 010 Ventilation Plan; UCEP Electrical Load Calculation; Temporary Power Plan
17-D-640-010: An invert suitable for transport of ASD accelerator equipment between the U1h shaft station and U1a.104 Drift	Documented in Building Code Requirements for Structural Concrete; Invert Plan; Invert Sections; Cast-In-Place Concrete Specification
17-D-640-010: Direct access from the U1a.01 Drift to the U1a.104 Drift for equipment and personnel	Documented in General Arrangement Plan
17-D-640-010: Multiple egress pathways from the U1a.100 Drift and U1a.104 Drift to the U1a.01 Drift	Documented in General Arrangement Plan
O17-D-640-010: Operational Refuge Station east of the U1a.01 Drift to accommodate the number of individuals anticipated to normally work in that area	Documented in NNSS Underground Facility Safety and Health Program Description; U1a.102D Drift Refuge Shelter Equipment
17-D-640-020: An invert suitable for installation of the ASD accelerator in the U1a.104 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Utilities and mechanical systems sufficient to support operation and maintenance of the ASD accelerator in the U1a.104 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: A zero room structure and mechanical systems that meet requirements for conducting subcritical experiments in the U1a.100 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Infrastructure that supports installation of a centralized control of operation system of the ASD accelerator and NDSE source	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Infrastructure that supports acquisition of experiment diagnostic data	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents

3. Project Cost and Schedule

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	2,675	2,675	330
FY 2018	681	681	3,026
Total, Design	**3,356**	**3,356**	**3,356**
Construction			
FY 2017	8,800	8,800	0
FY 2018	14,484	14,484	0
FY 2019	10,000	10,000	9,320
FY 2020	10,000	10,000	18,680
FY 2021	1,500	1,500	12,900
FY 2022	0	0	3,000
FY 2023	0	0	884
Total, Construction	**44,784**	**44,784**	**44,784**
Total Estimated Costs			
FY 2017	11,475	11,475	330
FY 2018	15,165	15,165	3,026
FY 2019	10,000	10,000	9,320
FY 2020	10,000	10,000	18,680
FY 2021	1,500	1,500	12,900
FY 2022	0	0	3,000
FY 2023	0	0	884
Total, TEC	**48,140**	**48,140**	**48,140**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	1,000	1,000	1,000
Total OPC, except D&D	**1,981**	**1,981**	**1,981**
OPC D&D			
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0

	Budget Authority (Appropriations)	Obligations	Costs
FY 2021	0	0	0
FY 2022	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	1,000	1,000	1,000
Total, OPC	**1,981**	**1,981**	**1,981**
Total Project Costs (TPC)			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	11,475	11,475	330
FY 2018	15,165	15,165	3,026
FY 2019	10,000	10,000	9,320
FY 2020	10,000	10,000	18,680
FY 2021	1,500	1,500	12,900
FY 2022	0	0	3,000
FY 2023	1,000	1,000	1,884
Grand Total	**50,121**	**50,121**	**50,121**

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	25	25	25
FY 2018	6,935	6,935	1,045
FY 2019	10,000	10,000	11,060
FY 2020	18,600	18,600	23,430
Total, Design	**35,560**	**35,560**	**35,560**
Construction			
FY 2020	6,400	6,400	1,000
FY 2021	159,100	159,100	96,860
FY 2022	135,000	135,000	150,000
FY 2023	123,000	123,000	125,000
FY 2024	0	0	50,640
Total, Construction	**423,500**	**423,500**	**423,500**

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Costs			
FY 2017	25	25	25
FY 2018	6,935	6,935	1,045
FY 2019	10,000	10,000	11,060
FY 2020	25,000	25,000	24,430
FY 2021	159,100	159,100	96,860
FY 2022	135,000	135,000	150,000
FY 2023	123,000	123,000	125,000
FY 2024	0	0	50,640
Total, TEC	**459,060**	**459,060**	**459,060**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2016	2,628	2,628	2,128
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	2,000	2,000	2,000
FY 2024	10,000	10,000	3,300
FY 2025	0	0	6,700
Total OPC, except D&D	**17,328**	**17,328**	**17,328**
OPC D&D			
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2016	2,628	2,628	2,128
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	2,000	2,000	2,000
FY 2024	10,000	10,000	3,300
FY 2025	0	0	6,700

	Budget Authority (Appropriations)	Obligations	Costs
Total, OPC	**17,328**	**17,328**	**17,328**
Total Project Costs (TPC)			
FY 2016	2,628	2,628	2,128
FY 2017	1,725	1,725	1,725
FY 2018	7,935	7,935	2,045
FY 2019	10,000	10,000	11,560
FY 2020	25,000	25,000	24,430
FY 2021	159,100	159,100	96,860
FY 2022	135,000	135,000	150,000
FY 2023	125,000	125,000	127,000
FY 2024	10,000	10,000	53,940
FY 2025	0	0	6,700
Grand Total	**476,388**	**476,388**	**476,388**

17-D-640: Total Project

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	2,700	2,700	355
FY 2018	7,616	7,616	4,071
FY 2019	10,000	10,000	11,060
FY 2020	18,600	18,600	23,430
Total, Design	**38,916**	**38,916**	**38,916**
Construction			
FY 2017	8,800	8,800	0
FY 2018	14,484	14,484	0
FY 2019	10,000	10,000	9,320
FY 2020	16,400	16,400	19,680
FY 2021	160,600	160,600	109,760
FY 2022	135,000	135,000	153,000
FY 2023	123,000	123,000	125,884
FY 2024	0	0	50,640
Total, Construction	**468,284**	**468,284**	**468,284**
Total Estimated Costs			
FY 2017	11,500	11,500	355
FY 2018	22,100	22,100	4,071
FY 2019	20,000	20,000	20,380
FY 2020	35,000	35,000	43,110
FY 2021	160,600	160,600	109,760
FY 2022	135,000	135,000	153,000
FY 2023	123,000	123,000	125,884
FY 2024	0	0	50,640

	Budget Authority (Appropriations)	Obligations	Costs
Total, TEC	**507,200**	**507,200**	**507,200**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	3,000	3,000	3,000
FY 2024	10,000	10,000	3,300
FY 2025	0	0	6,700
Total OPC, except D&D	**19,309**	**19,309**	**19,309**
OPC D&D			
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	3,000	3,000	3,000
FY 2024	10,000	10,000	3,300
FY 2025	0	0	6,700
Total, OPC	**19,309**	**19,309**	**19,309**
Total Project Costs (TPC)			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828
FY 2017	13,200	13,200	2,055

	Budget Authority (Appropriations)	Obligations	Costs
FY 2018	23,100	23,100	5,071
FY 2019	20,000	20,000	20,880
FY 2020	35,000	35,000	43,110
FY 2021	160,600	160,600	109,760
FY 2022	135,000	135,000	153,000
FY 2023	126,000	126,000	128,884
FY 2024	10,000	10,000	53,940
FY 2025	0	0	6,700
Grand Total	**526,509**	**526,509**	**526,509**

4. Details of Project Cost Estimate

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	2,852	2,852	2,852
Project Management	504	504	504
Contingency	0	0	0
Total, Design	**3,356**	**3,356**	**3,356**
Construction			
Site Work	0	0	0
Equipment	0	0	0
Construction	31,606	31,606	31,606
Construction Management	5,368	5,368	5,368
Contingency	7,810	7,810	7,810
Total, Construction	**44,784**	**44,784**	**44,784**
Total Estimated Cost	**48,140**	**48,140**	**48,140**
Contingency, TEC	*7,810*	*7,810*	*7,810*
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	200	200	200
Conceptual Design	281	281	281
Other OPC Costs	1,500	1,500	1,500
Contingency	0	0	0
Total, OPC	1,981	1,981	1,981
Contingency, OPC	*0*	*0*	*0*
Total Project Cost	**50,121**	**50,121**	**50,121**
Total Contingency (TEC+OPC)	**7,810**	**7,810**	**7,810**

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	21,024	7,800	0
Project Management	12,736	1,900	0
Contingency	1,800	1,800	0
Total, Design	**35,560**	**11,500**	**0**
Construction			
Site Work	0	0	0
Equipment	0	0	0
Construction	240,175	74,460	0
Construction Management	41,925	9,600	0
Contingency	141,400	19,300	0
Total, Construction	**423,500**	**103,360**	**0**
Total Estimated Cost	**459,060**	**114,860**	0
Contingency, TEC	*143,200*	*21,100*	*0*
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	300	300	0
Conceptual Design	728	728	0
Other OPC Costs	15,500	8,100	0
Contingency	800	700	0
Total, OPC	17,328	9,828	0
Contingency, OPC	*800*	*700*	*0*
Total Project Cost	**476,388**	**124,688**	**0**
Total Contingency (TEC+OPC)	**144,000**	**21,800**	**0**

17-D-640: Total Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	23,876	10,652	0
Project Management	13,240	2,404	0
Contingency	1,800	1,800	0
Total, Design	**38,916**	**14,856**	**0**
Construction			
Site Work	0	0	0
Equipment	0	0	0
Construction	271,781	106,066	0
Construction Management	47,293	14,968	0
Contingency	149,210	27,110	0
Total, Construction	**468,284**	**148,144**	**0**
Total Estimated Cost	**507,200**	**163,000**	0
Contingency, TEC	*151,010*	*28,910*	*0*
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	500	500	0
Conceptual Design	1,009	1,009	0
Other OPC Costs	17,000	9,600	0
Contingency	800	700	0
Total, OPC	19,309	11,809	0
Contingency, OPC	*800*	*700*	*0*
Total Project Cost	**526,509**	**174,809**	**0**
Total Contingency (TEC+OPC)	***151,810***	***29,610***	***0***

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2017	TEC	33,600	63,000	35,000	19,900	0	0	0	0	151,500
	OPC	6,309	800	0	0	0	0	0	0	7,109
	TPC	39,909	63,800	35,000	19,900	0	0	0	0	158,609
FY 2018	TEC	33,600	63,000	35,000	19,900	0	0	0	0	151,500
	OPC	6,300	800	0	0	0	0	0	0	7,109
	TPC	39,909	63,800	35,000	19,900	0	0	0	0	158,609
FY 2019	TEC	33,600	53,000	35,000	29,900	0	0	0	0	151,500
	OPC	6,300	800	0	0	0	0	0	0	7,109
	TPC	39,909	53,800	35,000	29,900	0	0	0	0	158,609
FY 2020	TEC	33,600	20,000	35,000	48,800	25,600	0	0	0	163,000
	OPC	6,309	0	0	0	1,000	0	4,500	0	11,809
	TPC	39,909	20,000	35,000	48,800	26,600	0	4,500	0	174,809
FY 2021	TEC	33,600	20,000	35,000	160,600	135,000	123,000	0	0	507,200
	OPC	6,309	0	0	0	0	3,000	10,000	0	19,309
	TPC	39,909	20,000	35,000	160,600	135,000	126,000	10,000	0	526,509

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY2025
Expected Useful Life	30
Expected Future Start of D&D of this capital asset	4Q FY 2055

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	36	36	1,075	1,075

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

8. Acquisition Approach

The project is being managed by the NNSS Management and Operating (M&O) contractor because of operations within the U1a Complex, which is an underground facility with limited access. Design and construction of the underground modifications will be performed by the NNSS M&O contractor

15-D-612, Emergency Operations Center
Lawrence Livermore National Laboratory (LLNL), California
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the 15-D-612, Emergency Operations Center (EOC) project at LLNL is $27,000K. The Total Project Cost (TPC) baseline is $35,200K.

Significant Changes:
This project is a not a new start.

On October 13, 2017, the Deputy Secretary exempted non-nuclear, non-complex line item construction projects with a Total Project Cost (TPC) less than $50 million from the requirements of the Department of Energy's (DOE) Order 413.3B which offered an opportunity to develop a new delivery model for line item projects in the $20M-$50M cost range.

On June 21, 2019, NNSA launched a pilot to streamline the execution of low complexity construction projects using an "Enhanced Minor Construction – Commercial" approach instead of following DOE Order 413.3B. This EOC project is one of four (each <$50M) projects in this pilot.

The pilot implements the FY 2018 National Defense Authorization Act guidance to streamline non-nuclear construction projects less than $100M and Executive Order 13777, Enforcing the Regulatory Reform Agenda.

The acquisition approach will be a firm fixed price Design-Build contract which will accelerate the completion (the CD-4 equivalent) date by one year. The base facility is approximately 12,000 square feet (SF) with a bid alternate scope that could increase the size of the facility up to 20,500 SF for consolidation of all Alarms Monitoring program and supporting staff.

The project was baselined on June 21, 2019.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	Final Design Complete	CD-2	CD-3	D&D Complete	CD-4
FY 2015	7/26/2012		4Q FY 2014	2Q FY 2017	1Q FY 2016	2Q FY 2017	N/A	4Q FY 2019
FY 2020	7/26/2012	3/23/2018	3Q FY 2019	3Q FY 2021	4Q FY 2020	4Q FY 2021	N/A	4Q FY 2023

Fiscal Year	CD-0	Conceptual Design Complete	Performance Baseline	Final Design Complete	Construction Mobilization	D&D Complete	Start Operations
FY 2021	7/26/2012	3/23/2018	9/6/2019	4Q FY 2020	1Q FY 2021	N/A	4Q FY 2022

The project followed DOE O 413.3B Critical Decisions (CD) requirements through selection of an alternative, pre-CD-1 approval.

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History[a]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	4,000	16,000	20,000	2,500	N/A	2,500	22,500
FY 2020	5,000	27,000	32,000	3,200	N/A	3,200	35,200
FY 2021	5,000	27,000	32,000	3,200	N/A	3,200	35,200

2. Project Scope and Justification

Scope

The project will provide a new approximately 12,000 SF facility to fulfill Emergency Operations Center and Emergency Program Office functions. The bid alternate scope adds up to 8,500 SF of flexible space for expansion primarily for the Alarms Division. The facility will enable the following minimum capabilities, based on DOE Order 151.1: a) responding effectively and efficiently to operational and energy emergencies, providing emergency assistance so that appropriate response measures are taken to protect workers, the public, the environment, and national security; b) recognizing and categorizing emergencies, as necessary; classifying emergencies promptly; and monitoring parameters associated with the emergency to detect changed or degraded conditions; c) reporting and notifying emergencies; and d) accomplishing re-entry activities properly and safely and commencing recovery and post-emergency activities properly.

The new facility will be constructed to meet California Building Code 2013 Risk Category IV and Seismic Category D to meet natural phenomena, hazardous material release, and seismic requirements.

Survivability and habitability (continued use of facility during emergencies), sustainability, and ease of access to the site for responders and managers will be incorporated into the project design.

Justification

Problems with the existing facility include:

- Inadequate workspace for emergency personnel
- Low likelihood of survival during high-consequence natural phenomena events, such as earthquakes, tornadoes, or floods
- Location within the range of worst-case hazardous material releases analyzed in the Emergency Preparedness Hazard Assessment
- Does not provide a significant barrier to hazardous material releases and is not equipped with a positive pressure filtration system, i.e. HEPA filtration for habitability
- Unable to sustain operations for 72 hours as required by DOE Order 151.1
- Limited access and egress
- Noncompliant with California Building Code 2013 Risk Category IV and Seismic Category D

The project is being conducted in accordance with the project management concepts within DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, Appendix C paragraph (1A-L).

Funds appropriated under this data sheet may be used for contracted support services to the Project Manager.

[a] The project is not following the DOE O 413.3b process requirements. The project baseline meets the cost profiles provided for FY 2021.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for contract award. The Objective KPPs represent the optimized and efficient operational performance.

The KPPs were finalized at approval of the Pilot including this project.

Performance Measure	Threshold	Objective
Functionality	Provide an Emergency Operations Center capable of self-sustained 24-hour operations during emergency conditions for a minimum of 72 hours without support from site infrastructure or services.	Provide space within the facility to accommodate site life safety/industrial alarms monitoring and site emergency communications (i.e. site fire department dispatching, building voice announcement system, etc.) functions.
Operational Capability	Maintain indoor air quality and radiation protection to maintain a habitable environment for a minimum of 72 hours after an on-site release of radiological or hazardous materials.	Provide space within the facility to accommodate site local emergency response functions.

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	5,000	5,000	3,500
FY 2021	0	0	1,500
Total Design	5,000	5,000	5,000
Construction			
FY 2021	27,000	27,000	8,000
FY 2022	0	0	19,000
Total Construction	27,000	27,000	27,000
Total Estimated Costs (TEC)			
FY 2020	5,000	5,000	3,500
FY 2021	27,000	27,000	9,500
FY 2022	0	0	19,000
Total TEC	32,000	32,000	32,000
Other Project Costs, except D&D			
FY 2013	237	237	237
FY 2014	155	155	155

	Budget Authority (Appropriations)	Obligations	Costs
FY 2015	108	108	108
FY 2016	500	500	213
FY 2017	600	600	329
FY 2018	600	600	519
FY 2019	0	0	144
FY 2020	400	400	539
FY 2021	0	0	0
FY 2022	600	600	956
Total OPC, except D&D	3,200	3,200	3,200
Total Project Costs (TPC)			
FY 2013	237	237	237
FY 2014	155	155	155
FY 2015	108	108	108
FY 2016	500	500	213
FY 2017	600	600	329
FY 2018	600	600	519
FY 2019	0	0	144
FY 2020	5,400	5,400	4,039
FY 2021	27,000	27,000	9,500
FY 2022	600	600	19,956
Grand Total	35,200	35,200	35,200

4. **Details of Project Cost Estimate**

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Baseline
Total Estimated Cost (TEC)			
Design			
Design	4,000	4,000	4,000
Contingency	1,000	1,000	1,000
Total, Design	5,000	5,000	5,000
Construction			
Site Work	500	500	500
Equipment	1,500	1,500	1,500
Construction	21,500	21,500	21,500
Federal Support	0	0	0
Contingency	3,500	3,500	3,500
Total, Construction	27,000	27,000	27,000
Total Estimated Cost	32,000	32,000	32,000
Contingency, TEC	4,500	4,500	4,500
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	400	400	400
Conceptual Design	1,000	1,000	1,000
Start-up	800	800	800
Other OPCs	700	700	700
Contingency	300	300	300
Total, OPC except D&D	3,200	3,200	3,200
OPC, D&D			
Demolition	N/A	N/A	N/A
Contingency	N/A	N/A	N/A
Total, OPC D&D	N/A	N/A	N/A
Total OPC	3,200	3,200	3,200
Contingency, OPC	300	300	300
Total Project Cost	35,200	35,200	35,200
Total Contingency (TEC+OPC)	4,800	4,800	4,800

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2015	TEC	20,000	0	0	0	0	0	0	20,000
	OPC	2,500	0	0	0	0	0	0	2,500
	TPC	22,500	0	0	0	0	0	0	22,500
FY 2020	TEC	0	5,000	27,000	0	0	0	0	32,000
	OPC	2,400	0	0	0	800	0	0	3,200
	TPC	2,400	5,000	27,000	0	800	0	0	35,200
FY 2021	TEC	0	5,000	27,000	0	0	0	0	32,000
	OPC	2,200	400	0	600	0	0	0	3,200
	TPC	2,200	5,400	27,000	600	0	0	0	35,200

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2022
Expected Useful Life	30
Expected Future Start of D&D of this capital asset	4QFY 2052

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	0.26	0.26	6.72	6.72

7. D&D Information

Area	Square Feet
Area of new construction	12,000 – 20,500
Area of existing facility(s) being replaced and D&D'ed by this project	NA
Area of other D&D outside the project	12,000 – 20,500
Area of additional D&D space to meet the "one-for-one" requirement from the banked area	NA

LLNL will D&D an offsetting amount of space in accordance with their current facility plan.

8. Acquisition Approach

A Design-Build contract will be acquired through open competition; selection will be based on best value to the government and award will be based on firm-fixed price delivery.

15-D-611, Emergency Operations Center
Sandia National Laboratories (SNL), New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the 15-D-611, Emergency Operations Center project at SNL is $36,000K. The Total Project Cost (TPC) performance baseline is $42,500K.

Significant Changes:
This project is not a new start.

On October 13, 2017, the Deputy Secretary exempted non-nuclear, non-complex line item construction projects with a Total Project Cost (TPC) less than $50 million from the requirements of the Department of Energy's (DOE) Order 413.3B which offered an opportunity to develop a new delivery model for line item projects in the $20M-$50M cost range.

On June 21, 2019, NNSA launched a pilot to streamline the execution of low complexity construction projects using an "Enhanced Minor Construction – Commercial" approach instead of following DOE Order 413.3B. This EOC project is one of four (each <$50M) projects in this pilot.

The pilot implements the FY 2018 National Defense Authorization Act guidance to streamline non-nuclear construction projects less than $100M and Executive Order 13777, Enforcing the Regulatory Reform Agenda.

The acquisition approach will be a firm fixed price Design-Bid-Build contract. The total estimated cost (TEC) remains unchanged. The base facility is approximately 24,000 square feet with a bid alternative scope that could increase up to 31,000 square feet based upon prioritization of function on the completed conceptual design.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	Final Design Complete	CD-2	CD-3	D&D Complete	CD-4
FY 2015	7/26/2012		1Q FY 2015	4Q FY 2015	3Q FY 2015	3Q FY 2015	4Q FY 2019	4Q FY 2019
FY 2020	7/26/2012	8/30/2018	3Q FY 2019	4Q FY 2021	3Q FY 2020	1Q FY 2022	N/A	4Q FY 2023

Fiscal Year	CD-0	Conceptual Design Complete	Performance Baseline	Final Design Complete	Construction Mobilization	D&D Complete	Start Operations
FY 2021	7/26/2012	8/30/2018	12/19/2019	1Q FY 2021	3Q FY 2021	N/A	4Q FY 2023

The project followed DOE O 413.3B Critical Decisions (CD) requirements through selection of an alternative, pre-CD-1 approval.

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History[a]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	2,000	38,000	40,000	1,500	1,200	2,700	42,700
FY 2020	4,000	36,000	40,000	2,500	0	2,500	42,500
FY 2021	4,000	36,000	40,000	2,500	0	2,500	42,500

2. Project Scope and Justification

Scope

The project will provide a new 24,000-31,000 square foot facility to fulfill Emergency Operations Center and Emergency Response Operations functions with requisite parking for personnel, computing, communications, building systems, and fuel and water storage sufficient to meet the following requirements: a) responding effectively and efficiently to operational emergencies and energy emergencies, providing emergency assistance so that appropriate response measures are taken to protect workers, the public, the environment, and national security; b) recognizing and categorizing emergencies, as necessary; classifying emergencies promptly; and monitoring parameters associated with the emergency to detect changed or degraded conditions; c) reporting and notifying emergencies; and d) accomplishing re-entry activities properly and safely and commencing recovery and post-emergency activities properly. The proposed facility will be built to International Building Code 2015 Risk Category IV standards to meet DOE requirements for natural and hazardous material risks.

Justification

Emergency Response Operations at SNL are currently housed in the basement of a substandard facility built in 1949. The existing facility only marginally meets requirements for habitability and space for required personnel and equipment.

Because the existing EOC does not meet habitability or seismic requirements, if a low probability/high impact event were to occur, the EOC itself would have to be evacuated. Although SNL emergency response personnel have worked to address numerous shortfalls and gaps due to the quality of the current location, their efforts have potentially masked a situation that may compromise a response in the future.

Other problems with the existing facility include:

- Limited workspace for emergency personnel
- Low likelihood of survival during high-consequence natural phenomena events, such as earthquakes, tornadoes, or floods
- Location within the range of worst-case hazardous material releases analyzed in the hazards analysis
- Does not provide a significant barrier to hazardous material releases and is not equipped with a positive pressure filtration system, i.e. HEPA filtration for habitability
- Inability to sustain operations for 72 hours as required by DOE Order 151.1
- Limited access and egress

An independent analysis of alternatives was conducted after CD-0 in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. The alternative which best met the mission need was construction of a new Emergency Operations Center at Sandia National Laboratories.

The project is being conducted in accordance with the project management concepts within DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, Appendix C paragraph (1A-L).

Funds appropriated under this data sheet may be used for contracted support services to the Project Manager.

[a] The project is not following the DOE O 413.3b process requirements. The project baseline meets the cost profiles requested in FY 2021.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for contract award. The Objective KPPs represent the optimized and efficient operational performance.

The KPPs were finalized at approval of the Pilot including this project.

Performance Measure	Threshold	Objective
Functionality	Provide an Emergency Operations Center capable of self-sustained 24-hour operations during emergency conditions for a minimum of 72 hours without support from site infrastructure or services.	Provide space within the facility to accommodate site local emergency response functions.
Operational Capability	Maintain indoor air quality and radiation protection to maintain a habitable environment for a minimum of 72 hours after an on-site release of radiological or hazardous materials.	

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	4,000	4,000	2,800
FY 2021	0	0	1,200
Total Design	4,000	4,000	4,000
Construction			
FY 2021	36,000	36,000	7,000
FY 2022	0	0	19,000
FY 2023	0	0	10,000
Total Construction	36,000	36,000	36,000
Total Estimated Costs (TEC)			
FY 2020	4,000	4,000	2,800
FY 2021	36,000	36,000	8,200
FY 2022	0	0	19,000
FY 2023	0	0	10,000
Total TEC	40,000	40,000	40,000
Other Project Costs			
FY 2014	400	400	400

	Budget Authority (Appropriations)	Obligations	Costs
FY 2015	200	200	200
FY 2016	0	0	0
FY 2017	200	200	152
FY 2018	355	355	403
FY 2019	806	806	35
FY 2020	200	200	600
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	339	339	710
Total OPC, except D&D	2,500	2,500	2,500
OPC D&D			
FY 2022	0	0	0
Total, OPC	2,500	2,500	2,500
Total Project Costs (TPC)			
FY 2014	400	400	400
FY 2015	200	200	200
FY 2016	0	0	0
FY 2017	200	200	152
FY 2018	355	355	403
FY 2019	806	806	35
FY 2020	4,200	4,200	3,400
FY 2021	36,000	36,000	8,200
FY 2022	0	0	19,000
FY 2023	339	339	10,710
Grand Total	42,500	42,500	42,500

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Baseline
Total Estimated Cost (TEC)			
Design			
Design	3,500	3,500	3,500
Contingency	500	500	500
Total, Design	4,000	4,000	4,000
Construction			
Site Work	2,900	2,900	2,900
Equipment	4,400	4,400	4,400
Construction	24,900	24,900	24,900
Federal Support	0	0	0
Contingency	3,800	3,800	3,800
Total, Construction	36,000	36,000	36,000
Total Estimated Cost	40,000	40,000	40,000
Contingency, TEC	4,300	4,300	4,300
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	200	200	200
Conceptual Design	695	695	695
Start-up	800	800	800
Other OPCs	805	805	805
Contingency	0	0	0
Total, OPC except D&D	2,500	2,500	2,500
Demolition	N/A	N/A	N/A
Contingency	N/A	N/A	N/A
Total, OPC D&D	N/A	N/A	N/A
Total OPC	2,500	2,500	2,500
Contingency, OPC	0	0	0
Total Project Cost	42,500	42,500	42,500
Total Contingency (TEC+OPC)	4,300	4,300	4,300

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2015	TEC	40,000	0	0	0	0	0	0	40,000
	OPC	2,700	0	0	0	0	0	0	2,700
	TPC	42,700	0	0	0	0	0	0	42,700
FY 2020	TEC	0	4,000	0	36,000	0	0	0	40,000
	OPC	1,500	200	0	0	800	0	0	2,500
	TPC	1,500	4,200	0	36,000	800	0	0	42,500
FY 2021	TEC	0	4,000	36,000	0	0	0	0	40,000
	OPC	1,961	200	0	0	339	0	0	2,500
	TPC	1,961	4,200	36,000	0	339	0	0	42,500

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2023
Expected Useful Life	40
Expected Future Start of D&D of this capital asset	4QFY 2063

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	0.33	0.33	11.09	11.09
Utilities	0.01	0.01	0.37	0.37
Maintenance & Repair	0.20	0.20	6.51	6.51
Recapitalization	N/A	N/A	0.92	0.92
Total	0.54	0.54	18.89	18.89

7. D&D Information

Area	Square Feet
Area of new construction	24,000-31,000
Area of existing facility(s) being replaced and D&D'ed by this project	NA
Area of other D&D outside the project	NA
Area of additional D&D space to meet the "one-for-one" requirement from the banked area	24,000-31,000

SNL will offset the EOC square footage with disposed enterprise square footage.

8. Acquisition Approach

The acquisition strategy will be Design-Bid-Build. Design and construction contracts will be acquired through open competition; selection will be based on best value to the government and awards will be on firm-fixed price delivery.

15-D-302, TA-55 Reinvestment Project (TRP) Phase III
Los Alamos National Laboratory (LANL), Los Alamos, New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 request for the TA-55 Reinvestment Project Phase III is $30,000K. The current TEC range is $180,788K to $190,732K. The upper end of the TPC range is currently estimated at $238,198K.

Significant Changes:

The TA-55 Reinvestment Project was initiated in FY 2005 and subsequently split into three phases.

The most recent Critical Decision (CD) for the project is CD-0, Approve Mission Need.
Since funds were last requested for the project in FY 2017, the project has completed an Analysis of Alternatives (AOA) and a revised conceptual design. The federally led AOA evaluated three potential upgrades that were approved as part of the mission need and not previously executed as part of TRP I and TRP II. These upgrades included: 1) replacing the Fire Panels and Devices; 2) upgrading the PF-4 ventilation to Active Confinement System, and 3) removing non-nuclear buildings within the TA-55 from the safety Class Fire Water Loop. On October 14, 2016, the Project Management Executive (PME) approved the AoA and the scope recommendation was to replace the Fire Panels and Devices only. Consistent with the PME approval, the scope of this Construction Project Data Sheet (CPDS), which previously assumed the scope would include disconnecting non-nuclear buildings from the safety-class fire loop and replacing only critical elements of the fire panels and devices, has been revised accordingly.

A conceptual design was completed on November 15, 2018 consistent with the AoA and PME scope selection.
Subsequently, the PME approved a tailoring strategy on March 7, 2019 allowing the project to complete final design and proceed with a combined CD-1/2/3. On July 23, 2019 a design contract was awarded to pursue the approved alternative.
An Independent Cost Estimate and External Independent Review are scheduled for August 2020 to support a planned 3Q FY 2021 Approval of the Performance Baseline and Start of Construction. FY 2021 funding will be used to support the start of construction post approval of CD 1/2/3.
Project cost estimate revisions were updated due to the scope selection from the Federal AoA, conceptual design, lessons learned, and input from the Independent Cost Review.

A Level III Federal Project Director has been appointed consistent with NNSA requirements.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	03/23/2005		1QFY2015	4QFY 2017	2QFY2018	2QFY2018	N/A	4QFY2022
FY 2016	03/23/2005	12/23/2014	4QFY2016	4QFY 2018	2QFY2018	4QFY2018	N/A	3QFY2026
FY 2017	03/23/2005	12/23/2014	4QFY2016	4QFY 2018	2QFY2018	4QFY2018	N/A	4QFY2025
FY 2021	03/23/2005	11/15/2018	3QFY2021	3QFY2021	4QFY2020	3QFY2021	2QFY2024	2QFY2026

CD-0 – Approve Mission Need
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Project Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction/Execution

D&D Complete – Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion
PB – Indicates the Performance Baseline

Project Cost History

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	30,062	110,000	140,062	29,500	N/A	29,500	169,562
FY 2016	30,060	150,002	180,062	46,500	N/A	46,500	226,562
FY 2017	30,060	111,448	141,508	31,500	N/A	31,500	173,008
FY 2021[a]	35,628	155,104	190,732	34,658	12,808	47,466	238,198

2. Project Scope and Justification

Scope
The TRP III scope will encompass replacing the currently outdated LANL TA-55 fire alarm system that is not compliant with current codes and standards. All major components of the system are obsolete and costly to maintain. Spare part availability has continued to be a significant concern as circuit boards for the main fire alarm control panel are no longer available.

The current single fire alarm control panel will be replaced with multiple panels; separating the nuclear facility, PF-4, and the non-nuclear facilities within the TA-55 site. The scope also includes addition of area-wide and early warning fire detection throughout PF-4, installation of UL listed digital/addressable components, sprinkler flow sensing switches, new evacuation strobes and audible alarms, consolidated monitoring of the campus in the TA-55 Operations Center, and other components to provide inputs from over 2,000 devices spread throughout 199 zones of protection in TA-55. All new systems must be installed and accepted into operation while existing systems continue to provide alarm functions for the operating facility.

Upon completion of the new system, the project includes decommissioning and decontamination of components of the old systems. Demolition involves appropriate radiation protection and waste management characterization of the areas and parts to be removed.

Justification
PF-4 within TA-55 is the only Hazard Category 2 (HC-2) nuclear facility/Security Category 1 (SC-1) supporting all enduring Plutonium missions for DOE/NNSA at this time. The mission need for TRP III is to extend the life of TA-55 so it can continue to operate safely and reliably in support of the stockpile stewardship program. This project specifically extends the life of TA-55 by recapitalizing and revitalizing an aging and obsolete fire alarm system.

The TA-55 main fire control panel and supporting devices represent a single point failure risk for this critical capability. More specifically, this facility is critical to support certification of the stockpile, pit production, and all other DOE/NNSA plutonium missions. PF-4 has been in operation for over 35 years and, before the TRP I and TRP II upgrades, the infrastructure and systems were aging and approaching the end of their service life, required excessive maintenance, and experienced increased operating costs and reduced system reliability. The facility is not in compliance with safety and regulatory requirements that are required for the fire alarm systems. TRP III is the final phase of the three-phase project that supports critical upgrades of PF-4 within the TA-55 boundary at LANL.
Funds appropriated under this data sheet may be used for contracted support services to the Federal Project Director to conduct independent assessments of the planning and execution of this project required by DOE Order 413.3B and to

[a] The table represents the initial project estimate and will be revised as final design and the CD-1/2/3 package is reviewed and validated.

conduct technical reviews of design and construction documents. Construction will not start until CD-3 approval is achieved.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Preliminary Key Performance Parameters (KPPs)
The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
New PF-4 fire alarm system	New fire alarm system is installed and accepted in operations for PF-4	N/A
New PF-4 fire alarm system	Existing data points cutover from old system to new system as required per baseline design	N/A

3. Project Cost and Schedule

Financial Schedule

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2015	16,062	16,062	0
FY 2016	18,195	18,195	0
FY 2017	1,371	1,371	0
FY 2018	0	0	0
FY 2019	0	0	1,500
FY 2020	0	0	17,100
FY 2021	0	0	17,028
FY 2022	0	0	0
Total Design	35,628	35,628	35,628
Construction			
FY 2017	629	629	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	30,000	30,000	16,000
FY 2022	30,000	30,000	44,629
FY 2023	30,000	30,000	30,000

[a] Key Performance Parameters will be approved upon approval of CD-1/2/3.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2024	30,000	30,000	30,000
FY 2025	34,475	34,475	30,000
FY 2026	0	0	4,475
Total Construction	155,104	155,104	155,104
Total Estimated Costs (TEC)			
FY 2015	16,062	16,062	0
FY 2016	18,195	18,195	0
FY 2017	2,000	2,000	0
FY 2018	0	0	0
FY 2019	0	0	1,500
FY 2020	0	0	17,100
FY 2021	30,000	30,000	33,028
FY 2022	30,000	30,000	44,629
FY 2023	30,000	30,000	30,000
FY 2024	30,000	30,000	30,000
FY 2025	34,475	34,475	30,000
FY 2026	0	0	4,475
Total TEC	**190,732**	**190,732**	**190,732**
Other Project Costs (OPC)			
OPC except D&D			
FY 2013[a]	1,675	1,675	1,675
FY 2014	751	751	751
FY 2015	1,801	1,801	1,801
FY 2016	133	133	133
FY 2017	828	828	828
FY 2018	3,596	3,596	3,596
FY 2019	1,804	1,804	1,804
FY 2020	2,000	2,000	2,000
FY 2021	2,000	2,000	2,000
FY 2022	3,000	3,000	3,000
FY 2023	5,000	5,000	5,000
FY 2024	5,000	5,000	5,000
FY 2025	4,000	4,000	4,000
FY 2026	3,070	3,070	3,070
Total, OPC except D&D	34,658	34,658	34,658
OPC D&D			
FY 2023	6,000	6,000	6,000

[a] The OPC costs for FY 2013 through FY 2019 have been updated to reflect the actual cost incurred.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2024	6,808	6,808	6,808
Total OPC D&D	12,808	12,808	12,808
Total OPC			
FY 2013[a]	1,675	1,675	1,675
FY 2014	751	751	751
FY 2015	1,801	1,801	1,801
FY 2016	133	133	133
FY 2017	828	828	828
FY 2018	3,596	3,596	3,596
FY 2019	1,804	1,804	1,804
FY 2020	2,000	2,000	2,000
FY 2021	2,000	2,000	2,000
FY 2022	3,000	3,000	3,000
FY 2023	11,000	11,000	11,000
FY 2024	11,808	11,808	11,808
FY 2025	4,000	4,000	4,000
FY 2026	3,070	3,070	3,070
Total OPC	**47,466**	**47,466**	**47,466**
Total Project Costs (TPC)			
FY 2013	1,675	1,675	1,675
FY 2014	751	751	751
FY 2015	17,863	17,863	1,801
FY 2016	18,328	18,328	133
FY 2017	2,828	2,828	828
FY 2018	3,596	3,596	3,596
FY 2019	1,804	1,804	3,304
FY 2020	2,000	2,000	19,100
FY 2021	32,000	32,000	35,028
FY 2022	33,000	33,000	47,629
FY 2023	41,000	41,000	41,000
FY 2024	41,808	41,808	41,808
FY 2025	38,475	38,475	34,000
FY 2026	3,070	3,070	7,545
Grand Total TPC	**238,198**	**238,198**	**238,198**

[a] The OPC costs for FY 2013 through FY 2019 have been updated to reflect the actual cost incurred.

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate[a]	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	22,794	23,560	N/A
Federal Support	2,585	1,500	N/A
Contingency	10,249	5,000	N/A
Total, Design	35,628	30,060	N/A
Construction			
Long Lead Procurements	0	0	N/A
Equipment	0	0	N/A
Construction	89,622	79,448	N/A
Safety Basis	142	1,000	N/A
Federal Support	10,180	2,000	N/A
Contingency	55,160	29,000	N/A
Total, Construction	155,104	111,448	N/A
Total, TEC	190,732	141,508	N/A
Contingency, TEC	65,409	34,000	N/A
Other Project Cost (OPC)			
OPC except D&D	0	0	N/A
Conceptual Planning	7,897	2,000	N/A
Conceptual Design	3,532	7,000	N/A
Start-Up	2,961	7,000	N/A
Project Support	9,547	4,000	N/A
Contingency	10,721	11,500	N/A
Total OPC except D&D	34,658	31,500	N/A
OPC D&D			
OPC D&D	7,092	0	N/A
Contingency	5,716	0	N/A
Total OPC D&D	12,808	0	
Total, OPC	**47,466**	**31,500**	**N/A**
Contingency, OPC	16,437	11,500	N/A
Total, TPC	**238,198**	**173,008**	**N/A**
Total, Contingency	**81,846**	**45,500**	**N/A**

[a] The previous cost estimate was developed prior to the AoA, conceptual design, and the incorporation of lessons learned from TRP II. The current estimate reflects the scope selection from the Federal AoA, conceptual design, lessons learned, and input from the Independent Cost Review.

5. Schedule of Appropriation Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Outyears	Total
FY 2015	TEC	118,062	10,000	10,000	2,000	0	0	0	0	0	140,062
	OPC	12,500	6,000	4,000	3,000	0	0	0	0	0	25,500
	TPC	130,562	16,000	14,000	5,000	0	0	0	0	0	165,562
FY 2016	TEC	77,870	17,500	12,996	31,696	0	0	0	0	0	140,062
	OPC	16,500	6,000	4,000	3,000	0	0	0	0	0	29,500
	TPC	94,370	23,500	16,996	34,696	0	0	0	0	0	169,562
FY 2017	TEC	79,012	17,500	12,996	0	32,000	0	0	0	0	141,508
	OPC	15,500	2,000	3,000	3,000	3,000	3,000	2,000	0	0	31,500
	TPC	94,512	19,500	15,996	3,000	35,000	3,000	2,000	0	0	173,008
FY 2021	TEC	36,257	0	0	30,000	30,000	30,000	30,000	34,475	0	190,732
	OPC	8,784	1,804	2,000	2,000	3,000	11,000	11,808	4,000	3,070	47,466
	TPC	45,041	1,804	2,000	32,000	33,000	41,000	41,808	38,475	3,070	238,198

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	FY 2026
Expected Useful Life (number of years)	25 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	FY 2051

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	N/A	N/A	N/A

7. D&D Information

There is no new area being constructed in this construction project.

8. Acquisition Approach

The TRP III acquisition strategy assigns project execution to the LANL Management and Operating (M&O) Contractor. The final design will be issued through a firm fixed price subcontract. Construction activities will be self-performed by the M&O Contractor for PF-4 scope and can be subcontracted for the Balance of Plant scope.

15-D-301 High Explosive Science and Engineering (HE S&E) Facility
Pantex Plant, Amarillo, Texas
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the High Explosive Science and Engineering (HE S&E) Facility is $43,000K. The most recent DOE O 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, that was approved on January 9, 2015, with a preliminary cost range of $100,000K to $155,000K and CD-4 date of 4th Quarter FY 2023. The projected schedule that was established at CD-1 has been deferred with the start of construction moving from early FY 2018 to late FY 2020. The FY 2021 Request is based upon the high range of the current Total Project Cost (TPC) estimate ($195,497k) since the updated TPC will not be determined until CD-2/3 review/approval. CD-2/3 approval is planned for FY 2020, and construction contract award for the Facility Construction is planned for FY 2021; fully funding the construction contract prior to award is a best practice.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2020 CPDS and does not include a new start for the budget year.

Preliminary and Final Design were completed in July 2018 before the project was placed on hold awaiting construction funding, which was deferred to accommodate higher priority projects. Due to the length of time between design completion and receipt of construction funding, design revalidation efforts have to be completed in FY 2020 before construction can begin. The CD-2/3 approval is planned for FY 2020 to award a firm fixed price construction contract for site preparation work. D&D will be accomplished after the construction contract is complete.

A Federal Project Director is currently assigned to this project, and has reviewed and approved this CPDS.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	11/22/2011	N/A	4Q FY 2014	4Q FY 2015	3Q FY 2016	4Q FY 2016	3Q FY 2020	3Q FY 2020
FY 2016	11/22/2011	1/9/2015	1/09/2015	1Q FY 2018	4Q FY 2017	1Q FY 2018	3Q FY 2023	4Q FY 2023
FY 2020	11/22/2011	1/9/2015	1/09/2015	3Q FY 2020	2Q FY 2020[b]	3Q FY 2020	3Q FY 2025	4Q FY 2025
FY 2021	11/22/2011	1/9/2015	1/09/2015	4Q FY 2020	3Q FY 2020[b]	4Q FY 2020	3Q FY 2025	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The schedules are estimates and consistent with the high end of the schedule ranges.
[b] The final design was completed on 7/27/2018, but revalidation will be completed prior to CD-2/3 approval.

Project Cost History[a,b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	11,800	60,500	72,300	6,100	18,600	24,700	97,000
FY 2016	14,249	83,051	97,300	21,055	36,124	57,179	154,479
FY 2020	15,372	119,900	135,272	12,025	48,200	60,225	195,497
FY 2021	15,372	119,900	135,272	12,025	48,200	60,225	195,497

2. Project Scope and Justification

Scope

The project will build three structures totaling 67,711 square feet with associated weather-proofed ramps totaling 3,072 square feet. These structures will replace the aging facilities in Zone 11 with new facilities that meet current codes and standards and better support program requirements:

- HE Laboratory: Equipment and facility will be designed to sustain an HE loading of 12 lb (±15%) HE equivalent.
- HE Staging: Equipment and facility will be designed to sustain 50 lb (±15%) HE equivalent for temporary storage.
- Technology Development and Deployment Laboratory: Provide necessary laboratory space for a minimum of 73 personnel to support the weapons complex mission.

The project will also complete D&D of equivalent square footage and relocation of utilities out of the buildings and ramps planned for demolition, while continuing support for mission essential facilities.

Justification

Currently HE S&E personnel, as well as laboratory operations, are located in 15 separate facilities which are, on average, more than 60 years old. The existing facilities are not constructed for today's operations or HE limits, and their distribution across Zone 11 does not provide for efficient work processes. The distance between facilities increases travel time for personnel and materials back and forth, which adds additional cost to operations. In addition, safety, security, and environmental issues associated with these aging facilities are mounting, as are the costs of addressing them.

Current HE capacity limits that prohibit quantities greater than a small amount create inefficient operations in several of the laboratories. HE limits mandate additional moves of HE to various facilities as well as to maintain safe separation limits. The HE capacity limitations are primarily due to the original design and structure of the old facilities. The numerous HE handling activities required to load, unload and move the HE increase potential safety hazards.

This project provides the following additional benefits in support of HE Manufacturing:

- Computational and experimental capability
- Capability to develop diagnostic tools for the evaluation, manufacturing support, surveillance, and testing of materials
- Capability to conduct technology development in modern facilities (most existing facilities that provide these capabilities are over 60 years old)
- Separate classified and non-classified spaces, increasing efficiency and lowering Information Security risk

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Funds appropriated under this data sheet may be used to provide independent assessments for planning and execution of this project, and contracted support services to the federal project team for oversight and support.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.
[b] The FY 2020/2021 numbers are estimates and consistent with the high end values of the cost ranges.

Preliminary Key Performance Parameters (KPPs)

The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
HE Laboratory: HE equivalent loading capacity	10.2 lbs	13.8 lbs
HE Staging: Amount of HE equivalent to sustain for temporary storage	42.5 lbs	57.5 lbs
Technology Development and Deployment Laboratory: personnel accommodated in laboratory space	73	N/A

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2015	11,800	11,760	61
FY 2016	0	-11	1,515
FY 2017	-28[b]	0	5,106
FY 2018	500[c]	519	4,041
FY 2019	0	-1,084	-7
FY 2020	3,100	4,188	3,746
FY 2021	0	0	910
Total, Design	**15,372**	**15,372**	**15,372**
Construction			
FY 2020	76,900	76,900	1,000
FY 2021	43,000	43,000	41,600
FY 2022	0	0	49,000
FY 2023	0	0	28,300
Total, Construction	119,900	119,900	119,900
Total Estimated Costs			
FY 2015	11,800	11,760	61
FY 2016	0	-11	1,515
FY 2017	-28	0	5,106
FY 2018	500	519	4,041

[a] Key Performance Parameters (KPPs) will be approved upon approval of the project baseline and the preliminary KPPs are subject to change post CD-2.

[b] Reflects rescission of $28,013 in FY 2017.

[c] Reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2019	0	-1,084	-7
FY 2020	80,000	81,088	4,746
FY 2021	43,000	43,000	42,510
FY 2022	0	0	49,000
FY2023	0	0	28,300
Total, TEC	**135,272**	**135,272**	**135,272**
Other Project Costs			
OPC, except D&D			
FY 2013	1,790	1,790	200
FY 2014	750	750	50
FY 2015	100	100	134
FY 2016	100	100	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	130	130	1,170
FY 2021	3,750	3,750	3,000
FY 2022	3,000	3,000	3,750
FY2023	2,405	2,405	2,900
FY 2024	0	0	821
Total OPC, except D&D	**12,025**	**12,025**	**12,025**
OPC D&D			
FY 2023	18,000	18,000	15,000
FY2024	30,200	30,200	25,000
FY 2025	0	0	8,200
Total, OPC D&D	**48,200**	**48,200**	**48,200**
Total Other Project Costs			
FY 2013	1,790	1,790	200
FY 2014	750	750	50
FY 2015	100	100	134
FY 2016	100	100	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	130	130	1,170
FY 2021	3,750	3,750	3,000
FY 2022	3,000	3,000	3,750
FY 2023	20,405	20,405	17,900
FY 2024	30,200	30,200	25,821

	Budget Authority (Appropriations)	Obligations	Costs
FY 2025	0	0	8,200
Total, OPC	**60,225**	**60,225**	**60,225**
Total Project Costs (TPC)			
FY 2013	1,790	1,790	200
FY 2014	750	750	50
FY 2015	11,900	11,860	195
FY 2016	100	89	1,515
FY 2017	-28	0	5,106
FY 2018	500	519	4,041
FY 2019	0	-1,084	-7
FY 2020	80,130	81,218	5,916
FY 2021	46,750	46,750	45,510
FY 2022	3,000	3,000	52,750
FY 2023	20,405	20,405	46,200
FY 2024	30,200	30,200	25,821
FY 2025	0	0	8,200
Grand Total	**195,497**	**195,497**	**195,497**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	13,572	13,572	N/A
Federal Design Review Support	1,300	1,300	N/A
Contingency	500	500	N/A
Total, Design	15,372	15,372	N/A
Construction			
Site Work	9,600	9,600	N/A
Equipment	5,000	5,000	N/A
Construction	86,000	86,000	N/A
Federal Support	2,600	2,600	N/A
Contingency	16,700	16,700	N/A
Total, Construction	119,900	119,900	N/A
Total, TEC	**135,272**	**135,272**	**N/A**
Contingency, TEC	*17,200*	*17,200*	*N/A*
Other Project Cost (OPC)			
OPC except D&D			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Analysis of Alternatives	200	200	N/A
Conceptual Design	1,600	1,600	N/A
Start-up	3,200	3,200	N/A
Equipment Move	4,800	4,800	N/A
Contingency	2,225	2,225	N/A
Total, OPC except D&D	12,025	12,025	N/A
OPC D&D			
Demolition	18,000	18,000	N/A
Utility Relocation	20,600	20,600	N/A
Contingency	9,600	9,600	N/A
Total, OPC D&D	48,200	48,200	N/A
Total, OPC	**60,225**	**60,225**	**N/A**
Contingency, OPC	*11,825*	*11,825*	*N/A*
Total Project Cost	**195,497**	**195,497**	**N/A**
Total Contingency (TEC+OPC)	***29,025***	***29,025***	***N/A***

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2015	TEC	31,800	33,500	7,000	0	0	0	0	0	0	72,300
	OPC	2,840	6,000	13,654	2,206	0	0	0	0	0	24,700
	TPC	34,640	39,500	20,654	2,206	0	0	0	0	0	97,000
FY 2016	TEC	31,316	27,435	19,953	17,752	0	0	0	0	0	96,456
	OPC	2,840	6,000	13,654	14,451	0	0	0	20,234	0	57,179
	TPC	34,156	33,435	33,607	32,203	0	0	0	20,234	0	153,635
FY 2020	TEC	11,772	500[a]	0	123,000	0	0	0	0	0	135,272
	OPC	2,740	0	0	130	3,750	3,750	19,655	30,200	0	60,225
	TPC	14,512	500	0	123,130	3,750	3,750	19,655	30,200	0	195,497
FY 2021	TEC	11,772	500[b]	0	80,000	43,000	0	0	0	0	135,272
	OPC	2,740	0	0	130	3,750	3,000	20,405	30,200	0	60,225
	TPC	14,512	500	0	80,130	46,750	3,000	20,405	30,200	0	195,497

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4QFY 2025
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	4QFY 2075

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	15.14	15.14	757	757

7. D&D Information

	Square Feet
New area being constructed by this project at Pantex Plant	67,711
Area of D&D in this project at the Pantex Plant	82,766
Area at the Pantex Plant to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
Total area eliminated	82,766

[a] Reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

[b] Reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

Pantex Plant Zone 11, Bldgs 11-2, 11-5, 11-14, 11-16, 11-17, 11-17A, 11-18, 11-19, 11-22, 11-27, 11-28, 11-38, 11-45, 11-47, 11-R-4, 11-R-7, 11-R-8, 11-R-10, 11-R-11, 11-R-13, 11-R-13A, and 11-R-23.

8. Acquisition Approach

The design has been, and the construction will be, acquired through firm-fixed price contracts.

07-D-220-04 Transuranic Liquid Waste (TLW) Treatment Facility Upgrade Project,
Los Alamos National Laboratory (LANL), Los Alamos, New Mexico
Project is for Design and Construction

1. Summary, Significant Changes and Schedule and Cost History

Summary: The FY 2021 request for the Transuranic Liquid Waste (TLW) Treatment Facility Project is $36,687K. The current Total Estimated Cost (TEC) Range is $76,000K to $134,624K based on the FY 2018 Independent Cost Estimate (ICE) conducted by the Department of Energy Office of Project Management (DOE-PM). FY 2021 funding will fully fund the construction sub-contract and establish the full management team going forward.

Significant Changes
The most recent critical decision (CD) is CD-1, Approve Alternative Selection and Cost Range, with a cost range of $62 million to $96 million and CD-4 date of 1Q FY 2020.

The Project completed the final design in September 2017 and the Preliminary Documented Safety Analysis was approved in April 2018. As required by the DOE O 413.3B, prior to CD-2/3 approval the DOE Office of Project Management Oversight and Assessment (PMOA) conducted the ICE in February 2018. Based on this estimate, the upper end of the Total Project Cost (TPC) range was estimated at $144,000K with a CD-4 date of 4th Q FY 2024. The Project was paused in September 2017 to allow the upcoming Management and Operating contractor to accept the ownership of the design and nuclear safety basis. The project was authorized to restart in 2019. In May 2019 a new architect engineer A/E evaluated the existing design and will become the A/E of record who accepts responsibility and liability of the design. The project design will need to be revised to address changes to DOE Orders and Standards. Prior to approval of CD-2/3, DOE-PM will update the ICE and conduct the required External Independent Review to validate the Performance Baseline.

The construction contract is expected to be awarded immediately after approval of Critical Decisions 2 and 3 in the first quarter, FY 2021. FY 2021 funds are being requested to account for the latest cost estimates based on current design and market conditions which will allow full funding of the construction sub-contract and have the full management team in place to oversee execution.

A Federal Project Director has been appointed.

Critical Milestone History

Fiscal Quarter or Date[a]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2014	10/04/2004		09/16/2011	4QFY 2016	1QFY 2017	1Q FY 2017	N/A	4Q FY 2020
FY 2015	10/04/2004		09/23/2013	4QFY 2016	1QFY 2017	2Q FY 2017	N/A	4Q FY 2020
FY 2016	10/04/2004	09/23/2013	09/23/2013	4QFY 2017	1QFY 2017	4Q FY 2017	N/A	4Q FY 2020
FY 2017	10/04/2004	09/23/2013	09/23/2013	4Q FY 2017	1Q FY 2017	4Q FY 2017	N/A	4Q FY 2021
FY 2018	10/04/2004	09/23/2013	09/23/2013	2Q FY 2018	02/06/2017	2Q FY 2018	N/A	4Q FY 2023
FY 2021	10/04/2004	09/23/2013	09/23/2013	1Q FY 2021	1Q FY2021	1Q FY2021	N/A	4Q FY 2024

CD-0 – Approve Mission Need
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)

[a] The schedules are only estimates until the project baseline is approved.

CD-3 – Approve Start of Construction/Execution
D&D Complete –Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion
PB – Indicates the Performance Baseline

Project Cost History

(dollars in thousands)[a]

	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2014	20,546	74,270	94,816	12,780	0	12,780	107,596
FY 2015	25,605	60,000	85,605	10,428	0	10,428	96,033
FY 2016	25,605	66,997	92,602	10,428	0	10,428	103,030
FY 2017	25,605	66,997	92,602	10,428	0	10,428	103,030
FY 2018	25,605	67,244	92,849	12,940	0	12,940	105,789
FY 2021	40,500	89,036	129,536	14,464	0	14,464	144,000

2. Project Scope and Justification

Scope
The project will design and construct a new 2,000-4,000 square foot, hazard category 3 nuclear facility. The reinforced concrete structure will house processing equipment capable of treating at least 29,000 liters of transuranic (TRU) liquid waste each year, and will include a TRU liquid influent storage and separate utilities.

Justification
The existing degraded and outdated treatment facility systems pose elevated risk to workers, public, environment and plutonium missions at LANL. Continuous workarounds are required to keep systems running and excessive corrosion threatens system availability. The replacement is needed to remediate significant deficiencies associated with the existing Radioactive Liquid Waste (RLW) treatment capabilities that pose a threat to the long-term availability of this function. The replacement is ultimately aimed at providing a RLW treatment capability that is safe, reliable, and effective for the next 50 years in support of primary plutonium missions at LANL. Delays in TLW could have a significant risk to the NNSA plutonium mission due to the potential risks associated with the aging existing RLWTF. The new facility will be built to comply with the current codes, Nuclear Safety/Quality, standards including International Building Code, seismic design/construction codes, and the National Electric Code (NEC).

The project is being executed in accordance with the project management requirements in DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets. Funds appropriated under this data sheet may be used to provide independent assessments of the planning and execution of this project and for contracted support services to the federal project team for oversight and support.

Construction will not start and funds will not be released for project use until the project achieves CD-3.

[a] The costs are only estimates until the project performance baseline is approved.

Key Performance Parameters (KPPs)

The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
-Design and construct the capability to process 29,000 liters per year of TRU liquid waste -Design and construct the TLW Facility such that the TLW effluent will meet the WAC for the LLW collection system	-Process 29,000 liters per year -Meet the WAC for the LLW collection system	Any additional through put will be accomplished through operational tempo since this facility is a batch process expected to be used about 5 days a month

3. Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
***Total Estimated Cost (TEC)**			
Design			
FY 2014	10,605	10,605	641
FY 2015	7,500	7,450	4,471
FY 2016	22,395	22,437	8,474
FY 2017	0	8	7,390
FY 2018	0	0	203
FY 2019	0	0	1,000
FY 2020	0	0	13,800
FY 2021			4,521
Total Design	40,500	40,500	40,500
Construction			
FY 2016	18,554	18,554	0
FY 2017[b]	15,900	15,900	0
FY 2018	17,895	17,895	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	36,687	36,687	16,244
FY 2022	0	0	37,429
FY 2023	0	0	28,205
FY2024	0	0	7,158
Total Construction	89,036	89,036	89,036
Total Estimated Costs (TEC)			

[a] Key Performance Parameters will be updated upon approval of the project baseline.

[b] FY 2017 amounts reflect a reprogramming of $1,153K from this project to the Radioactive Liquid Waste Treatment Facility – Low Level Waste project. The original amount appropriated was $17,053K.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2014	10,605	10,605	641
FY 2015	7,500	7,450	4,471
FY 2016	40,949	40,991	8,474
FY 2017	15,900	15,908	7,390
FY 2018	17,895	17,895	203
FY 2019	0	0	1,000
FY 2020	0	0	13,800
FY 2021	36,687	36,687	20,765
FY 2022	0	0	37,429
FY 2023	0	0	28,205
FY2024	0	0	7,158
Total TEC	129,536	129,536	129,536
Other Project Costs			
FY 2014[a]	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	524	524	0
FY 2019	1,000	1,000	1,524
FY 2020	1,710	1,710	175
FY 2021	1,000	1,000	0
FY 2022	3,000	3,000	437
FY 2023	4,000	4,000	5,400
FY 2024	3,230	3,230	6,928
FY2025	0	0	0
Total OPC	14,464	14,464	14,464
Total Project Costs (TPC)			
FY 2014	10,605	10,605	641
FY 2015	7,500	7,450	4,471
FY 2016	40,949	40,991	8,474
FY 2017	15,900	15,908	7,390
FY 2018	18,419	18,419	203
FY 2019	1,000	1,000	2,524
FY 2020	1,710	1,710	13,975
FY 2021	37,687	37,687	20,765
FY 2022	3,000	3,000	37,866
FY 2023	4,000	4,000	33,605

[a] There were no OPCs in FY 2014 – FY 2017 because these activities (e.g., safety basis documentation) were included in the original AE design contract.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2024	3,230	3,230	14,086
FY 2025	0	0	0
Grand Total	**144,000**	**144,000**	**144,000**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
*Total Estimated Cost (TEC)			
Design			
Design	27,500	22,393	NA
Design Support (Federal)	2,200	1,300	NA
Contingency	10,800	1,912	NA
Total, Design	40,500	25,605	NA
Total Design Contingency	10,800	1,912	NA
Construction			
Other Construction	51,259	29,237	NA
Equipment (GFE)	8,191	7,500	NA
Safety Basis Documents	6,994	6,997	NA
Construction Support (Federal)	3,000	3,000	NA
Contingency	19,592	20,510	NA
Total, Construction	89,036	67,244	NA
Total, TEC	129,536	92,849	NA
Contingency, TEC	30,392	22,422	NA
*Other Project Cost (OPC)			
OPC			
Conceptual Planning & Conceptual Design	NA	NA	NA
Design Support	3,565	2,041	NA
Start-Up	5,537	5,537	NA
Contingency	5,362	5,362	NA
Total, OPC except D&D	14,464	12,940	NA
D&D			
D&D	0	0	NA
Contingency	0	0	NA
Total, D&D	0	0	NA
Total, OPC	14,464	12,940	NA
Contingency, OPC	5,362	5,362	NA
***Total, TPC**	**144,000**	**105,789**	**NA**
****Total, Contingency***	**35,754**	**27,784**	**NA**

5. Schedule of Appropriation Requests

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	*Total
FY 2014	TEC	86,053	0	0	0	0			0	86,053
	OPC	7,354	2,000	3,426	0	0			0	12,780
	TPC	93,407	2,000	3,426	0	0			0	98,833
FY 2015	TEC	85,605	0		0	0			0	85,605
	OPC	7,354	2,000	1,074	0	0			0	10,428
	TPC	92,959	2,000	1,074	0	0			0	96,033
FY 2016	TEC	85,102	0	0	0	0			0	85,102
	OPC	5,718	2,000	2,710	0	0			0	10,428
	TPC	90,820	2,000	2,710	0	0			0	95,530
FY 2017	TEC	85,102	0	0	0	0			0	85,102
	OPC	5,718	2,000	1,710	1,000	0			0	10,428
	TPC	90,820	2,000	1,710	1,000	0			0	95,530
FY 2018	TEC	92,849	0	0	0	0			0	92,849
	OPC	5,718	2,000	1,710	1,000	2,000	512	0	0	12,940
	TPC	98,567	2,000	1,710	1,000	2,000	512	0	0	105,789
FY 2021	TEC	92,849	0	0	36,687	0	0	0	0	129,536
	OPC	524	1,000	1,710	1,000	3,000	4,000	3,230	0	14,464
	TPC	93,373	1,000	1,710	37,687	3,000	4,000	3,230	0	144,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	1QFY2025
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	1QFY2075

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Current Total Estimate	Previous Total Estimate	Current Total Estimate	Previous Total Estimate
Operations	1.400	1.400	70.0	70.0
Utilities	.050	.050	2.5	2.5
Maintenance & Repair	.400	.400	20.0	20.0
Total	1.850	1.850	92.5	92.5

7. D&D Information

The one-for-one offset requirement will be met by utilizing site-banked square footage. A plan for D&D of the existing facility will be developed at the end of construction of the new facility when characterization data is available.

	Square Feet
New area being constructed by this project at LANL	2,000 – 4,000
Area of D&D in this project at LANL	0
Area at LANL to be transferred, sold, and/or D&D outside the project including area previously "banked"	2,000 – 4,000
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
Total area eliminated	2,000 - 4,000

8. Acquisition Approach

The TLW design was and the construction will be obtained through competitively awarded contracts using firm fixed price contracting. The current design effort associated with the restart of the project, incorporating design improvements and becoming the A/E of record is being executed as a time and materials contract.

06-D-141, Uranium Processing Facility (UPF)
Y-12 National Security Complex, Oak Ridge, Tennessee
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary:
The FY 2021 Request for the Uranium Processing Facility (UPF) project is $750,000K. The project's overall Total Project Cost (TPC) remains at $6,500 million and CD-4 of December 31, 2025.

This FY 2021 Construction Project Data Sheet (CPDS) reflects the most recent Critical Decision (CD) approvals in February 2018, March 2018 and December 2019. The most recently approved DOE Order 413.3B CDs are the CD-2/3 approvals (*Performance Baseline and Start of Construction*) for the Main Process Building (MPB) Subproject and the Salvage and Accountability Building (SAB) Subproject approved on March 21, 2018, and the Process Support Facilities (PSF) Subproject approved on March 15, 2018. CD-4, *Project Completion*, for the Site Infrastructure and Services (SIS) Subproject was approved on February 28, 2018. CD-4 for the Substation Subproject was approved on December 20, 2019.

The UPF consists of processing capabilities for enriched uranium casting, oxide production, and salvage and accountability operations. The UPF project includes the MPB, the SAB, a Mechanical Electrical Building (MEB), and various support facilities. The UPF project will be considered complete upon successful authorization to startup the described capabilities in the new UPF buildings.

Significant Changes:
Construction associated with the UPF MPB Subproject (-04), SAB Subproject (-09), PSF Subproject (-08) is ongoing. The MEB Subproject (-06) is on target to achieve CD-4 by January 2022 at the approved TPC. CD-4 for the Substation Subproject was approved on December 20, 2019.

During FY 2019, target prices for the MPB, SAB, and PSF subprojects were negotiated with the Y-12 Management and Operating (M&O) contractor and contractor Performance Measurement Baselines (PMBs) were established to reflect the contractor's plans for completing the remaining work. The CPDS has been updated to reflect the subproject PMBs in place as of July 31, 2019.

FY 2021 funds will be used for construction for the MPB, SAB, and PSF subprojects. Subproject descriptions are included in Section 2.

Site Readiness Subproject (06-D-141-01): The Site Readiness Subproject received CD-4 on February 27, 2015. The project was completed under budget and CD-4 was achieved on schedule.

Site Infrastructure and Services (SIS) Subproject (06-D-141-05): The SIS Subproject received CD-4 on February 28, 2018. The project was completed under budget and CD-4 was achieved on schedule.

Substation Subproject (06-D-141-07): The Substation Subproject received CD-4 on December 20, 2019. The project was completed $13 million under budget and CD-4 was achieved ahead of schedule. Per DOE O 413.3B, the $13 million underrun from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS. Contingency will become part of the other Subprojects if needed after approval of a baseline change.

Mechanical Electrical Building (MEB) Subproject (06-D-141-06): The MEB Subproject CD-2/3 was approved on December 13, 2016 at a cost of $284 million with a CD-4 date of January 2022.

Process Support Facilities (PSF) Subproject (06-D-141-08): The PSF Subproject CD-2/3 was approved on March 15, 2018 at a cost of $140 million with a CD-4 date of December 2025.

Salvage and Accountability Building (SAB) Subproject (06-D-141-09): The SAB Subproject CD-2/3 was approved on March 21, 2018 at a cost of $1,180 million with a CD-4 date of December 2025. The long lead equipment authorized as part of MPB CD-3B for the SAB was included in the SAB TPC at CD-2/3 for the SAB.

Main Process Building (MPB) Subproject (06-D-141-04): The MPB subproject CD-2/3 was approved on March 21, 2018 at a cost of $4,732 million with a CD-4 date of December 2025. The MPB subproject includes UPF design, site preparation, and long lead procurements as well as construction of the MPB nuclear facility. The CD-3A for Long Lead Procurement and Site Preparation was approved on March 30, 2016. The long lead equipment authorized as part of CD-3B for the MPB is included in the MPB TPC.

A Level 4 PMCDP qualified Federal Project Director (FPD) has been assigned to this project and has approved this CPDS. A FPD at the appropriate level has been assigned to each subproject. Project funds may be used by the FPD for contracted support services for the federal project team.

As represented since the FY 2012 request, design, construction and Other Project Costs (OPC) will continue to be executed through the line item funding. After October 1, 2011, OPC work has been and will only be performed using funding specifically appropriated by Congress for the project.

Critical Milestone History

Overall Project (06-D-141-01 through 06-D-141-09)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	12/17/2004		7/25/2007	TBD	2QFY2014	TBD	TBD	TBD
FY 2012	12/17/2004		7/25/2007	4QFY2013	2QFY2014	4QFY2013	TBD	TBD
FY 2013	12/17/2004		7/25/2007	4QFY2013	2QFY2014	4QFY2013	N/A	TBD
FY 2104	12/17/2004		6/8/2012	3QFY2014	4QFY2015	3QFY2015	N/A	TBD
FY 2015	12/17/2004		6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2016	12/17/2004	2/9/2006	6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025
FY 2021	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

Site Readiness Subproject (06-D-141-01)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2014 PB	12/17/2004		6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2015	12/17/2004		6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2016	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2017	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2/27/2015

Site Infrastructure and Services Subproject (06-D-141-05)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	12/17/2004		7/25/2007	4QFY2014	4QFY2013	4QFY2014	N/A	4QFY2016
FY 2016	12/17/2004	2/9/2006	6/8/2012	2QFY2015	3QFY2015	2QFY2015	N/A	4QFY2016
FY 2017 PB	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2018	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2019	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2020	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	2/28/2018

Substation Subproject (06-D-141-07)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2016	4QFY2016	4QFY2016	N/A	1QFY2019
FY 2018 PB	12/17/2004	6/24/2015	6/8/2012	9/14/2016	9/30/2017	9/14/2016	N/A	6/30/2020
FY 2019	12/17/2004	6/24/2015	6/8/2012	9/14/2016	12/22/2017	9/14/2016	N/A	6/30/2020
FY 2020	12/17/2004	6/24/2015	6/8/2012	9/14/2016	12/22/2017	9/14/2016	N/A	6/30/2020
FY 2021	12/17/2004	6/24/2015	6/8/2012	9/14/2016	12/22/2017	9/14/2016	N/A	12/20/2019

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	2QFY2017	4QFY2017	2QFY2017	N/A	4QFY2021
FY 2018 PB	12/17/2004	6/24/2015	6/8/2012	12/13/2016	4QFY2017	12/13/2016	N/A	1/31/2022
FY 2019	12/17/2004	6/24/2015	6/8/2012	12/13/2016	9/30/2017	12/13/2016	N/A	1/30/2022
FY 2020	12/17/2004	6/24/2015	6/8/2012	12/13/2016	9/30/2017	12/13/2016	N/A	1/30/2022
FY 2021	12/17/2004	6/24/2015	6/8/2012	12/13/2016	9/30/2017	12/13/2016	N/A	1/30/2022

Process Support Facilities Subproject (06-D-141-08)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	3QFY2017	3QFY2017	3QFY2017	N/A	4QFY2021
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	9/30/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/15/2018	9/30/2017	3/15/2018	N/A	12/31/2025
FY 2021	12/17/2004	6/24/2015	6/8/2012	3/15/2018	9/30/2017	3/15/2018	N/A	12/31/2025

Salvage and Accountability Building Subproject (06-D-141-09)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025
FY 2021	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

Main Process Building Subproject (06-D-141-04)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2104	12/17/2004		6/8/2012	3QFY2014	4QFY2015	3QFY2015	N/A	TBD
FY 2015	12/17/2004		6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2016	12/17/2004	2/9/2006	6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025
FY 2021	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	MPB CD-3A	MPB CD-3B	MPB CD-3C	Substation CD-3A
FY 2017	2Q FY 2016	1Q FY 2017	1Q FY 2017	3Q FY 2016
FY 2018	3/30/2016	1/13/2017	N/A	N/A

MPB CD-3A – Site preparation and long lead procurements
MPB CD-3B – Long Lead Procurements
MPB CD-3C – Cancelled as reflected in the FY 2018 CPDS
Substation CD-3A – Cancelled as reflected in the FY 2018 CPDS

Project Cost History

Overall Project (06-D-141-01 through 06-D-141-09)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	351,149	935,000-1,604,000	1,124,000-1,928,000	276,000-472,000	TBD	TBD	1,400,000-3,500,000
FY 2012	528,690	3,174,779-5,320,310	3,703,000-5,849,000	497,000-651,000	N/A	497,000-651,000	4,200,000-6,500,000
FY 2013	566,192	3,136,808-5,150,808	3,703,000-5,717,000	497,000-783,000	N/A	497,000-783,000	4,200,000-6,500,000
FY 2014	1,164,000	TBD	TBD	TBD	N/A	TBD	TBD
FY 2015	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2017	1,880,000	4,103,000	5,983,000	517,000	0	517,000	6,500,000
FY 2018	1,926,000	4,148,500	6,074,500	425,500	0	425,500	6,500,000
FY 2019	1,855,809	4,463,724	6,319,533	180,467	0	180,467	6,500,000
FY 2020	1,838,000	4,283,337	6,121,337	378,663	0	378,663	6,500,000
FY 2021	1,838,000	4,283,337	6,121,337	378,663	0	378,663	6,500,000

Site Readiness Subproject (06-D-141-01)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	N/A	64,000	64,000	1,000	N/A	1,000	65,000
FY 2016		64,000	64,000	1,000	N/A	1,000	65,000
FY 2017	0	43,277	43,277	0	0	0	43,277
FY 2018	0	43,277	43,277	0	0	0	43,277
FY 2019	0	43,714	43,714	0	0	0	43,714

Site Infrastructure and Services Subproject (06-D-141-05)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	N/A	58,000	58,000	1,500	N/A	1,500	59,500
FY 2016	N/A	84,500	84,500	500	N/A	500	85,000
FY 2017	0	78,000	78,000	500	0	500	78,500
FY 2018	0	78,000	78,000	500	0	500	78,500
FY 2019	0	78,000	78,000	500	0	500	78,500
FY 2020	0	60,500	60,500	0	0	0	60,500

Substation Subproject (06-D-141-07)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	48,000	48,000	2,000	0	2,000	50,000
FY 2018	0	60,000	60,000	0	0	0	60,000
FY 2019	0	60,000	60,000	0	0	0	60,000
FY 2020	0	60,000	60,000	0	0	0	60,000
FY 2021	0	48,568	48,568	0	0	0	48,568

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	540,000	540,000	60,000	0	60,000	600,000
FY 2018	0	284,000	284,000	0	0	0	284,000
FY 2019	0	283,917	283,917	83	0	83	284,000
FY 2020	0	282,980	282,980	1,020	0	1,020	284,000
FY 2021	0	282,980	282,980	1,020	0	1,020	284,000

Process Support Facilities Subproject (06-D-141-08)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	55,000	55,000	5,000	0	5,000	60,000
FY 2018	0	111,000	111,000	10,000	0	10,000	121,000
FY 2019	0	116,702	116,702	4,298	0	4,298	121,000
FY 2020	0	118,000	118,000	22,000	0	22,000	140,000
FY 2021	0	118,000	118,000	22,000	0	22,000	140,000

Salvage and Accountability Building Subproject (06-D-141-09)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	1,200,000	1,200,000	130,000	0	130,000	1,330,000
FY 2018	0	1,060,250	1,060,250	25,000	0	25,000	1,085,250
FY 2019	0	1,013,761	1,013,761	16,239	0	16,239	1,030,000
FY 2020	0	1,105,000	1,105,000	75,000	0	75,000	1,180,000
FY 2021	0	1,105,000	1,105,000	75,000	0	75,000	1,180,000

Main Process Building Subproject (06-D-141-04)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2017	1,880,000	2,138,723	4,018,723	319,500	0	319,500	4,338,223
FY 2018	1,926,000	2,511,973	4,437,973	390,000	0	390,000	4,827,973
FY 2019	1,855,809	2,867,630	4,723,439	159,347	0	159,347	4,882,786
FY 2020	1,838,000	2,613,143	4,451,143	280,643	0	280,643	4,731,786
FY 2021	1,838,000	2,613,143	4,451,143	280,643	0	280,643	4,731,786

2. Project Scope and Justification

Scope

The UPF Project, which consists of a series of industrial and nuclear buildings and supporting infrastructure, is a major system acquisition that was selected in the Record of Decision for the Complex Transformation Supplemental Programmatic Environmental Impact Statement to ensure the long-term viability, safety, and security of the Enriched Uranium (EU) capability at the Y-12 National Security Complex. Within budget constraints, the UPF project focuses on modernizing uranium processing capabilities at Y-12 to reduce program and safety risk. The UPF project provides new buildings to replace the Building 9212 capabilities for Highly Enriched Uranium (HEU) casting, oxide production, recovery, decontamination, and assay. Coordination between Headquarters Acquisition and Project Management, the Uranium Program Manager, the NNSA Production Office, and the UPF Project Office is essential as the uranium mission strategy and associated implementation plans define how the uranium capabilities are transitioned, relocated, sustained, and/or replaced.

The goals and objectives of the UPF Project are to support the following modernization strategy:

- Ensure the long-term capability and improve the reliability of EU operations;
- Replace deteriorating, end-of-life buildings with modern manufacturing buildings;
- Significantly improve the health and safety posture for workers and the public by replacing administrative controls with engineered controls to manage the risks related to worker safety, criticality safety, fire protection, and environmental compliance.

The UPF project consists of the following subprojects:

Site Readiness Subproject (06-D-141-01): The Site Readiness Subproject scope included Bear Creek Road relocation, including a bridge overpass of the haul road; installation of potable water lines paralleling the new road; electrical line demolition to make way for the road and clear the construction site; electrical line and communication cable installation; preparation of the West Borrow area to receive excess-soil and preparation and maintenance of a spoil area for wet soil; extension of an existing haul road for access to the construction site; and jack-and-bore installation of casings for future utilities.

Site Infrastructure and Services (SIS) Subproject (06-D-141-05): The SIS Subproject scope included demolition of Building 9107 and its hillside, installation of haul road security features, completion of a sedimentation basin, a concrete batch plant, and completion of the Construction Support Building.

Substation Subproject (06-D-141-07): The Substation Subproject provided for the installation of the 161kV Main Electrical Substation for the Uranium Processing Facility Project and capacity for most of the rest of the Y-12 plant. The Substation will provide electrical power from the Tennessee Valley Authority (TVA) 161kV transmission system. The Substation Subproject included all equipment, facilities, or structures needed for a fully operational substation including the high voltage superstructure, control house buildings, site work, equipment foundations, oil containment system, fencing, outdoor lighting, grounding system and all underground raceways, conduits and cable trenches, transmission lines, access road, and fire protection for the substation.

Mechanical Electrical Building (MEB) Subproject (06-D-141-06): The MEB Subproject will construct a facility and install the utility equipment and support systems required by both the MPB and the SAB. The MEB will be a stand-alone building housing mechanical, electrical, heating, ventilation, and air conditioning, utility equipment, and support systems. The MEB will be constructed to nonnuclear commercial industrial standards. This subproject includes support buildings including leased temporary and permanent construction support facilities.

Process Support Facilities (PSF) Subproject (06-D-141-08): The Process Support Facilities Subproject provides facilities for the chilled water, instrument air, demineralized water, waste management, and chemical and gas storage needed to support the MPB and SAB.

Salvage and Accountability Building (SAB) Subproject (06-D-141-09): The SAB will contain the following processes: waste preparation, decontamination, nondestructive analysis, the clean and contaminated shops, chemical recovery, calcination and leaching, electronics and calibration maintenance, filter room, and personnel-related rooms. The SAB will be constructed to standards commensurate with the radioactive hazard and security requirements for the materials and processes contained within. This subproject includes support buildings including a fire tank pump building as well as the Personnel Support Building which provides personnel access and monitoring station, truck bay, loading dock, and material access. Long lead equipment purchases associated with the SAB Subproject are allocated to the SAB TPC.

> **Long Lead Procurements, CD-3B:** Includes long lead gloveboxes, skids, and select long lead procurements for structural steel, rebar, embeds, and specialty items associated with SAB.

Main Process Building (MPB) Subproject (06-D-141-04): The MPB will house the casting and oxide production capabilities. It also contains nondestructive analysis and waste preparations, furnaces and repacking, and spaces needed for process support such as the shift manager's office, restrooms, and other personnel-related rooms. The MPB will be constructed to nuclear standards commensurate with high-hazard materials and security for the processes to be carried out within. The

MPB Subproject will include the construction of the HEUMF connector, and the new Perimeter Intrusion Detection and Assessment System surrounding the UPF campus and support buildings. Design costs for the UPF project are included in the MPB Subproject baseline, as design costs are not tracked for each individual UPF subproject.

Site Preparation and Long Lead Procurements, CD-3A: Includes excavation and fill for the MPB, SAB, and the MEB; installation of temporary facilities, power, storm water and sanitary sewers; and long lead procurements of tower cranes and rebar for the MEB slab.

Long Lead Procurements, CD-3B: Includes long lead gloveboxes, skids, and select long lead procurements for structural steel, rebar, embeds, and specialty items associated with MPB.

Justification

The UPF Project is needed to ensure the long-term viability, safety, and security of the EU capability in the United States. The UPF Project will support the Nation's nuclear weapons stockpile, down blending of EU in support of nonproliferation, and provide uranium as feedstock for fuel for naval reactors. Currently, these capabilities reside in aged and "genuinely decrepit" facilities as noted by the 2009 Strategic Posture Commission. There is substantial risk that the existing facilities will continue to deteriorate to the point of significant impact to Defense Programs, Defense Nuclear Nonproliferation, and Naval Reactors programs. The impacts could result in loss of the U.S. capability to maintain the nuclear weapons stockpile through life extension programs, shutdown of the U.S. Navy nuclear powered fleet due to lack of EU fuel feedstock materials, and impact to the Defense Nuclear Nonproliferation program's ability to reduce the enrichment level of foreign research reactors through supply of lower enrichment fuels manufactured at Y-12. The risk of inadvertent or accidental shutdown of the existing facilities is high and may occur prior to completion and startup of the UPF Project.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Consistent with DOE O 413.3B, Earned Value (EV) information for all subprojects and the UPF design effort is reported in the Project Assessment and Reporting System (PARS). The M&O contractor received EV Management System certification approval from DOE in 2018. Funds appropriated under this data sheet may be used for the incremental funding and execution of the project on an annual basis. Funds appropriated under this data sheet may be used for contracted support services to the FPD and to conduct reviews of design and construction.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure	Threshold	Objective
UPF supports phasing out mission dependency on 9212	Threshold Performance Parameters are identified in the Classified Project Requirements Document	Objective Performance Parameters are identified in the Classified Project Requirements Document

3. Project Cost and Schedule

Financial Schedule

UPF funding is appropriated at the Overall Project level (06-D-141) and is allocated to the subprojects in the tables below.

Site Readiness Subproject (06-D-141-01)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
Total Construction	43,714	43,714	43,714
Total Estimated Costs (TEC)			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
Total TEC	**43,714**	**43,714**	**43,714**
Other Project Costs (OPC)			
FY 2016	0	0	0
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
Grand Total	**43,714**	**43,714**	**43,714**

Site Infrastructure and Services (SIS) Subproject (06-D-141-05)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2015	60,500[a]	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
Total Construction	60,500	60,500	60,500
Total Estimated Costs (TEC)			
FY 2015	60,500	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
Total TEC	**60,500**	**60,500**	**60,500**
Other Project Costs (OPC)			
FY 2017	0	0	0
FY 2018	0	0	0
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2015	60,500	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
Grand Total	**60,500**	**60,500**	**60,500**

[a] Subproject received CD-4 approval in FY 2018 and completed under budget; baseline was $78M, actual cost was $60.5M.

Substation Subproject (06-D-141-07)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2016	48,568[a]	48,568	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	11,403
Total Construction	48,568	48,568	48,568
Total Estimated Costs (TEC)			
FY 2016	48,568	48,568	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	11,403
FY 2020	0	0	0
Total TEC	48,568	48,568	48,568
Other Project Costs (OPC)			
FY 2016	0	0	0
FY 2017	0	0	0
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2016	48,568	48,568	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	11,403
Grand Total	**48,568**	**48,568**	**48,568**

[a] Final allocation of funding and obligations reflects the final TPC of the Substation Subproject. Per DOE O 413.3B, the approximately $11 million underrun from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS.

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2017	55,000	55,000	1,425
FY 2018	160,000	160,000	35,061
FY 2019	67,980	67,980	61,039
FY 2020	0	0	176,961
FY 2021	0	0	8,494
Total Construction	282,980	282,980	282,980
Total Estimated Costs (TEC)			
FY 2017	55,000	55,000	1,425
FY 2018	160,000	160,000	35,061
FY 2019	67,980	67,980	61,039
FY 2020	0	0	176,961
FY 2021	0	0	8,494
Total TEC	**282,980**	**282,980**	**282,980**
Other Project Costs (OPC)			
FY 2019	1,020	1,020	0
FY 2020	0	0	0
FY 2021	0	0	1,000
FY 2022	0	0	20
Total OPC	1,020	1,020	1,020
Total Project Costs (TPC)			
FY 2017	55,000	55,000	1,425
FY 2018	160,000	160,000	35,061
FY 2019	69,000	69,000	61,039
FY 2020	0	0	176,961
FY 2021	0	0	9,494
FY 2022	0	0	20
Grand Total	**284,000**	**284,000**	**284,000**

Process Support Facilities (PSF) Subproject (06-D-141-08)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	6,883
FY 2020	54,000	54,000	89,117
FY 2021	19,000	19,000	13,000
FY 2022	0	0	6,861
Total Construction	118,000	118,000	118,000
Total Estimated Costs (TEC)			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	6,883
FY 2020	54,000	54,000	89,117
FY 2021	19,000	19,000	13,000
FY 2022	0	0	6,861
Total TEC	**118,000**	**118,000**	**118,000**
Other Project Costs (OPC)			
FY 2020	1,000	1,000	1,000
FY 2021	21,000	21,000	2,000
FY 2022	0	0	14,000
FY 2023	0	0	4,000
FY 2024	0	0	750
FY 2025	0	0	250
Total OPC	22,000	22,000	22,000
Total Project Costs (TPC)			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	6,883
FY 2020	55,000	55,000	90,117
FY 2021	40,000	40,000	15,000
FY 2022	0	0	20,861

	Budget Authority (Appropriations)	Obligations	Costs
FY 2023	0	0	4,000
FY 2024	0	0	750
FY 2025	0	0	250
Grand Total	**140,000**	**140,000**	**140,000**

Salvage and Accountability Building (SAB) Subproject (06-D-141-09)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	144,625
FY 2020	250,000	250,000	415,375
FY 2021	197,000	197,000	163,897
FY 2022	178,000	178,000	100,000
FY 2023	32,000	32,000	126,103
FY 2024	0	0	98,806
Total Construction	1,105,000	1,105,000	1,105,000
Total Estimated Costs (TEC)			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	144,625
FY 2020	250,000	250,000	415,375
FY 2021	197,000	197,000	163,897
FY 2022	178,000	178,000	100,000
FY 2023	32,000	32,000	126,103
FY 2024	0	0	98,806
FY 2025	0	0	0
Total TEC	**1,105,000**	**1,105,000**	**1,105,000**
Other Project Costs (OPC)			
FY 2020	2,000	2,000	2,000

	Budget Authority (Appropriations)	Obligations	Costs
FY 2021	5,000	5,000	5,000
FY 2022	22,000	22,000	22,000
FY 2023	38,000	38,000	31,000
FY 2024	8,000	8,000	8,000
FY 2025	0	0	7,000
Total OPC	75,000	75,000	75,000
Total Project Costs (TPC)			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	144,625
FY 2020	252,000	252,000	417,375
FY 2021	202,000	202,000	168,897
FY 2022	200,000	200,000	122,000
FY 2023	70,000	70,000	157,103
FY 2024	8,000	8,000	106,806
FY 2025	0	0	7,000
Grand Total	**1,180,000**	**1,180,000**	**1,180,000**

Main Process Building (MPB) Subproject (06-D-141-04)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389

	Budget Authority (Appropriations)	Obligations	Costs
FY 2014	301,886[a]	301,886	198,448
FY 2015	270,929[b]	269,823	220,761
FY 2016	298,000	297,978	309,154
FY 2017	179,884	179,748	326,205
FY 2018	9,562	10,954	115,718
Total Design	1,838,000	1,838,000	1,838,000[c]
Construction			
FY 2016	72,000	72,000	4,958
FY 2017	340,116	340,116	54,263
FY 2018	283,438	283,438	177,259
FY 2019	351,000	350,873	344,296
FY 2020	436,000	436,127	365,548
FY 2021	502,500	502,500	545,109
FY 2022	388,500	388,500	471,619
FY 2023	171,000	171,000	304,897
FY 2024	68,589	68,589	160,944
FY 2025	0	0	184,250
Total Construction	2,613,143	2,613,143	2,613,143
Total Estimated Costs (TEC)			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448

[a] In FY 2014, $5,000,000 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Maintenance and Repair of Facilities at Y-12. Change from FY 2018 CPDS also reflects a rescission of $2,114,341.

[b] In FY 2016, $2,885,659 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Uranium Sustainment: Storage under the Directed Stockpile Work program. Change from FY 2018 CPDS also reflects a rescission of $685,002.08.

[c] Allocations to Design will be updated in future data sheets as final design costs and fee payment requests are reviewed and adjudicated.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2015	270,929	269,823	220,761
FY 2016	370,000	369,978	314,112
FY 2017	520,000	519,864	380,468
FY 2018	293,000	294,392	292,977
FY 2019	351,000	350,873	344,296
FY 2020	436,000	436,127	365,548
FY 2021	502,500	502,500	545,109
FY 2022	388,500	388,500	471,619
FY 2023	171,000	171,000	304,897
FY 2024	68,589	68,589	160,944
FY 2025	0	0	184,250
Total TEC	**4,451,143**	**4,451,143**	**4,451,143**
Other Project Costs (OPC)			
FY 2005	12,113	12,113	12,113
FY 2006	7,809	7,809	7,809
FY 2007	10,082	10,082	10,082
FY 2008	11,730	11,730	11,730
FY 2009	14,000	14,000	14,000
FY 2010	20,500	20,500	20,500
FY 2011	18,409	18,409	18,409
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	2,000	2,000	2,000
FY 2021	5,500	5,500	5,500
FY 2022	31,500	31,500	31,500
FY 2023	59,000	59,000	59,000
FY 2024	88,000	88,000	82,500
FY 2025	0	0	5,500
Total OPC	280,643	280,643	280,643

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Costs (TPC)			
FY 2005	12,113	12,113	12,113
FY 2006	12,809	12,809	7,809
FY 2007	15,082	15,082	10,759
FY 2008	50,313	50,313	45,680
FY 2009	104,622	104,622	93,184
FY 2010	114,500	114,500	101,459
FY 2011	133,680	133,680	128,264
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448
FY 2015	270,929	269,823	220,761
FY 2016	370,000	369,978	314,112
FY 2017	520,000	519,864	380,468
FY 2018	293,000	294,392	292,977
FY 2019	351,000	350,873	344,296
FY 2020	438,000	438,127	367,548
FY 2021	508,000	508,000	550,609
FY 2022	420,000	420,000	503,119
FY 2023	230,000	230,000	363,897
FY 2024	156,589	156,589	243,444
FY 2025	0	0	189,750
Grand Total	**4,731,786**	**4,731,786**	**4,731,786**

Overall Project (06-D-141-01 through 06-D-141-09)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184

	Budget Authority (Appropriations)	Obligations	Costs
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448
FY 2015	270,929	269,823	220,761
FY 2016	298,000	297,978	309,154
FY 2017	179,884	179,748	326,205
FY 2018	9,562	10,954	115,718
Total Design	1,838,000	1,838,000	1,838,000[a]
Construction			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	60,500	60,500	20,853
FY 2016	132,000	132,000	32,270
FY 2017	395,116	395,116	89,918
FY 2018	653,438	653,438	298,467
FY 2019	701,980	701,853	568,246
FY 2020	740,000	740,127	1,047,001
FY 2021	718,500	718,500	730,500
FY 2022	566,500	566,500	578,480
FY 2023	203,000	203,000	431,000
FY 2024	68,589	68,589	259,750
FY 2025	0	0	195,682
FY 2026	0	0	0
Total Construction	4,283,337	4,283,337	4,283,337
Total Estimated Costs (TEC)			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959

[a] Allocations to Design will be updated in future data sheets as final design costs and fee payment requests are reviewed and adjudicated.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	312,783	312,740	197,631
FY 2014	301,886	301,886	224,376
FY 2015	331,429	330,323	241,614
FY 2016	430,000	429,978	341,424
FY 2017	575,000	574,864	416,123
FY 2018	663,000	664,392	414,185
FY 2019	701,980	701,853	568,246
FY 2020	740,000	740,127	1,047,001
FY 2021	718,500	718,500	730,500
FY 2022	566,500	566,500	578,480
FY 2023	203,000	203,000	431,000
FY 2024	68,589	68,589	259,750
FY 2025	0	0	195,682
Total TEC	**6,121,337**	**6,121,337**	**6,121,337**
Other Project Costs (OPC)			
FY 2005	12,113	12,113	12,113
FY 2006	7,809	7,809	7,809
FY 2007	10,082	10,082	10,082
FY 2008	11,730	11,730	11,730
FY 2009	14,000	14,000	14,000
FY 2010	20,500	20,500	20,500
FY 2011	18,409	18,409[a]	18,409
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0[b]
FY 2018	0	0	0

[a] Updated to correctly represent the OPC funding allocated to the MPB subproject. This was an error in the prior year's PDS and budget authority should have been aligned to the actual costs based on DCAA audit.

[b] The amount included in the FY 2019 data sheet was an estimate and has been revised to reflect actual cost in FY 2017.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2019	1,020	1,020	0
FY 2020	5,000	5,000	5,000
FY 2021	31,500	31,500	13,500
FY 2022	53,500	53,500	67,520
FY 2023	97,000	97,000	94,000
FY 2024	96,000	96,000	91,250
FY 2025	0	0	12,750
Total OPC	**378,663**	**378,663**	**378,663**
Total Project Costs (TPC)			
FY 2005	12,113	12,113	12,113
FY 2006	12,809	12,809	7,809
FY 2007	15,082	15,082	10,759
FY 2008	50,313	50,313	45,680
FY 2009	104,622	104,622	93,184
FY 2010	114,500	114,500	101,459
FY 2011	133,680	133,680	128,264
FY 2012	160,194	160,109	170,700
FY 2013	312,783	312,740	197,631
FY 2014	301,886	301,886	224,376
FY 2015	331,429	330,323	241,614
FY 2016	430,000	429,978	341,424
FY 2017	575,000	574,864	416,123
FY 2018	663,000	664,392	414,185
FY 2019	703,000	702,873	568,246
FY 2020	745,000	745,127	1,052,001
FY 2021	750,000	750,000	744,000
FY 2022	620,000	620,000	646,000
FY 2023	300,000	300,000	525,000
FY 2024	164,589	164,589	351,000
FY 2025	0	0	208,432
Grand Total	**6,500,000**	**6,500,000**	**6,500,000**

4. Details of Project Cost Estimate

Site Readiness Subproject (06-D-141-01)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	N/A
Contingency	0	0	N/A
Total Design	0	0	N/A
Construction			
Site Preparation	43,714	43,714	50,200
Equipment	0	0	0
Construction	0	0	0
Contingency	0	0	13,800
Total Construction	43,714	43,714	64,000
Total Estimated Cost	43,714	43,714	64,000
Contingency, TEC	0	0	13,800
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	0	1,000
Contingency	0	0	0
Total, OPC	0	0	1,000
Contingency, OPC	0	0	0
Total Project Cost	**43,714**	**43,714**	**65,000**
Total Contingency (TEC+OPC)	**0**	**0**	**13,800**

Site Infrastructure and Services (SIS) Subproject (06-D-141-05)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	26,000
Equipment	0	0	0
Construction	60,500	60,500	30,000
Contingency	0	0	22,500
Total Construction	60,500	60,500	78,500
Total Estimated Cost	60,500	60,500	78,500
Contingency, TEC	0	0	22,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	0	0
Contingency	0	0	0
Total, OPC	0	0	0
Contingency, OPC	0	0	0
Total Project Cost	**60,500**	**60,500**	**78,500**
Total Contingency (TEC+OPC)	**0**	**0**	**22,500**

Substation Subproject (06-D-141-07)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	3,000
Equipment	0	0	47,000
Construction	48,568	48,000	0
Contingency	0	12,000	10,000
Total Construction	48,568	60,000	60,000
Total Estimated Cost	48,568	60,000	60,000
Contingency, TEC	0	12,000	10,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	0	0
Contingency	0	0	0
Total, OPC	0	0	0
Contingency, OPC	0	0	0
Total Project Cost	**48,568**	**60,000**	**60,000**
Total Contingency (TEC+OPC)	**0**	**12,000**	**10,000**

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	18,000	18,000	20,000
Construction	194,105	201,780	184,000
Contingency	70,875	63,200	80,000
Total Construction	282,980	282,980	284,000
Total Estimated Cost	282,980	282,980	284,000
Contingency, TEC	70,875	63,200	80,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	1,000	1,000	0
Contingency	20	20	0
Total, OPC	1,020	1,020	0
Contingency, OPC	20	20	0
Total Project Cost	**284,000**	**284,000**	**284,000**
Total Contingency (TEC+OPC)	**70,895**	**63,220**	**80,000**

Process Support Facilities (PSF) Subproject (06-D-141-08)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	10,000	10,000	10,000
Construction	74,524	85,500	85,500
Contingency	33,476	22,500	22,500
Total Construction	118,000	118,000	118,000
Total Estimated Cost	118,000	118,000	118,000
Contingency, TEC	33,476	22,500	22,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	18,000	18,000	18,000
Contingency	4,000	4,000	4,000
Total, OPC	22,000	22,000	22,000
Contingency, OPC	4,000	4,000	4,000
Total Project Cost	**140,000**	**140,000**	**140,000**
Total Contingency (TEC+OPC)	**37,476**	**26,500**	**26,500**

Salvage and Accountability Building (SAB) Subproject (06-D-141-09)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	378,000	378,000	378,000
Construction	349,341	503,500	503,500
Contingency	377,659	223,500	223,500
Total Construction	1,105,000	1,105,000	1,105,000
Total Estimated Cost	1,105,000	1,105,000	1,105,000
Contingency, TEC	377,659	223,500	223,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	60,000	60,000	60,000
Contingency	15,000	15,000	15,000
Total, OPC	75,000	75,000	75,000
Contingency, OPC	15,000	15,000	15,000
Total Project Cost	**1,180,000**	**1,180,000**	**1,180,000**
Total Contingency (TEC+OPC)	**392,659**	**238,500**	**238,500**

Main Process Building (MPB) Subproject (06-D-141-04)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	1,838,000	1,838,000	1,838,000
Contingency	0	0	0
Total Design	1,838,000	1,838,000	1,838,000
Construction			
Site Preparation	112,500	112,500	112,500
Equipment	919,300	919,300	919,300
Construction	825,722	1,139,343	1,139,343
Contingency	755,621	442,000	442,000
Total Construction	2,613,143	2,613,143	2,613,143
Total Estimated Cost	4,451,143	4,451,143	4,451,143
Contingency, TEC	755,621	442,000	442,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	30,000	30,000	30,000
Conceptual Design	64,643	64,643	64,643
Start-up	146,000	146,000	146,000
Contingency	40,000	40,000	40,000
Total, OPC	280,643	280,643	280,643
Contingency, OPC	40,000	40,000	40,000
Total Project Cost	**4,731,786**	**4,731,786**	**4,731,786**
Total Contingency (TEC+OPC)	**795,621**	**482,000**	**482,000**

Overall Project (06-D-141-01 through 06-D-141-09)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	1,838,000	1,838,000	1,838,000
Contingency	0	0	0
Total Design	1,838,000	1,838,000	1,838,000

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Construction			
Site Preparation	156,214	156,214	156,214
Equipment	1,325,300	1,325,300	1,325,300
Construction	1,551,192	2,038,623	2,038,623
Contingency	1,250,631[a]	763,200	763,200
Total Construction	4,283,337	4,283,337	4,283,337
Total Estimated Cost	6,121,337	6,121,337	6,121,337
Contingency, TEC	1,250,631[a]	763,200	763,200
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	30,000	30,000	30,000
Conceptual Design	64,643	64,643	64,643
Start-up	225,000	225,000	225,000
Contingency	59,020	59,020	59,020
Total, OPC	378,663	378,663	378,663
Contingency, OPC	59,020	59,020	59,020
Total Project Cost	**6,500,000**	**6,500,000**	**6,500,000**
Total Contingency (TEC+OPC)	**1,309,651[a]**	**822,220**	**822,220**

[a] ~ $13 million of funds from underruns from the Substation Subproject have been reallocated to construction contingency at the overall project level as allowed for by DOE Order 413.3B.

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2011	TEC	1,233,620	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	1,499,649	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2012	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2013	TEC	2,254,185	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	129,128	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	2,383,313	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2014	TEC	3,436,047	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	174,313	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,610,360	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2015	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,005,096	520,000	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2016	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,005,096	520,000	525,000	TBD	TBD	TBD	TBD	TBD	TBD
FY 2017	TEC	TBD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	TBD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,180,096	620,000	620,000	635,000	645,000	500,000	250,000	49,904	6,500,000
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,223,096	722,000	735,000	740,000	630,000	385,000	64,904	0	6,500,000
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,223,096	703,000	745,000	750,000	620,000	300,000	159,000	5,589	6,500,000
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,217,411	703,000	745,000	750,000	620,000	300,000	164,589	0	6,500,000
FY 2021	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,217,411	703,000	745,000	750,000	620,000	300,000	164,589	0	6,500,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2025
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	N/A

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	$0.466	$0.466	$32,915	$32,915

7. D&D Information

The new area being constructed in this project is replacing existing facilities; however, the costs of D&D of the facilities that are being replaced are not included in the costs of this construction project. Following risk reduction and stabilization activities by NNSA, final D&D of existing facilities will be the responsibility of the DOE Office of Environmental Management.

The construction of the UPF Project adds approximately 230,000 base-level square[a] feet of new buildings to the Y-12 footprint and will allow eventual replacement of functions in Building 9212 including EU casting and EU chemical processing operations. The final D&D and demolition of these areas are not part of the UPF project. Building 9107 (11,000 square feet) was demolished as part of the SIS Subproject to facilitate clearing the UPF construction site.

8. Acquisition Approach

The NNSA Federal Project Director and Integrated Project Team are responsible for the execution of the project. The Y-12 M&O contractor is the designated design authority. Designated officials in the Office of Defense Programs (NA-10) are responsible for defining program requirements and identifying project scope changes. The Office of Acquisition and Project Management (NA-APM) is responsible for providing support for alternative studies, and serves as the lead NNSA office for design and construction of the project.

The UPF Project construction scope is being performed under firm fixed price contracts or subcontracts along with cost-plus contracts as determined to be the best value for the government. The Department is administering Architect-Engineer and construction contracts utilizing the M&O contract and stand-alone contract vehicles. The United States Army Corps of Engineers (USACE) and Tennessee Valley Authority have had acquisition and project management responsibility for appropriate scopes of work as determined by the Department.

[a] Square footage figures rounded to the next highest 1,000 square feet.

04-D-125, Chemistry and Metallurgy Research Replacement (CMRR) Project
Los Alamos National Laboratory (LANL), Los Alamos, New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The 2021 Request for the Chemistry and Metallurgy Research Replacement (CMRR) Project is $169,427k, to be distributed across four ongoing subprojects.

The CMRR Project provides continuity in analytical chemistry (AC) and materials characterization (MC) capabilities through the relocation of programmatic operations from the existing CMR facility, and provides infrastructure and support facilities for consolidated operations at the TA-55 site. CMRR has four active subprojects for equipment installation into Plutonium Facility 4 (PF-4) and the Radiological Laboratory and Utility Office Building (RLUOB).[a] Also included is the supporting infrastructure for CMRR projects, and for ongoing operations related to the relocation of chemistry and metallurgy operations and personnel to the TA-55 site.

Significant Changes:
The FY 2021 Construction Project Data Sheet (CPDS) is an update from FY 2020, and does not include a new start for the budget year. This data sheet redefines the project to include, a) previously completed subprojects, b) the two active baselined subprojects [RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI 1)] and c) the restoration of PF-4 Equipment Installation Phase 2 (PEI2) and RLUOB Hazard Category 3 (RC3) into the CMRR project. In previous years, Congress removed the PEI2 and RC3 subprojects from the CMRR project. However, consistent with recent Congressional direction, NNSA is requesting funds for these subprojects within the CMRR project in FY 2021.

Critical Decision (CD)-2/3 for the REI2 and PEI1 subprojects was approved on October 31, 2016 with a total project cost (TPC) for both subprojects of $1,027,250K. The PEI2 and RC3 Subprojects achieved CD-1 on August 21, 2014, with a top end range of $1,012,730K, and have yet to be baselined.

This Construction Project Data Sheet reflects:
- All current subprojects underway.
- The final year of funding for the REI2 and PEI1 subprojects.
- PEI2 and RC3 subprojects.

The CMRR subprojects are described below:

RLUOB Subproject (04-D-125-01): *COMPLETE* - CD-4 approved on June 24, 2010.
RLUOB Equipment Installation (REI1) Subproject (04-D-125-02): *COMPLETE* - CD-4 approved on June 20, 2013.
Nuclear Facility (NF) Subproject (04-D-125-03): *CANCELLED* - This subproject was cancelled.
REI2 Subproject (04-D-125-04): Transfers part of AC and MC capabilities from CMR to RLUOB by designing, purchasing, and installing additional equipment in the RLUOB, and developing select project shop/warehouse infrastructure. A CD-3A request for procurement of long lead equipment and site preparations, following a reconciled Independent Cost Estimate (ICE) conducted by DOE-PM, was approved for REI2 on December 18, 2014. CD-3B for additional long lead procurements for REI2 was approved on December 22, 2015. REI2 CD-2/3 approval was received on October 31, 2016 with the Performance baseline established at $633,250K. CD-4 completion is scheduled for January 5, 2022.

PEI1 Subproject (04-D-125-05): Maximizes use of PF-4 by decommissioning and decontaminating (D&D) old gloveboxes and equipment, reconfiguring and reusing existing gloveboxes, consolidating and relocating existing capabilities, installing new gloveboxes and equipment for AC/MC capabilities and developing select project-related warehouse and office infrastructure. PEI1 will establish AC and MC capabilities that utilize larger amounts of nuclear materials and therefore are required to be in PF-4 operational space. CD-3A for long lead procurements for PEI1 was approved on

[a] As directed in House Report 116-83 accompanying the Energy and Water Development and Related Agencies Appropriations Bill, 2020 (H.R. 2960), this data sheet reflects the reinclusion of PF-4 Equipment Installation Phase 2 (PEI2) and RLUOB Hazard Category 3 (RC3) into CMRR.

March 18, 2015. CD-3B for additional long lead procurements was approved on December 22, 2015. PEI1 CD-2/3 approval was received on October 31, 2016 with the Performance Baseline established at $394,000K. CD-4 completion is scheduled for April 30, 2022.

PEI2 Subproject (04-D-125-06): Maximizes use of PF-4 by consolidating and relocating existing capabilities, replacing existing equipment, installing gloveboxes and equipment, D&D of existing PF-4 laboratory space for AC/MC capabilities and development of infrastructure supporting AC/MC mission relocation to TA-55. PEI2 will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions. PEI-2 also improves TA-55 and PF-4 personnel and vehicular ingress/egress, levels of worker preparation/staging, warehousing, office and parking infrastructure for relocated AC/MC operations and personnel. See Section 4 of this datasheet for additional detail on *Project Scope and Justification*. The cost range for the work in this subproject will be determined at baseline. The schedule range for completion is currently FY 2026 to FY 2028. An integrated master schedule will be developed for CD-2/3 approval.

RC3 (04-D-125-07): Maximizes use of RLUOB by reconfiguring existing laboratory space and equipping the remaining empty laboratories with AC and MC capabilities. Prior to the equipment installation, RC3 supports activities necessary to upgrade the RLUOB from a Radiological Facility to a Hazard Category 3 Nuclear Facility. The subsequent RC3 equipment installation will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions, and provide for increased reliability of the pit production mission. The cost range for the work in this subproject will be determined at baseline. The schedule range for completion is currently FY 2026 to FY 2028. An integrated master schedule will be developed for CD-2/3.

Consistent with DOE O 413.3B, any TPC savings from CMRR subprojects will be returned to the contingency pool for other CMRR subprojects.

A Federal Project Director (FPD) is assigned to each sub-project.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2004	07/16/2002	N/A	1QFY2004		N/A	2QFY2004	N/A	1QFY2011
FY 2005	07/16/2002	N/A	3QFY2004		N/A	3QFY2005	N/A	3QFY2012
FY 2006	07/16/2002	N/A	2QFY2005	4QFY2005	N/A	1QFY2006	N/A	4QFY2010
FY 2007	07/16/2002	N/A	09/30/2005	1QFY2006	N/A	1QFY2006	N/A	1QFY2013
FY 2008	07/16/2002	N/A	09/30/2005	10/21/2005	N/A	1QFY2006	N/A	1QFY2013
FY 2009	07/16/2002	N/A	09/30/2005	TBD	N/A	TBD	N/A	TBD
FY 2010	07/16/2002	N/A	09/30/2005	TBD	N/A	TBD	N/A	TBD
FY 2011	07/16/2002	N/A	05/18/2005	TBD	N/A	TBD	N/A	TBD
FY 2012	07/16/2002	N/A	05/18/2005	4QFY2012	N/A	4QFY2012	N/A	TBD
FY 2012 Rep	07/16/2002	N/A	05/18/2005	TBD	TBD	TBD	N/A	TBD
FY 2016	07/16/2002	N/A	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	4QFY2024
FY 2017	07/16/2002	N/A	08/21/2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	4QFY2024
FY 2018	07/16/2002	N/A	08/21/2014	2QFY2022	3QFY2021	2QFY2022	4QFY2026	4QFY2026
FY 2019	07/16/2002	N/A	08/21/2014	4QFY2022	4QFY2022	4QFY2022	4QFY2026	4QFY2026
FY 2020	07/16/2002	N/A	08/21/2014	10/31/2016	12/1/2016	10/31/2016	N/A	3QFY2022
FY 2021	07/16/2002	N/A	08/21/2014	1QFY2023	2QFY2023	2QFY2023	4QFY2025	4QFY2029[a]

[a] These dates reflect current planning estimates and will be revised when the remaining subprojects are baselined.

RLUOB Subproject (04-D-125-01)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	02/28/2010
FY 2012	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2012 Rep	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010[a]

REI1 Subproject (04-D-125-02)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	04/30/2013
FY 2012	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	04/30/2013
FY 2012 Rep	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	3QFY2013[b]

Nuclear Facility (NF) Subproject (04-D-125-03)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	TBD	N/A	TBD	N/A	TBD
FY 2012	07/16/2002	N/A	05/18/2005	4QFY2012	N/A	4QFY2012	N/A	TBD
FY 2012 Rep	07/16/2002	N/A	05/18/2005	TBD	TBD	TBD	N/A	TBD
FY 2016	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled[c]

REI2 Subproject (04-D-125-04)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	8/21/2014	8/21/2014	3QFY2016	2QFY2016	3QFY2016	N/A	1QFY2020
FY 2017	07/16/2002	8/21/2014	8/21/2014	3QFY2016	2QFY2016	3QFY2016	N/A	1QFY2020
FY 2018 PB	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022
FY 2019	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022
FY 2020	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022
FY 2021	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022

[a] This subproject is complete and the project history has not changed.

[b] This subproject is complete and the project history has not changed.

[c] This subproject was canceled and the project history has not changed.

Fiscal Quarter or Date

Fiscal Year	CD-3A	CD-3B
FY 2016	12/18/2014	2QFY2015
FY 2017	12/18/2014	12/22/2015
FY 2018	12/18/2014	12/22/2015
FY 2019	12/18/2014	12/22/2015
FY 2020	12/18/2014	12/22/2015
FY 2021	12/18/2014	12/22/2015

CD-3A – Approve Long-Lead Procurements
CD-3B – Approve Long-Lead Procurements

PEI1 Subproject (04-D-125-05)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	4QFY2015	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2024
FY 2017	07/16/2002	8/21/2014	08/21/2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2020
FY 2018 PB	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022
FY 2019	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022
FY 2020	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022
FY 2021	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022

Fiscal Quarter or Date

Fiscal Year	CD-3A	CD-3B
FY 2016	03/18/2015	12/22/2015
FY 2017	03/18/2015	12/22/2015
FY 2018	03/18/2015	12/22/2015
FY 2019	03/18/2015	12/22/2015
FY 2020	03/18/2015	12/22/2015
FY 2021	03/18/2015	12/22/2015

CD-3A – Approve Long-Lead Procurements
CD-3B – Approve Long-Lead Procurements

PEI2 Subproject (04-D-125-06)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	8/21/2014	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2024
FY 2021	07/16/2002	8/21/2014	8/21/2014	2QFY2023	2QFY2023	2QFY2023	4QFY2025	4QFY2028

Fiscal Quarter or Date

Fiscal Year	CD-3A	CD-3B
FY 2016	03/18/2015	
FY 2017	03/18/2015	
FY 2018	03/18/2015	
FY 2019	03/18/2015	
FY 2020	03/18/2015	
FY 2021	03/18/2015	2QFY2022

CD-3A – D&D of Room 209
CD-3B – Infrastructure scope/early site security/access

RC3 (04-D-125-07)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	08/21/2014	4QFY2014	3QFY2018	2QFY2017	4QFY2017	N/A	1QFY2024
FY 2021	07/16/2002	08/21/2014	4QFY2014	2QFY2023	2QFY2023	2QFY2023	N/A	4QFY2028

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2004	N/A	N/A	500,000	100,000	N/A	N/A	600,000
FY 2005	N/A	N/A	500,000	100,000	N/A	N/A	600,000
FY 2006	N/A	N/A	750,000	100,000	N/A	N/A	850,000
FY 2007	N/A	N/A	738,097	100,000	N/A	N/A	838,097
FY 2008	65,939	672,158	738,097	100,000	N/A	N/A	838,098
FY 2009	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2010	65,138	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	63,646	2,295,936	2,359,582	463,721	54,000	517,721	2,877,303
FY 2017	63,646	2,243,436	2,307,082	516,221	54,000	570,221	2,877,303
FY 2018	63,573	2,209,842	2,273,415	549,815	54,000	603,815	2,877,230
FY 2019	63,573	2,209,069	2,272,642	550,588	54,000	604,588	2,877,230
FY 2020	63,573	1,492,091	1,555,664	336,089	N/A	336,089	1,891,753
FY 2021	63,573	2,209,069[a]	2,272,642[a]	550,588[a,b]	54,000[a]	604,588[ab]	2,877,230[ab]

[a] This total only includes funding requests through FY 2025; this is not inclusive of TPC.
[b] This number reflects the total estimate for scope now captured in the CMRR line-item, regardless of previous funding sources.

RLUOB Subproject (04-D-125-01)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2012	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2012 Rep	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2016[a]	N/A	194,130	194,130	4,870	N/A	4,870	199,000

REI1 Subproject (04-D-125-02)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2012	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2012 Rep	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2016[b]	N/A	151,963	151,963	44,797	N/A	44,797	196,760

NF Subproject (03-D-103 and 04-D-125-03)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	65,138	TBD	TBD	TBD	N/A	TBD	TBD
FY 2012	65,138	3,239,862 – 5,169,862	3,305,000 – 5,235,000	405,000 - 625,000	N/A	405,000- 625,000	3,710,000 - 5,860,000
FY 2012 Rep	65,138	TBD	TBD	4,870	N/A	TBD	TBD
FY 2016	63,646	391,324	454,970	40,274	N/A	40,274	495,244
FY 2017	63,646	391,324	454,970	40,274	N/A	40,274	495,244
FY 2018[c]	63,573	336,919	400,492	39,054	N/A	39,054	439,546

REI2 Subproject (04-D-125-04)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	540,000	540,000	135,000	N/A	135,000	675,000
FY 2017	0	540,000	540,000	135,000	N/A	135,000	675,000
FY 2018 PB	0	488,040	488,040	145,210	N/A	145,210	633,250
FY 2019	0	488,040	488,040	145,210	N/A	145,210	633,250
FY 2020	0	488,040	488,040	145,210	N/A	145,210	633,250
FY 2021	0	488,040	488,040	145,210	N/A	145,210	633,250

PEI1 Subproject (04-D-125-05)

[a] This subproject is complete and the project history has not changed.

[b] This sub-project is complete and the project history has not changed.

[c] This sub-project was canceled and the project history has not changed.

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	1,071,000	1,071,000	240,000	54,000	294,000	1,365,000
FY 2017	0	257,595	257,595	57,405	N/A	57,405	315,000
FY 2018 PB	0	292,300	292,300	101,700	N/A	101,700	394,000
FY 2019	0	292,300	292,300	101,700	N/A	101,700	394,000
FY 2020	0	292,300	292,300	101,700	N/A	101,700	394,000
FY 2021	0	292,300	292,300	101,700	N/A	101,700	394,000

PEI2 Subproject (04-D-125-06)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	471,500	471,500	159,500	54,000	213,500	685,000
FY 2020	0	28,739	28,739	296	N/A	296	[a]29,035
FY 2021	0	475,242[b]	475,242[a]	146,098[a,c]	54,000[a]	200,098[ab]	675,340[ab]

RC3 (04-D-125-07)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	289,405	289,405	75,595	N/A	75,595	365,000
FY 2020	0	0	0	162	N/A	162	162[d]
FY 2021	0	270,475	226,475[a]	68,859[ab]	N/A	68,859[ab]	339,334[ab]

2. Project Scope and Justification

Scope

The CMRR Project, as originally proposed, relocated and consolidated mission critical analytical chemistry (AC), material characterization (MC), and actinide research and development (R&D) capabilities; and provided special nuclear material (SNM) storage and large vessel handling capabilities. The SNM storage and large vessel handling capabilities originally planned for CMRR-NF are not included in the current set of CMRR subprojects. This data sheet provides information related to the four ongoing subprojects to transition AC and MC capabilities into RLUOB and PF-4, to ensure continuity in plutonium support capabilities and enable the cessation of program operations in CMR.

The complete list of CMRR line item subprojects since inception are:

- **RLUOB Subproject (04-D-125-01):** Construction of a 203,686 gross square foot (gsf) facility to house laboratory space capable of handling radiological quantities of SNM; a 22,071 gsf utility building sized to provide utility services (including chilled and hot water, potable hot/cold water, compressed air, and process gases) for all CMRR facility elements; office space for CMRR workers located outside of perimeter security protection systems; and space for centralized TA-55

[a] This amount reflects funding executed before moving these subprojects to LAP4.
[b] This total only includes funding requests through FY 2025; this is not inclusive of TPC.
[c] This number reflects the total estimate for scope now captured in the CMRR line-item, regardless of previous funding sources.
[d] This amount reflects funding executed before moving these subprojects to LAP4.

training activities. The RLUOB became fully functional and operational after the completion of the equipment installation effort for this facility in the REI phase.

- **RLUOB Equipment Installation (REI) Subproject (04-D-125-02):** Equipment installation included gloveboxes, hoods, AC/MC instrumentation, security and communication hardware, and final facility tie-ins and operational readiness/turnover activities. RLUOB equipment fabrication, installation, testing, and acceptance physically completed in FY 2012. Staff occupation of the office spaces has occurred and CD-4 has been approved. The facility exceeded its sustainability goal of LEED Silver by achieving LEED Gold in June 2012.

- **Nuclear Facility (NF) Subproject (04-D-125-03):** This subproject is cancelled with the remaining mission need (excluding SNM storage and large vessel handling) for CMRR to be met by REI2, PEI1, PEI2 and RC3.

- **REI Phase 2 (REI2) Subproject (04-D-125-04):** Maximizes the use of RLUOB laboratories by both reconfiguring some existing laboratory space and equipping empty laboratories with AC and MC capabilities. Until the RC3 subproject is complete, the RLUOB will operate at the increased radiological limit, 38.6 g of Pu-239 equivalent, consistent with the new limit established by NNSA Supplemental Guidance NA-1 SD G 1027, which enables additional AC and MC operations to move in. New gloveboxes/hoods and equipment will be installed in RLUOB through this subproject. This project makes progress toward ceasing program operations in CMR. Specific capabilities in REI2 scope include the following:

    - Trace Elements Sample Preparation
    - Mass Spectrometry Sample Preparation
    - X-Ray Fluorescence Sample Preparation and Instruments
    - Radiochemistry Counting Laboratory and Sample Preparation
    - Oxide and Metal Sample Distribution
    - Coulometry
    - AC and MC Capabilities for R&D and Troubleshooting

- **PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05):** The PEI1 subproject involves the following: relocation of existing PF-4 processes to create open consolidated space, reusing existing gloveboxes for new processes, decontamination and decommissioning (D&D) of old gloveboxes/equipment in PF-4 to create open laboratory space; and, installation of new gloveboxes/equipment in the created open space. PEI1 will support the AC and MC capabilities that require the processing of larger amounts of nuclear material. This project makes progress toward ceasing program operations in CMR. These capabilities support pit production, pit surveillance, plutonium science and other national security programs. The removal work will be executed as site-prep work within this subproject. Specific capabilities in PEI1 scope include, but are not limited to the following:

    - Sample Preparation Surface Science
    - Mechanical Testing
    - Physical Properties
    - Small Sample Fabrication and Preparation

    PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06): This scope will maximize use of PF-4 by consolidating and relocating existing capabilities, replacing existing equipment, installing gloveboxes and equipment and decontamination and demolition (D&D) of existing laboratory equipment to create space for relocated AC/MC equipment. PEI2 will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions, including pit production. PEI2 will also accomplish infrastructure scope necessary to support the latter phases of the CMRR project, and to accommodate the relocation of personnel and supporting facilities to TA-55. Included are facilities upgrades and new construction of:

    - Office building in the immediate vicinity of TA-55
    - Parking structure, located to support new office building occupants and workers located within TA-55.
    - Increased capacity for change rooms leading into PF-4.
    - Upgrade in capacity for vehicular entrance/exit to and from TA-55.

- Warehousing for handling of PEI2 equipment procurement/inspection/preparation/installation.
- Upgrades to existing PF-4 ingress/egress security posts for essential capacity increases related to CMRR missions.

The infrastructure portions of PEI2 may be tailored into a separate subproject in a future year request, as need dates precede those of the equipment installations in PF-4. The preliminary cost range for the work in this subproject is $806,728K - $931,904K and schedule range 2026 to 2028; the cost estimate will be updated prior to CD-2/3 approval for this subproject. An integrated master schedule will be developed for CD-2/3.

RLUOB Hazard Category 3 (RC3) (04-D-125-07): This scope will maximizes use of RLUOB by reconfiguring existing laboratory space and equipping the remaining empty laboratories with AC and MC capabilities, and supports the conversion of the Radiological Laboratory to a Hazard Category 3 Nuclear Facility. RC3 equipment installation will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions. The preliminary cost range for the work in this subproject is $250,000K - $350,000K and schedule range of 2026 to 2028; the cost estimate will be updated prior to CD-2/3 approval for this subproject. An integrated master schedule will be developed for CD-2/3.

Justification

As defined in the most recent revision of the Mission Need Statement (MNS), the mission of the CMRR Project is to ensure continuity in AC and MC capabilities for NNSA actinide-based missions in support of stockpile stewardship. The AC and MC capabilities provided by this project support pit production, pit surveillance, plutonium science and other national security programs. During development of the plutonium strategy, the joint DOD-CAPE business case analysis (BCA) indicated that optimizing RLUOB and repurposing space in PF-4 should be started as soon as possible to maintain continuity in AC and MC capabilities.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Funds appropriated for this project may be used to provide independent assessments and other direct contractual support determined necessary by the FPD for the planning and execution of this project.

Key Performance Parameters (KPPs)

REI2) Subproject (04-D-125-04): Transfer AC/MC capabilities from CMR to the RLUOB and complete transition to operations (i.e., preparation of operational startup, management self-assessments and hot testing) of AC/MC capabilities in eight RLUOB laboratory rooms as referenced in the CMRR REI2 and PEI1 Transition to Operations (TTO) Plan (CMRR-PLAN-00004) and PEP section 5.19 Transition to Operations.

PEI1 Subproject (04-D-125-05): Transfer AC/MC capabilities from CMR to PF-4 and complete transition to operations (i.e., preparation of operational startup, management self-assessments and hot testing) of AC/MC capabilities in PF-4 Rooms 115/124 and nondestructive analysis (NDA) capability as referenced in the CMRR REI2 and PEI1 TTO Plan (CMRR-PLAN-00004) and PEP Section 5.20 Transition to Operations.

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06) This scope will maximize use of PF-4 by consolidating and relocating existing capabilities into Room 209, replacing existing equipment, installing gloveboxes and equipment and D&D of existing laboratory space for AC/MC capabilities and will be referenced in the PEI2 Transition to Operations (TTO) Plan (CMRR-PLAN-#####) and PEP section for Transition to Operations once developed in preparation for CD-2.

RLUOB Hazard Category 3 (RC3) (04-D-125-07): This scope will maximizes use of RLUOB by reconfiguring existing laboratory space and equipping the remaining empty laboratories with AC and MC capabilities will be referenced in the REI3 Transition to Operations (TTO) Plan and PEP section for Transition to Operations once developed in preparation for CD-2.

3. Financial Schedule –All tables in this section identify total funding for each sub-project. More detailed data will be forthcoming pending reconciliation of funding plans.

Prior Subprojects (RLUOB/REI/Nuclear Facility)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Total Estimated Costs (TEC)			
Design (03-D-103-010)			
Prior Years - FY 2018	63,573	63,573	63,573
Total Design (03-D-103-010)	**63,573**	**63,573**	**63,573**
Design (04-D-125)			
Prior Years - FY 2018	386,929	386,929	386,929
Total Design (04-D-125)	**386,929**	**386,929**	**386,929**
Total Design			
Prior Years - FY 2018	450,502	450,502	450,502
Total Design (04-D-125)	**450,502**	**450,502**	**450,502**
Construction (04-D-125)			
Prior Years - FY 2018	296,083	296,083	296,083
Total Construction (04-D-125)	**296,083**	**296,083**	**296,083**
TEC (04-D-125)			
Prior Years - FY 2018	746,585	746,585	746,585
Total TEC (04-D-125)	**746,585**	**746,585**	**746,585**
Other Project Cost (OPC)			
(OPC except D&D)			
Prior Years - FY 2018	88,721	88,721	88,721
Total OPC except D&D (04-D-125)	**88,721**	**88,721**	**88,721**
Total Project Cost (TPC)			
Prior Years - FY 2018	835,306	835,306	835,306
Total TPC (03-D-103-010 & 04-D-125)	**835,306**	**835,306**	**835,306**

REI Phase 2 (REI2) Subproject (04-D-125-04)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-04)			
Total Design (04-D-125-04)	**42,179**	**42,179**	**42,179**
Construction (04-D-125-04)			
Total Construction (04-D-125-04)	**445,861**	**445,861**	**445,861**
TEC (04-D-125-04)			
Total TEC (04-D-125-04)	**488,040**	**488,040**	**488,040**
Other Project Cost (OPC)			
(OPC except D&D)			
Total OPC except D&D (04-D-125-04)	**145,210**	**145,210**	**145,210**
Total Project Cost (TPC)			
Total TPC (04-D-125-04)	**633,250**	**633,250**	**633,250**

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-05)			
Total Design (04-D-125-05)	**31,611**	**31,611**	**31,611**
Construction (04-D-125-05)			
Total Construction (04-D-125-05)	**260,689**	**260,689**	**260,689**
TEC (04-D-125-05)			
Total TEC (04-D-125-05)	**292,300**	**292,300**	**292,300**
Other Project Cost (OPC)			
(OPC except D&D)			
Total OPC except D&D (04-D-125-05)	**101,700**	**101,700**	**101,700**
Total Project Cost (TPC)			
Total TPC (04-D-125-05)	**394,000**	**394,000**	**394,000**

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-06)			
Total Design (04-D-125-06)	**46,657**	**46,657**	**46,657**
Construction (04-D-125-06)			
Total Construction (04-D-125-06)	**428,585**	**428,585**	**428,585**
TEC (04-D-125-06)			
Total TEC (04-D-125-06)	**475,242**	**475,242**	**474,242**
Other Project Cost (OPC)			
(OPC except D&D)			
Total OPC except D&D (04-D-125-06)	**146,098**	**146,098**	**146,098**
Other Project Cost (OPC) D&D			
Total OPC D&D (04-D-125-06)	**54,000**	**54,000**	**54,000**
Total Other Project Cost (OPC)			
Total OPC (04-D-125-06)	**200,098**	**200,098**	**200,098**
Total Project Cost (TPC)			
Total TPC (04-D-125-06)	**675,340**	**675,340**	**675,340**

RLUOB Hazard Category 3 (RC3) (04-D-125-07)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-07)			
Total Design (04-D-125-07)	**44,000**	**44,000**	**44,000**
Construction (04-D-125-07)			
Total Construction (04-D-125-07)	**226,475**	**226,475**	**226,475**
TEC (04-D-125-07)			
Total TEC (04-D-125-07)	**270,475**	**270,475**	**270,475**
Other Project Cost (OPC)			
(OPC except D&D)			
Total OPC except D&D (04-D-125-07)	**68,859**	**68,859**	**68,859**
Total Other Project Cost (OPC)			
Total OPC (04-D-125-07)	**0**	**0**	**0**
Total Project Cost (TPC)			
Total TPC (04-D-125-07)	**339,334**	**339,334**	**339,334**

Total Project

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design			
Total	**614,949**	**614,949**	**614,949**
Construction			
Total Construction	**1,657,693**	**1,657,693**	**1,657,693**
TEC			
Total TEC	**2,272,642**	**2,272,642**	**2,272,642**
Other Project Cost (OPC)			
(OPC except D&D)			
Total OPC except D&D	**550,558**	**550,588**	**550,588**
Other Project Cost (OPC) D&D			
OPC D&D			
Total OPC D&D	**54,000**	**54,000**	**54,000**
OPC Total			
OPC Total			
Total OPC	**604,588**	**604,588**	**604,588**
Total Project Costs (TPC)			
Total TPC	**2,877,230**	**2,877,230**	**2,877,230**

4. Details of Project Cost Estimate

Prior Subprojects (RLUOB/REI/Nuclear Facility)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			N/A
Design			N/A
Contingency			N/A
Total, Design	450,502	450,502	N/A
Construction			N/A
Site Work			N/A
Equipment			N/A
Construction			N/A

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency			N/A
Total, Construction	296,083	296,083	N/A
Total Estimated Cost	746,585	746,585	N/A
Contingency, TEC			
Other Project Cost (OPC)			
OPC except D&D			
R&D			N/A
Conceptual Planning			N/A
Conceptual Design			N/A
Other OPC Costs			N/A
Contingency			N/A
Total, OPC	88,721	88,721	N/A
Contingency, OPC			
Total Project Cost	835,306	835,306	N/A
Total Contingency (TEC+OPC)			N/A

REI Phase 2 (REI2) Subproject (04-D-125-04)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	42,179	42,179	44,816
Construction			
Site Work	5,461	5,461	5,461
Equipment	52,089	52,089	52,089
Construction	307,660	307,660	305,023
Contingency	80,651	80,651	80,651
Total, Construction	445,861	445,861	443,224
Total Estimated Cost	488,040	488,040	488,040
Contingency, TEC	80,651	80,651	80,651
Other Project Cost (OPC)			
OPC except D&D			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
R&D			
Conceptual Planning	1,883	1,883	1,883
Conceptual Design	2,663	2,663	2,663
Other OPC Costs	81,070	81,070	81,070
Contingency	59,594	59,594	59,594
Total, OPC	145,210	145,210	145,210
Contingency, OPC	59,594	59,594	59,594
Total Project Cost	**633,250**	**633,250**	**633,250**
Total Contingency (TEC+OPC)	**140,245**	**140,245**	**140,245**

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	31,611	31,611	34,308
Construction			
Site Work	43,054	43,054	43,054
Equipment	11,842	11,842	11,842
Construction	140,589	140,589	137,892
Contingency	65,204	65,204	65,204
Total, Construction	260,689	260,689	257,992
Total Estimated Cost	**292,300**	**292,300**	**292,300**
Contingency, TEC	*65,204*	*65,204*	*65,204*
Other Project Cost (OPC)			
OPC except D&D			
R&D			
Conceptual Planning	2,189	2,189	2,189
Conceptual Design	0	0	0
Other OPC Costs	63,686	63,686	63,686
Contingency	35,825	35,825	35,825
Total, OPC	**101,700**	**101,700**	**101,700**

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency, OPC	*35,825*	*35,825*	*35,825*
Total Project Cost	**394,000**	**394,000**	**394,000**
Total Contingency (TEC+OPC)	***101,029***	***101,029***	***101,029***

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	46,657	46,657	N/A
Construction			
Site Work			N/A
Equipment			N/A
Construction			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	428,585	428,585	N/A
Other TEC (if any)			
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	**475,242**	**475,242**	**N/A**
Contingency, TEC			
Other Project Cost (OPC)			
OPC D&D			
OPC D&D	54,000	54,000	N/A
OPC except D&D			
R&D			
Conceptual Planning			
Conceptual Design			
Other OPC Costs	146,098	146,098	N/A

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency			
Total, OPC	**200,098**	**200,098**	N/A
Contingency, OPC			N/A
Total Project Cost	**675,340**	**675,340**	N/A
Total Contingency (TEC+OPC)			N/A

RLUOB Hazard Category 3 (RC3) (04-D-125-07)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	44,000	44,000	N/A
Construction			
Site Work			N/A
Equipment			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	226,475	226,475	N/A
Other TEC (if any)			N/A
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	**270,952**	**270,952**	N/A
Contingency, TEC			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Other Project Cost (OPC)			
OPC except D&D			
R&D			N/A
Conceptual Planning			N/A
Conceptual Design			N/A
Other OPC Costs	68,859	68,859	N/A
Contingency			N/A
Total, OPC	68,859	68,859	N/A
Contingency, OPC			N/A
Total Project Cost	**339,334**	**339,334**	N/A
Total Contingency (TEC+OPC)			N/A

Total Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	614,949	614,949	N/A
Construction			N/A
Site Work			N/A
Equipment			N/A
Contingency			N/A
Total, Construction	1,657,693	1,657,693	N/A
Other TEC (if any)			N/A
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	2,272,642	2,272,642	N/A
Contingency, TEC	*145,855*	*145,855*	N/A
Other Project Cost (OPC)			N/A
OPC D&D			N/A
OPC D&D	54,000	54,000	N/A

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
OPC except D&D	550,588	550,588	N/A
Total, OPC	**604,588**	**604,588**	N/A
Contingency, OPC	*95,419*	*95,419*	N/A
Total Project Cost	**2,877,230**	**2,877,230**	N/A
Total Contingency (TEC+OPC)	***241,274***	***241,274***	N/A

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY2019	FY2020	FY2021	FY2022	FY2023	FY 2024	FY 2025	OutYears	Total
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,020	239,600	239,600	274,000	289,000	0	0	00	359,000	2,536,715
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,020	239,600	239,600	274,000	285,000	0	0	0	359,000	2,537,709
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,463,650	219,842	168,444	39,817	0	0	0	0	0	1,891,753
FY 2021	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,465,040	237,019	168,444	169,427	238,123	113,655	275,841	198,477	11,204	2,877,230

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	3Q FY 2022
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2072

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	25	25	1,250	1,250

7. D&D Information

The scope parameters established at CD-1 provided necessary Site Infrastructure Improvements (office facilities, physical security, warehouse, material staging and laydown area, access control and change rooms, etc) to support AC/MC mission relocation, and to enable increased construction capacity, risk mitigation, and project efficiency. These activities will include an increase in site square footage and the D&D of equipment within existing facilities. The D&D of existing facilities is not funded on this project.

Current Future Years Nuclear Security Program (FYNSP) funding profiles do not include the funding for the D&D of the CMR. CMR D&D is not part of the CMRR project scope. Some removal of contaminated equipment in PF-4 for space reuse will occur using project funds.

Gross Square Footage Created/Eliminated	REI1 Square Feet	REI2/PEI1 Square Feet	PEI2 Square Feet
New area constructed previously by this project at Los Alamos National Laboratory……	225,757	50,000	127,500
Area of D&D in this project at Los Alamos National Laboratory ……	0	0	0
Area at Los Alamos National Laboratory to be transferred, sold, and/or D&D outside the project including area previously "banked"……	225,757	50,000	127,500
Area of D&D in this project at other sites ……	0	0	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"……	0	0	0
Total area eliminated ……	0	0	0

8. Acquisition Approach

The CMRR Acquisition Strategy is based on procurement strategies specific for each subproject of the CMRR project in order to mitigate overall technical and schedule risk. The RLUOB subproject was executed via LANL-issued design-build subcontract based on performance specifications developed during CMRR Conceptual Design. The REI subproject was executed via LANL-issued final design-bid build construction contracts. The REI2 subproject is being executed via LANL-issued final design-bid-build construction contracts. The PEI1 subproject is being executed via LANL-issued final design, and the construction will be self-performed in the PF-4. The PEI2 subproject will be executed via LANL-issued design contract, and construction will be self-performed in the PF-4. THE RC3 subproject will be executed via LANL-issued final design-bid-build construction contracts. Non-nuclear design and construction across subprojects will be executed variously via the US Army Corps of Engineers and LANL-issued final design-bid-build construction contracts. The performance baselines for each baselined subproject have been/will be established upon completion of 90% design maturity to allow development of credible cost estimates in accordance with DOE Order 413.3B and NNSA policy.

Secure Transportation Asset

Overview

The Secure Transportation Asset (STA) provides safe, secure transport of the Nation's nuclear weapons, weapon components, and special nuclear material throughout the nuclear security enterprise to meet nuclear security requirements and support the broader NNSA and DOE operations. Nuclear weapon life-extension programs, limited-life component exchanges, surveillance, dismantlement, nonproliferation activities, and experimental programs rely on transport of weapons, weapon components, and special nuclear material on schedule and in a safe and secure manner.

The STA program includes the Operations and Equipment and Program Direction subprograms. The Operations and Equipment subprogram provides the STA's transportation service infrastructure required to meet NNSA's nuclear security activities as outlined in the FY 2020 Stockpile Stewardship and Management Plan. The Program Direction subprogram provides salaries, travel, and other related expenses for Federal Agents and the secure transportation workforce.

STA currently has the mission capacity to meet NNSA stockpile sustainment priorities, strategic material and component transfers, and other DOE workload. The Secure Transportation Steering Committee will continue to balance and prioritize customer requests against STA capacity. Since its establishment in 1974, STA has maintained its legacy of safety and security to include no loss of cargo and no radiological release on any shipment.

The FY 2021 budget request supports modernizing STA transportation assets, including life extension of the Safeguards Transporter (until replaced by Mobile Guardian Transporter), replacement of DC-9 aircraft, vehicle sustainment, replacement armored tractors, escort and support vehicles; and upgrade of the Tractor Control Unit to accommodate for communications and security. Funding also supports a commitment to a stable human resources strategy that recruits and retains Federal Agents and staff with the requisite skills to meet priorities and mission requirements.

Secure Transportation Asset
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Secure Transportation Asset				
Operations and Equipment	176,617	185,000	266,390	+81,390
Program Direction	102,022	107,660	123,684	+16,024
Total, Secure Transportation Asset	**278,639**	**292,660**	**390,074**	**+97,414**
Federal FTEs	**564**	**566**	**590**	**+24**

Outyears for Secure Transportation Asset
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Secure Transportation Asset				
Operations and Equipment	213,704	220,116	226,338	249,915
Program Direction	123,060	125,217	128,338	131,058
Total, Secure Transportation Asset	**336,764**	**345,333**	**354,676**	**380,973**
Federal FTEs	**590**	**590**	**590**	**590**

Secure Transportation Asset
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Secure Transportation Asset				
Operations and Equipment				
Mission Capacity	59,892	55,168	61,206	+6,038
Security/Safety Capability	22,218	23,760	23,477	-283
Infrastructure and C5 Systems	31,858	34,295	29,751	-4,544
Program Management	10,817	9,623	11,473	+1,850
Mobile Guardian Transporter	51,832	62,154	102,483	+40,329
STA Aircraft	0	0	38,000	+38,000
Total Operations and Equipment	**176,617**	**185,000**	**266,390**	**+81,390**
Program Direction				
Salaries and Benefits	80,714	86,803	100,605	+13,802
Travel	5,935	6,912	6,807	-105
Other Related Expenses	15,373	13,945	16,272	+2,327
Total, Program Direction	**102,022**	**107,660**	**123,684**	**+16,024**
Total, Secure Transportation Asset	**278,639**	**292,660**	**390,074**	**+97,414**
Federal FTEs - Program Direction Funded	**564**	**566**	**590**	**+24**
Federal FTEs - WCF Funded	**0**	**0**	**0**	**0**
Total FTEs	**564**	**566**	**590**	**+24**

Secure Transportation Asset
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Secure Transportation Asset (STA)	
Operations and Equipment: Funding increase supports development of the Mobile Guardian Transporter; to include final testing of Test Article 2 assembly (head-on impact crash test), begin build of the qualification and production testers, and release of the product specification to the production agency, procurement of replacement aircraft.	**+81,390**
Program Direction: Funding increase reflects 590 full time equivalents and provides an increase in workers' compensation claims resulting from non-mission accident, travel, and inflation to include re-competes on service support contracts.	**+16,024**
Total, Secure Transportation Asset	**+97,414**

Secure Transportation Asset
Operations and Equipment

Description

The Operations and Equipment (O&E) subprogram includes providing trained Federal Agents (FAs), specialized vehicles (such as highly secure trailers), and robust communications systems. Within the STA O&E subprogram, five activities make unique contributions to the safety and security of the nuclear stockpile. These activities accomplish the following:

(1) Mission Capacity – provides mission-essential agent equipment, maintenance, modification and replacement of the transportation fleet, and aviation services
(2) Security/Safety Capability - provides Nuclear Materials Courier Basic (NMCB) training to increase the FA workforce, develop and implement new fleet technologies, execute agent sustainment training, implement Security, Safety, and Emergency Response programs, and provide uniforms or allowances for a uniform, as authorized by 5 U.S.C. 5901-5902
(3) Infrastructure and Command and Control, Communication, Computer and Cyber (C5) Systems - provides support for maintenance and minor construction projects and C5 systems
(4) Program Management - provides corporate functions and business operations that control, assist, and direct secure transport operations
(5) Mobile Guardian Transporter (MGT) – the design, development, test, and fabrication of the MGT

The Mission Capacity activity sustains STA systems capacity through equipment purchases to fulfill the transportation requirements. STA must maintain assets to support current and future missions based on changing customer needs and potential threats. These assets include agent equipment, vehicles (tractors, trailers, and escort vehicles), and aircraft. Modernizing and sustaining these assets requires an integrated, long-term strategy and a substantial investment. The STA strategy includes eliminating outdated assets, refurbishing existing assets to extend their useful life, and procuring new assets. This includes the following activities:

- Replace the vehicle fleet with new-vehicles including the design, engineering, testing, and fielding of specialized vehicles, tractors, and trailers necessary for successful convoy operations.
- Maintain the aviation program, to include the maintenance and sustainment of STA's aircraft fleet.
- Maintain the readiness posture of the STA fleet.

The Security/Safety Capability activity sustains STA systems capacity through safety and security upgrades. This includes the following activities:

- Identify, design, and test new fleet and mission technologies. Deliverables include safety and security upgrades as well as enhancements to the secure trailers, analysis of intelligence data, dissemination of information, and the application of emerging physical security technology.
- Conduct NMCB classes to increase the agent end-strength, including the equipping and training of FA candidates.
- Maintain specialized FA skills and qualifications, sustain and support training to include technical equipment, logistics, curriculum development, and staffing necessary to conduct Special Response Force training, Operational Readiness Training , Validation Force-on-Force exercises, and agent sustainment training. Sustainment training includes surveillance detection, tactics, advanced driving, and firearms. Placing contracts for mission operation support and off-site training venues capable of supporting unit or command training.
- Maintain security and safety programs. Includes liaison activities with state and local law enforcement organizations, analysis of security methods and equipment, vulnerability assessments, development of the Safeguards and Security Plan and combat simulation computer modeling, validation of safety and security, and execution of safety studies and safety engineering for the Safety Basis, Nuclear Explosive Safety, and over-the-road safety issues.
- Maintain the NNSA Emergency Operations Center in Albuquerque, New Mexico and train and exercise the STA response capability. Includes the Emergency Management Program, FA Incident Command System refresher, and sustainment training.
- Evaluate, test, and determine the viability of unmanned systems for use in the STA mission to conduct safe and secure operations.

The Infrastructure and Command, and Control, Communication, Computer, and Cyber (C5) Systems activity sustains the infrastructure and command and control system platforms operated by STA. Mission support systems provide the critical information necessary to ensure mission success. This includes information that is obtained, analyzed, and disseminated prior to the mission, the continuous monitoring of that information to ensure it is accurate and valid, and constant communication within the convoys and between the convoy and headquarters. This must be accomplished seamlessly in real-time while balancing the evolving requirements of cyber security to ensure system reliability and integrity. Additionally, STA leverages other information technology systems supporting business processes and operations to improve the efficiency and effectiveness of the STA mission. This funding supports the following sub-elements:

- Modernize and maintain C5 systems activities to maintain vigilant oversight of nuclear convoys. Operate the Transportation Emergency Control Centers (TECC) and maintain the New Mexico Relay Station, as well as maintain communications systems across the STA.
- Maintain and expand a secure unclassified to classified controlled interface, Mission Management System. This allows communications from unclassified to classified systems, and maintenance and enhancement of a common operating picture for the TECC as well as convoys.
- Expand, upgrade, and maintain the STA facilities and equipment in support of mission requirements. STA is minimizing operational safety and health risks by addressing deferred maintenance at most of our facilities. Facilities include FA commands, vehicle mechanical and electronic maintenance facilities, training facilities, and facilities operated to house support staff. Activities to sustain these facilities include maintenance and minor construction projects.

The Program Management activity creates a well-managed, responsive, and accountable organization by employing effective business practices for the STA program. This goal includes:

- Corporate functions such as technical document support and business operations that control, assist, and direct secure transport operations including supplies, equipment, and regulation control processes.
- Assess, evaluate, and improve work functions and processes including self-assessments, routine STA intranet support, configuration management, Quality Assurance program, and business integration activities.

The Mobile Guardian Transporter (MGT) activity provides for the design, production, and testing of the MGT, the replacement for the existing Safeguard Transporter (SGT). The MGT will assure the safety and security of cargo and containers, protect the public, meet nuclear explosive safety requirements associated with accident scenarios, reduce the risk to new security threats, and provide the means for enhanced communications. This includes the following activities:

- Test Article(s) Assembly and Testing
- Mechanical Systems Development
- Electronics and Auxiliary Systems Development
- Active Delay System Development
- Enhanced Cargo Restraint Development

The STA Aircraft fleet consists of three government-owned aircraft, one DC-9 and two B-737s. STA must maintain aircraft fleet to support Limited Life Component movements, transportation of FA's to exercises and incidents, and STA emergency response. The FY 2021 budget supports replacement of the current DC-9, based on a Business Case Analysis performed in FY 2018, which outlined efficiencies of similar aircraft including commonality of systems, type rating, parts and part inventory, training for operations, maintenance, payload/capacity and performance. STA also has an agreement with the Office of Counterterrorism and Counterproliferation to provide 24/7 alert in support of NNSA's Nuclear Incident Response mission.

Highlights of the FY 2021 Budget Request

The FY 2021 O&E Budget Request reflects an increase above the FY 2020 enacted amount to support STA mission priorities. These include providing specialized vehicles such as highly secure trailers, trained FAs, and robust communications systems. FY 2021 funding specifically supports:

- MGT development to include final testing of Test Article 2, begin build of the qualification and production testers, and release product specifications to the production agency. The current MGT funding profile supports the First Production Unit in FY 2025.
- Replacement aircraft for the obsolete DC-9.

- Upgrade of the Tractor Control Unit (TCU) to support communications between the SGT and MGT.
- Design and begin production of the Next Generation Armored Tractor (T4) and Escort Vehicle (EV4).
- Continue life extension and risk reduction activities for the aging SGT to ensure the fleet continues to meet the Nuclear Explosive Safety Study requirements associated with transporting nuclear weapons and components.
- Deferred maintenance and minor construction projects of existing facilities, and steady state replacement of vehicles and tractors.
- Maintain and sustain staffing levels, travel, workers' compensation, DOE Common Operating Environment (DOECOE) Information Technology Fees, support service contracts, and rising costs due to inflation.

FY 2022 - FY 2025 Key Milestones

- Maintain risk reduction efforts to keep a portion of the SGT fleet in operation far beyond the 20-year service life.
- Develop MGT with FPU delivery in FY 2025.
- Refurbish and replace FA equipment and vehicles.

FY 2019 Accomplishments

- Completed more than 165 over-the-road shipments and made 64 limited-life component deliveries without incident.
- Enhanced reliability and availability of mission support communications by updating cellular technology and modernizing server infrastructure.
- Executed vehicle sustainment efforts to remove mission vehicles that reach the end-of-service life.
- Completion of the MGT baseline design review, assembly of Test Article 1, Over-the-Road Test Plan, and Calibration Sled Test of Test Article 1.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Operations and Equipment $185,000,000	**Operations and Equipment $266,390,000**	**Operations and Equipment +$81,390,000**
Mission Capacity $55,168,000	**Mission Capacity $61,206,000**	**Mission Capacity +$6,038,000**
• Procured contract for the Next Generation Escort Vehicle (EV4). • Built 12 Support Vehicles (SV2), refurbish 6 Escort Vehicle Light Chassis (EVLCs).	• Design and begin production of the Next Generation Armored Tractor (T4) and Escort Vehicle (EV4). • Refurbish 6 EVLCs. • Redesign of the TCU.	• Redesign of the TCU to ensure updated communications and security. • Design and begin production of the Next Generation Armored Tractor (T4) and Escort Vehicle (EV4).
Security/Safety Capability $23,760,000	**Security/Safety Capability $23,477,000**	**Security/Safety Capability -$283,000**
• Conducted three NMCB classes. • Conducted an operational emergency response exercise. • Continued research and testing of unmanned systems to determine viability for use in the STA mission. • Conducted Security Site Survey and Staff Assistance Visits. • Continued National Incident Management System/Incident Command System training program for agents and staff. • Conducted safety analysis on mechanical insults to weapons in transit.	• Conduct three NMCB classes. • Conduct an operational emergency response exercise. • Conduct Security Site Survey and Staff Assistance Visits. • Continue National Incident Management System/Incident Command System training program for FAs and staff.	• FY 2020 provided an increase to conduct safety analysis on mechanical insults to weapons in transit. The funding is not a planned requirement in FY 2021.
Infrastructure and C5 Systems $34,295,000	**Infrastructure and C5 Systems $29,751,000**	**Infrastructure and C5 Systems -$4,544,000**
• Integrated High-Frequency Communications systems into the vehicle fleet as a backup system to reach the TECC in the event of Internet collapse. • Implemented STA Active Security Doctrine in cyber security operations. • Applied additional data to the Mission Management System (Phase IV) to include personnel schedules, qualifications, and	• Conduct maintenance and deferred minor construction projects at the FA commands and STA HQs. • Continue to implement applications/systems that interconnect MGT with the TECC and STA vehicles. • Continue to support advanced cyber threat intelligence capabilities and integrate awareness into mission operations.	• The decrease reflects the completion of funding for the Agent Operation Western Command facility in FY 2020.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
maintenance information to enhance STA's Common Operating Picture. • Procured upgraded long-lead communications equipment for the TECC/Emergency Operations Center to support the transition to the new NNSA Albuquerque Complex. • Implemented the Vehicle and Property Management System. • Conducted maintenance and minor construction projects at the FA commands and STA HQs including construction of a permanent Agent Operation Western Command facility to replace the temporary facility.		
Program Management $9,623,000	**Program Management $11,473,000**	**Program Management +$1,850,000**
• Executed program with approximately 25full-time support service contractors that provide acquisitions and personnel service support to STA's 566 federal full-time staff. • Conducted Quality Assurance assessments. • Continued corporate business services and integration activities.	• Execute program with approximately 25 full-time support service contractors that provide acquisitions and personnel service support to STA's 590 federal full-time staff. • Conduct Quality Assurance assessments. • Continue corporate business services and integration activities.	• Basic option year increases for service support contracts and inflation.
Mobile Guardian Transporter $62,154,000	**Mobile Guardian Transporter $102,483,000**	**Mobile Guardian Transporter +$40,329,000**
• Assembled and integrate Test Article 1. • Completed the Rolling Chassis Manufacturing Readiness Review for Test Article 2. • Completed the Cargo Manufacturing Readiness Review.	• Complete head-on crash test of Test Article 2. • Begin build of the qualification and production testers. • Release product specifications to the production agency.	• Complete head-on crash test of Test Article 2. • Begin build of the qualification and production testers. • Release product specifications to the production agency.
STA Aircraft $0	**STA Aircraft $38,000,000**	**STA Aircraft +$38,000,000**
• Not Applicable.	• Procurement of one 737 aircraft to increase availability and reliability for mission critical operations.	• Procurement of one 737 aircraft is life-cycle replacement and increases ability to consistently and reliably support Limited Life Component, other mission-related cargo security operations, and support for the Nuclear Incident Response mission.

Secure Transportation Asset
Program Direction

Description

The STA Program Direction subprogram provides personnel to support the security and safety of the nuclear stockpile. The total planned Full Time Equivalents (FTEs) support the FA force, federal pilots, emergency management, security and safety programs, and other key elements of the STA mission. STA has committed to a stable human resources strategy to achieve an optimal agent force and meet the NNSA's nuclear security enterprise priorities and mission requirements. The optimal agent force is validated by customer workload projections. STA has increased FA staffing numbers by optimizing position qualifications and managing risk associated with the Human Reliability Program (HRP). STA anticipates reaching 370 FAs by the end of FY 2020 and plans to continue to support staffing levels that meet requirements and mission capacity.

Salaries and benefits are provided for the program staff located at Albuquerque, New Mexico; Fort Chaffee, Arkansas; and Washington, District of Columbia; and for FAs and support staff at the three FA force locations in Albuquerque, New Mexico, Oak Ridge, Tennessee, and Amarillo, Texas. It also includes salaries, overtime, worker's compensation, and health/retirement benefits associated with FAs, secondary positions, and support staff. The total on-board count may not match the planned FTEs. Funding allocations account for projected average vacancy rates over the entire year and may not match actual on-board FTEs at any given time.

Travel is associated with secure convoys, training at other federal facilities and military installations, and program oversight.

Other Related Expenses provides required certification training for the handling of nuclear materials by FAs as well as staff professional development. It also maintains the HRP for FAs and designated staff and provides for Permanent Change of Station moves and other contractual service requirements, to include facility maintenance.

Highlights of the FY 2021 Budget Request

The FY 2021 Program Direction Budget Request reflects an increase above the FY 2019 enacted amount to support FA and staff manning for STA mission priorities. These include:

- Fully burdened costs attributed to the increase in FAs on-board
- Higher workers' compensation costs (a result of a non-mission accident)
- DOECOE Information Technology Fees
- Funding for support service contracts

FY 2022 - FY 2025 Key Milestones

- Provide for salaries, travel, and other related expenses for FAs and the secure transportation federal and non-federal workforce
- Maintain FA and staff levels to support requirements and mission capacity

FY 2019 Accomplishments

- On-boarded 56 FAs

Program Direction

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Program Direction $107,660,000	**Program Direction $123,684,000**	**Program Direction +$16,024,000**
Salaries and Benefits $86,803,000	**Salaries and Benefits $100,605,000**	**Salaries and Benefits +$13,802,000**
• Recruited, hired, and retained quality personnel based on current and future mission needs. • Continued to fill agent vacancies to support workload requirements. • Conducted NMCB classes.	• Recruit, hire, and retain quality personnel based on current and future mission needs. • Continue to fill agent vacancies to support workload requirements. • Conduct NMCB classes.	• Increase reflects fully burden cost to support additional FAs. • Workers' compensation claims higher as a result of non-mission accident.
Travel $6,912,000	**Travel $6,807,000**	**Travel -$105,000**
• Traveled required to transport nuclear weapons, components, and special nuclear material. • Funding to support federal facilities that provided unique training to maintain agent skill sets.	• Travel required to transport nuclear weapons, components, and special nuclear material. • Funding to support federal facilities that provided unique training to maintain agent skill sets.	• FY 2020 provided an increase to support charter aircraft projection due to availability of STA aircraft. The funding is not a planned requirement for FY 2021.
Other Related Expenses $13,945,000	**Other Related Expenses $16,272,000**	**Other Related Expenses +$2,327,000**
• Performed HRP reviews to NMCB candidates. • Conducted FA candidate training at the Federal Law Enforcement Training Center. • Supported processing of security clearances. • Supported DOECOE.	• Perform HRP reviews to NMCB candidates. • Conduct NMCB candidate training at the Federal Law Enforcement Training Center. • Support processing of security clearances. • Support DOECOE.	• Increase reflects updates to facility maintenance and medical/HRP support service contracts and inflation.

Secure Transportation Asset
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	7,130	7,130	7,287	45,447	+38,160
Minor Construction	N/A	N/A	5,566	5,566	14,100	6,702	-7,398
Total, Capital Operating Expenses	N/A	N/A	**12,696**	**12,696**	**21,387**	**52,149**	**+30,762**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	7,130	7,130	7,287	7,447	+160
Aircraft	38,000	0	0	0	0	38,000	+38,000
MGT	7,500	0	0	0	0	0	0
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**7,130**	**7,130**	**7,287**	**45,447**	**+38,160**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	5,566	5,566	4,100	6,702	+2,602
Agents Operation Western Command Facility	10,000	0	0	0	10,000	0	-10,000
Total, Minor Construction Projects	**N/A**	**N/A**	**5,566**	**5,566**	**14,100**	**6,702**	**-7,398**
Total, Capital Summary	**N/A**	**N/A**	**12,696**	**12,696**	**21,387**	**52,149**	**+30,762**

Outyears for Secure Transportation Asset
Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	7,611	7,778	7,949	15,624	N/A
Minor Construction	7,500	7,500	7,500	7,500	N/A
Total, Capital Operating Expenses	**15,111**	**15,278**	**15,449**	**23,124**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	7,611	7,778	7,949	8,124	N/A
MGT	0	0	0	7,500	0
Total, Capital Equipment (including MIE)	**7,611**	**7,778**	**7,949**	**15,624**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	7,500	7,500	7,500	7,500	N/A
Total, Minor Construction Projects	**7,500**	**7,500**	**7,500**	**7,500**	**0**
Total, Capital Summary	**15,111**	**15,278**	**15,449**	**23,124**	**0**

Defense Nuclear Security

Overview

The Office of Defense Nuclear Security (DNS) leads, develops, and implements the National Nuclear Security Administration's (NNSA) security program to enable NNSA's nuclear security enterprise (NSE) missions. DNS provides protection for NNSA personnel, facilities, nuclear weapons, and materials from a full spectrum of threats, ranging from minor security incidents to acts of terrorism, at its national laboratories, production plants, processing facilities, and the Nevada National Security Site (NNSS). In addition, DNS provides nuclear security expertise for a broad set of 21st century national security needs, in line with its core mission, such as those in defense nuclear nonproliferation, homeland security, and intelligence. Employing more than 1,500 Protective Force officers, DNS secures more than 4,400 buildings and protects more than 50,000 personnel.

Defense Nuclear Security
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Security				
Operations and Maintenance				
Protective Forces	376,279	392,617	408,756	+16,139
Physical Security Systems	105,193	149,138	155,821	+6,683
Information Security	43,011	44,261	46,400	+2,139
Personnel Security	40,376	39,988	44,760	+4,772
Material Control and Accountability	31,125	30,865	31,690	+825
Security Program Operations and Planning	94,654	93,131	128,468	+35,337
Total, Operations and Maintenance	**690,638**	**750,000**	**815,895**	**+65,895**
Construction	0	25,000	11,000	-14,000
Total, Defense Nuclear Security	**690,638**	**775,000**	**826,895**	**+51,895**

Outyears for Defense Nuclear Security
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Defense Nuclear Security				
Operations and Maintenance				
Protective Forces	426,518	456,811	493,661	500,443
Physical Security Systems	183,043	138,410	168,887	140,480
Information Security	48,704	49,856	51,025	52,479
Personnel Security	49,275	50,518	51,732	53,261
Material Control and Accountability	35,534	35,755	36,687	37,444
Security Program Operations and Planning	131,548	139,957	137,928	148,693
Total, Operations and Maintenance	**874,622**	**871,307**	**939,920**	**932,800**
Construction	41,900	8,810	0	0
Total, Defense Nuclear Security	**916,522**	**880,117**	**939,920**	**932,800**

Defense Nuclear Security
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Security	
Operations and Maintenance: The increases are based on additional security requirements associated with growth across the NNSA NSE, including Plutonium Pit Production efforts. The additional costs also complete implementation and sustain operation of counter unmanned aircraft systems (CUAS) at sites possessing Category 0/I special nuclear material (SNM), as well as support the Physical Security Center of Excellence (PSCOE) and the Center for Security Technology, Analysis, Response and Testing (CSTART). They provide for planned equipment lifecycle replacements across the enterprise; and implement upgrades to NNSA's Special Access Program (SAP) classified network.	**+65,895**
Construction: Decrease for 17-D-710, the West End Protected Area Reduction (WEPAR), due to receipt of funding in FY 2020.	**-14,000**
Total, Defense Nuclear Security	**+51,895**

Highlights of the FY 2021 Budget Request

The FY 2021 Budget Request of $826,895,000 reflects an increase of $51,895,000 or 6.7% above the FY 2020 enacted amount. The Budget Request for FY 2021 includes funding to fill positions in key security program areas required to implement a risk-based, layered protection strategy at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear MC&A, and security program operations and planning; supports sustaining operations of and implementing improvements to the classified network that supports the NNSA SAP; and supports sustaining implementation and operation of CUAS at sites possessing Category 0/I SNM. It also includes funding to continue efforts to recapitalize security infrastructure through SIRP projects, which address high-priority security systems and related security infrastructure and equipment refresh needs; and the WEPAR project, which will install a new PIDAS section, reducing the Y-12 Protected Area by approximately 50%.

FY 2022 – FY 2025 Key Milestones

Physical Security Systems

- Sustain CUAS implementation and operation at sites possessing Category 0/I quantities of SNM
- Complete critical SIRP projects needed to implement the 10-Year Refresh Plan at all NNSA sites

Security Program Operations and Planning

- Continue Design Basis Threat implementation

Construction

- Complete West End Protected Area Reduction project at Y-12 National Security Complex (Y-12)

FY 2019 Accomplishments

- Began Phase II of the Security Management Improvement Program in FY 2019; Phase II included a successful proof-of-concept pilot at the Nevada Field Office.
- Completed an enterprise-wide Security Culture Campaign that reinforced the importance of a positive security culture, emphasizing “Protecting What is Ours.”
- Initiated an Interagency Acquisition to standardize the long-gun (M27 Infantry Automatic Rifle) across all NNSA sites.
- Deployed NNSA’s automated clearance action tracking work flow system (CATS) upgrade for use by all eight of DOE’s Cognizant Personnel Security Offices.
- Deployed a fully operational CUAS to one site and working toward deploying to all Category 0/I sites.

Defense Nuclear Security
Operations and Maintenance

Description

Defense Nuclear Security Operations and Maintenance integrates personnel, equipment, and procedures to protect physical assets and resources against theft, sabotage, diversion, or other criminal acts. Each NNSA site or facility has an approved Site Security Plan detailing protection measures and resources needed to protect site security interests.

Protective Forces include duties, specialized training, performance testing, facilities, equipment, weapons/firearms, ammunition, vehicles, and other expenses. These forces are each site's primary front-line protection and consist of armed, uniformed officers. Protective force officers are an integral part of a site's security posture and are trained in tactics and techniques necessary to protect our sites.

Physical Security Systems includes critical Security Infrastructure Revitalization Program (SIRP) projects, CUAS, intrusion detection and assessment systems (IDAS), performance testing and certification/recertification, access control systems, barrier and delay mechanisms, canine explosive detection programs, and tactical systems. Many of the systems in use are well beyond their designed lifecycles and require increased maintenance and testing. Additional investment in critical security systems and infrastructure upgrade projects are necessary to sustain these systems. This includes the centrally managed Argus program for sites possessing Category I quantities of SNM and PSCOE at Sandia, New Mexico.

Table 1 shows the plans for critical SIRP projects to be executed in FY 2021. Other than Perimeter Intrusion Detection and Assessment System (PIDAS) vehicle barrier upgrades, SIRP projects do not qualify as minor construction. Rather, SIRP projects include sensor, camera, lighting, and communication refreshes, and smaller capital equipment projects. This requirement is driven by the urgent necessity to repair systems that have the highest risk of failure.

Table 1

Planned FY 2021-2025 SIRP Project Allocations by Site (Dollars in Millions)		
Site	**Project Name**	**FY 2021 Allocation ($M)**
Pantex	Zone 12 Material Access Area (MAA) Booths: replacement of existing booths with NNSA standard Positive Personnel Identification and Verification (PPIV) booths	4.2
Y-12	PIDAS Refresh – Quadrant 2: sensor revitalization, camera replacement, and camera tower replacement (includes power, fiber, network, sensors, and fences)	30.1
	Vehicle Barrier Upgrade: replaces current cable barrier	4.4
	Portal 8 Booths: replacement of existing booths with NNSA standard PPIV booths	5.9
Total, FY 2021		**44.6**
Site	**Project Name**	**FY 2022 Allocation ($M)**
Pantex	Zone 12 North PIDAS: sensor revitalization, camera replacement, and camera tower replacement (includes power, fiber, network, sensors, and fences)	16.2
	Zone 12 Vehicle Barrier Upgrade: replaces current cable barrier	10.6
NNSS	Device Assembly Facility: Design/Implementation for Protected Area revitalization work, includes PIDAS and sensor revitalization	23.5
LANL	TA-55: Design/Implementation for Protected Area revitalization work, includes PIDAS and sensor revitalization	23.5
Total, FY 2022		**73.8**

Planned FY 2021-2025 SIRP Project Allocations by Site (Dollars in Millions)		
Site	**Project Name**	**FY 2023 Allocation ($M)**
Pantex	Zone 12 West PIDAS: sensor revitalization, camera replacement, and camera tower replacement (includes power, fiber, network, sensors, and fences)	19.3
	Zone 12 Entry Control Facility Refresh: refresh sensors, cameras and gate controls	6.1
Total, FY 2023		**25.4**
Site	**Project Name**	**FY 2024 Allocation ($M)**
Pantex	Zone 12 South PIDAS: sensor revitalization, camera replacement, and camera tower replacement (includes power, fiber, network, sensors, and fences)	18.3
NNSS	Device Assembly Facility: continued implementation for Protected Area revitalization work, includes PIDAS and sensor revitalization	17.6
LANL	TA-55: continued implementation for Protected Area revitalization work, includes PIDAS and sensor revitalization	17.5
Total, FY 2024		**53.4**
Site	**Project Name**	**FY 2025 Allocation ($M)**
Pantex	Zone 12 East PIDAS: sensor revitalization, camera replacement, and camera tower replacement (includes power, fiber, network, sensors, and fences)	22.7
Y-12	Y-12 MAA Booths: replacement of existing booths with NNSA standard PPIV booths	6.8
Total, FY 2025		**29.5**

Information Security provides classification guidance, technical surveillance countermeasures, operations security, and classified matter protection and control.

Personnel Security includes access authorizations, badging, the Human Reliability Program, classified and unclassified visits, and foreign national assignments. It encompasses the administrative support for the site clearance process, including security clearance determinations at each site.

Material Control and Accountability (MC&A) controls and accounts for special and alternative nuclear materials through measurements, quality assurance, accounting, containment, surveillance, and physical inventory. This activity also includes the Local Area Nuclear Material Accountability System (LANMAS) software application, as well as training and operational support provided to Department of Energy (DOE) and NNSA sites and facilities.

Security Program Operations and Planning includes development of budgets; responses to audits and information requests, Site Security Plans, vulnerability/risk assessments, and performance testing and assurance activities. It also includes: security incident and reporting management, security surveys and self-assessments, activities related to deviation requests, and control of security technology transfer activities. It also supports facility clearance processing, Foreign Ownership, Control, or Influence determinations for security contracts, and communication activities to support NNSA's SAP classified network.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Operations and Maintenance $750,000,000	**Operations and Maintenance $815,895,000**	**Operations and Maintenance +$65,895,000**
Protective Forces $392,617,000	**Protective Forces $408,756,000**	**Protective Forces +$16,139,000**
• Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments. • Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner.	• Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments. • Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner. • Supports pit production at Los Alamos.	• Reflects regular escalation, increases associated with growth across NNSA's NSE, and Pit Production support.
Physical Security Systems $149,138,000	**Physical Security Systems $155,821,000**	**Physical Security Systems +$6,683,000**
• Funds preventive and corrective maintenance for physical security systems and infrastructure at NNSA sites, and provides protection against the threat. • Includes funding for PSCOE activities at Sandia. • Sustains CUAS implementation and operation at sites possessing Category 0/I quantities of SNM. • Supports critical SIRP projects needed to implement the 10-Year Refresh Plan at all NNSA sites.	• Funds preventive and corrective maintenance for physical security systems and infrastructure at NNSA sites, and provides protection against the threat • Includes funding for PSCOE activities at Sandia. • Sustains CUAS operation at sites possessing Category 0/I quantities of SNM. • Supports critical SIRP projects included in the 10-Year Refresh Plan at all NNSA sites.	• Reflects regular escalation, increases associated with growth across the enterprise, and Pit Production support. • Sustains CUAS implementation and operation. • Funds increasing preventive and corrective maintenance for aging systems and infrastructure at NNSA sites, pending completion of upgrades/replacement. • Includes funding to address SIRP replacement and minor construction projects.
Information Security $44,261,000	**Information Security $46,400,000**	**Information Security +$2,139,000**
• Maintains an information protection program and sustains implementation of DOE Order 470.6, *Technical Security Program*.	• Maintains an information protection program and sustains implementation of DOE Order 470.6, *Technical Security Program*. • Supports pit production at Los Alamos.	• Reflects regular escalation, increases associated with growth across the NNSA NSE, and Pit Production support.
Personnel Security $39,988,000	**Personnel Security $44,760,000**	**Personnel Security +$4,772,000**
• Maintains a personnel security program while implementing efficiencies in a risk-based manner.	• Maintains a personnel security program while implementing efficiencies in a risk-based manner. • Supports pit production at Los Alamos.	• Reflects regular escalation, increases associated with growth across the enterprise, and Pit Production support.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Material Control and Accountability $30,865,000	**Material Control and Accountability $31,690,000**	**Material Control and Accountability +$825,000**
• Provides for control and accountability of special and alternative nuclear materials and maintains a level of effort that is a critical part of NNSA's layered protection program. • Continues implementation of the LANMAS software upgrade.	• Provides for control and accountability of special and alternative nuclear materials and maintains a level of effort that is a critical part of NNSA's layered protection program. • Sustains LANMAS software upgrade. • Supports pit production at Los Alamos.	• Reflects regular escalation, increases associated with growth across the NNSA NSE, and Pit Production support.
Security Program Operations and Planning $93,131,000	**Security Program Operations and Planning $128,468,000**	**Security Program Operations and Planning +$35,337,000**
• Maintains site security plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs.	• Maintains site security plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs. • Sustain operations of and improvements to the classified network that supports NNSA SAPs. • Includes funding for the CSTART effort. • Supports pit productions at Los Alamos.	• Reflects regular escalation, increases associated with growth across NNSA's NSE, and Pit Production support. • Includes support for the CSTART efforts and the classified network that support NNSA SAPs.

Description

DNS Construction supports critical physical security infrastructure within the NNSA NSE. In FY 2021, Project 14-D-710, Device Assembly Facility (DAF) Argus Installation Project at the NNSS, is scheduled for completion. Remaining Other Project Costs (OPC) funds, funded out of Operations and Maintenance, will be used for project certification and turnover to operations. DAF works in conjunction with the Entry Guard Station Expansion and other legacy completed projects. The Argus security system replaces the aging Process Equipment Control Operating System (PECOS) in the DAF. Argus is the NNSA standard security system to integrate access control, intrusion detection, and video assessment of alarms for protection of high-consequence assets. Argus is necessary to support the DAF complex, which is a critical facility within the NNSA NSE designed for the staging of SNM. Completion of this project provides the security required to protect SNM.

The DAF Argus project originated as a minor construction project in late FY 2010, with planning commencing in FY 2011. In FY 2012, it was determined that the project would exceed the minor construction threshold, and a decision was made to convert it into a line item construction project. Within the period in which it was executed as a minor construction project, NNSA completed much of the Argus system design; a significant level of conceptual planning, followed by preliminary planning for startup testing, acceptance, cyber security, and system cut-over; and a commensurate amount of project management. In FY 2016, a decision was made to break the project into two subprojects in order to address higher security risks in a timely manner:

Perimeter Protection (PP) subproject (14-D-710-01): The PP subproject Critical Decision (CD)-2/3 was approved in December 2016, at a cost of $19,200,000 with a CD-4 date of December 2018. The PP subproject CD-4 was approved in August 2018, at a cost of $13,446,000.

Interior Protection (IP) subproject (14-D-710-02): The IP subproject CD-2/3 was approved in December 2018, at a cost of $24,421,000. The projected CD-4 date is September 2020.

Funding for 17-D-710, WEPAR, or Protected Area Reduction Project at Y-12, was provided in FY 2017 ($2,500,000), 2018 ($53,600,000) and 2020 ($25,000,000). This project will install a new PIDAS section to reduce the Y-12 Protected Area by approximately 50%. CD-1 was approved in December 2018. Funding provided for WEPAR will be used in FY 2020 and FY 2021 to complete design work and prepare for CD-2/3. Contract acquisition will begin in FY 2020, which will prepare the project for construction in FY 2021.

Planning and conceptual design is underway for a series of future projects to sustain and recapitalize the PIDAS at Pantex and Y-12.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Construction $25,000,000	**Construction $11,000,000**	**Construction -$14,000,000**
• Funding provided to complete design work and prepare for WEPAR CD-2/3.	• WEPAR construction begins.	• Decrease due to receipt of WEPAR funding in FY 2020.

Defense Nuclear Security
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	2,139	2,193	2,186	2,232	+46
Minor Construction	N/A	N/A	14,488	14,458	4,400	4,410	+10
Total, Capital Operating Expenses	N/A	N/A	**16,627**	**16,651**	**6,586**	**6,642**	**+56**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	2,139	2,193	2,186	2,232	+46
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**2,139**	**2,193**	**2,186**	**2,232**	**+46**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	0
TA-72 Outdoor Range Upgrades Project, LANL	7,000	1,500	5,500	5,500	0	0	0
Range Facility Replacement, LLNL	8,138	0	8,138	8,138	0	0	0
Y12 PIDAS Vehicle Barriers	9,130	0	350	320	4,400	4,410	+10
Zone 12 PIDAS Vehicle Barriers, PX	10,850	0	250	250	0	0	0
Pantex Zone 4 PIDAS Vehicle Barriers	10,550	0	250	250	0	0	0
Total, Minor Construction Projects	**N/A**	**N/A**	**14,488**	**14,458**	**4,400**	**4,410**	**+10**
Total, Capital Summary	**N/A**	**N/A**	**16,627**	**16,651**	**6,586**	**6,642**	**+56**

Outyears for Defense Nuclear Security

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	2,234	2,283	2,333	2,384	0
Minor Construction	10,600	5,500	0	0	10,300
Total, Capital Operating Expenses	**12,834**	**7,783**	**2,333**	**2,384**	**10,300**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	2,234	2,283	2,333	2,384	0
Total, Capital Equipment (including MIE)	**2,234**	**2,283**	**2,333**	**2,384**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
TA-72 Outdoor Range Upgrades Project, LANL	0	0	0	0	0
Range Facility Replacement, LLNL	0	0	0	0	0
Y12 PIDAS Vehicle Barriers	0	0	0	0	0
Zone 12 PIDAS Vehicle Barriers, PX	10,600	0	0	0	0
Pantex Zone 4 PIDAS Vehicle Barriers	0	0	0	0	10,300
Total, Minor Construction Projects	**10,600**	**0**	**0**	**0**	**10,300**
Total, Capital Summary	**12,834**	**2,283**	**2,333**	**2,384**	**10,300**

Defense Nuclear Security
Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
17-D-710, West End Protected Area Reduction (WEPAR), Y-12							
Total Estimated Cost (TEC)	142,810	56,100	0	0	25,000	11,000	-14,000
Other Project Cost (OPC)	17,040	6,100	0	0	0	3,000	+3,000
Total Project Cost, 17-D-710, West End Protected Area Reduction (WEPAR), Y-12	**159,850**	**62,200**	**0**	**0**	**25,000**	**14,000**	**-11,000**
Total All Construction Projects							
Total Estimated Cost (TEC)	142,810	56,100	0	0	25,000	11,000	-14,000
Other Project Cost (OPC)	17,040	6,100	0	0	0	3,000	+3,000
Total Project Cost (TPC) All Construction Projects	**159,850**	**62,200**	**0**	**0**	**25,000**	**14,000**	**-11,000**

[a] Prior Year OPCs have been updated from the FY 2020 congressional justification to reflect actuals.

Outyear Construction Projects Summary

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
17-D-710, West End Protected Area Reduction (WEPAR), Y-12					
Total Estimated Cost (TEC)	41,900	8,810	0	0	0
Other Project Cost (OPC)	3,500	3,590	850	0	0
Total Project Cost, 17-D-710, West End Protected Area Reduction (WEPAR), Y-12	**45,400**	**12,400**	**850**	**0**	**0**
Total All Construction Projects					
Total Estimated Cost (TEC)	41,900	8,810	0	0	0
Other Project Cost (OPC)	3,500	3,590	850	0	0
Total Project Cost (TPC) All Construction Projects	**45,400**	**12,400**	**850**	**0**	**0**

Defense Nuclear Security
Other Information

Full Cost Recovery Estimates

The FY 2021 Budget Request provides direct funding for mission-based programs for DNS. Strategic Partnership Projects (formerly known as Work for Others [WFO] Projects) will continue to fund an allocable share of the base program through full cost recovery. Extraordinary security requirements for Strategic Partnership Projects, such as dedicated security for special projects or exercises on an extended basis, will be a direct charge to those customers.

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Site				
Kansas City National Security Campus	696	629	715	+86
Lawrence Livermore National Laboratory	9,200	9,200	9,200	0
Los Alamos National Laboratory	5,455	5,200	5,414	+214
NNSA Production Office	3,063	2,574	2,366	- 208
Sandia National Laboratories	23,657	22,571	21,700	- 871
Total	**42,071**	**40,174**	**39,395**	**- 779**

17-D-710, West End Protected Area Reduction
Y-12 National Security Complex, Oak Ridge, Tennessee
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the West End Protected Area Reduction (WEPAR) Project is $11,000K. The current Total Estimated Cost (TEC) range is $78.8 to $159.8 M, approved at Critical Decision-1 (CD-1) on December 14, 2018. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

Significant Changes: This Construction Project Data Sheet (CPDS) is new, but the project is not a new start for the budget year. The most recent DOE Order 413.3B Critical Decision (CD) was CD-1, Approve Alternate Selection and Cost Range, approved by the Project Management Executive on December 14, 2018, with a cost range of $78.8M to $159.8M and an estimated CD-4 approval of 3Q FY 2024. This CPDS reflects the approved CD-1 range estimate.

A Level 2 PMCDP-qualified Federal Project Director has been assigned to this project.

FY 2021 funding will be used for construction. Remaining other project cost (OPC) funding will come from the Defense Nuclear Security operations budget.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2021	9/9/2017	7/25/2018	12/14/2018	1QFY2021	2QFY2020	1QFY2021	N/A	3QFY2024

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – N/A
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2021	19,540	123,270	142,810	17,040	N/A	17,040	159,850

2. Project Scope and Justification

Scope

The project will design and move the western Protected Area (PA) boundary Perimeter Intrusion, Detection, and Assessment System (PIDAS), design and construct a pedestrian and vehicle portal, secure facilities that fall outside of the newly established PA, and demolish legacy PIDAS structures. During the conceptual design phase, feasible options were evaluated to ensure the project scope was correctly sized to meet the site's critical mission needs. The WEPAR project will eliminate approximately 70 acres from the Y-12 PA. The new PIDAS leg will be approximately 1,750 linear feet located on the footprint that currently is H-road and then parallel to North First Street. This will provide a reduction in current PIDAS by approximately 8,000 linear feet; above-grade components of the existing/abandoned 8,000 linear feet will be demolished as

part of the project. Scope also includes refurbishing legacy PIDAS south of the UPF, and converting four building areas to Limited Area (LA)s. The final scope, schedule, and cost will be baselined at the time CD-2/3 is approved.

Justification

The removal of 70 acres from the PA will allow DOE/NNSA to avoid ongoing security operation requirements that are instituted within a PA, decrease costs for legacy facility operation, maintenance, and demolition, and will reduce the cost of any new facility construction to support potential mission needs in the future. This project will allow the DOE Office of Environmental Management to disposition Building 9201-5 (Alpha-5), NNSA's highest risk excess facility, outside of the PA, saving an estimated $250 million.

WEPAR is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Funds appropriated under this data sheet may be used for contracted support services to the Federal Program Manager and the Federal Project Director to conduct independent assessments of the planning and execution of this Project required by DOE O 413.3B and to conduct technical reviews of design and construction documents.

Key Performance Parameters (KPPs)

The preliminary Threshold KPPs represent the minimum acceptable performance that the project must achieve. The preliminary Threshold KPPs will be validated with CD-2/3 approval. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs are to be determined (TBD) and will be finalized with CD-2/3 approval.

Performance Measure	Threshold	Objective
Provide a new PIDAS boundary	Detection and assessment capability as required by DOE O 473.3A	TBD
Provide a new entry control point	Control point will provide access control and entry/exit inspection as required by DOE O 473.3A	TBD
Install annunciator agnostic communications that is compatible with current system	Satisfactory completes Assessment, Verification, Cut Over (Testing compliant with DOE O 473.3A	TBD
Secure storage in Buildings 9720-25, 9720-33, 9811-1 and 9720-59	Buildings meet DOE O 473.3A requirements	TBD

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	2,500	2,500	0
FY 2018	17,040	17,040	0
FY 2019	0	0	3,462
FY 2020	0	0	11,540
FY 2021	0	0	4,538

	Budget Authority (Appropriations)	Obligations	Costs
Total Design	**19,540**	**19,540**	**19,540**
Construction			
FY 2017	0	0	0
FY 2018	36,560	36,560	0
FY 2019	0	0	0
FY 2020	25,000	25,000	0
FY 2021	11,000	11,000	40,000
FY 2022	41,900	41,900	60,000
FY 2023	8,810	8,810	20,000
FY 2024	0	0	3,270
Total Construction	**123,270**	**123,270**	**123,270**
Total Estimated Costs (TEC)			
FY 2017	2,500	2,500	0
FY 2018	53,600	53,600	0
FY 2019	0	0	3,462
FY 2020	25,000	25,000	11,540
FY 2021	11,000	11,000	44,538
FY 2022	41,900	41,900	60,000
FY 2023	8,810	8,810	20,000
FY 2024	0	0	3,270
Total TEC	**142,810**	**142,810**	**142,810**
Other Project Costs			
FY 2017	6,100	6,100	0
FY 2018	0	0	2,225
FY 2019	0	0	2,000
FY 2020	0	0	1,875
FY 2021	3,000	3,000	2,000
FY 2022	3,500	3,500	4,000
FY 2023	3,590	3,590	4,065
FY 2024	850	850	875
Total OPC	17,040	17,040	17,040

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Costs (TPC)			
FY 2017	8,600	8,600	0
FY 2018	53,600	53,600	2,225
FY 2019	0	0	5,462
FY 2020	25,000	25,000	13,415
FY 2021	14,000	14,000	46,538
FY 2022	45,400	45,400	64,000
FY 2023	12,400	12,400	24,065
FY 2024	850	850	4,145
Grand Total	**159,850**	**159,850**	**159,850**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	15,885	N/A	N/A
Contingency	3,655	N/A	N/A
Total, Design	19,540	N/A	N/A
Construction			
Site Work	10,000	N/A	N/A
Equipment	30,000	N/A	N/A
Construction	71,203	N/A	N/A
D&D	1,100	N/A	N/A
Contingency	10,967	N/A	N/A
Total, Construction	123,270	N/A	N/A
Total Estimated Cost	142,810	N/A	N/A
Contingency, TEC	14,622	N/A	N/A

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	900	N/A	N/A
Conceptual Design	1,200	N/A	N/A
Other OPC Costs	11,940	N/A	N/A
Contingency	3,000	N/A	N/A
Total, OPC	17,040	N/A	N/A
Contingency, OPC	3,000	N/A	N/A
Total Project Cost	159,850	N/A	N/A
Total Contingency (TEC+OPC)	17,622	N/A	N/A

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	Total
FY 2021	TEC	56,100	25,000	11,000	41,900	8,810	0	0	0	0	142,810
	OPC	6,100	0	3,000	3,500	3,590	850	0	0	0	17,040
	TPC	62,200	25,000	14,000	45,400	12,400	850	0	0	0	159,850

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	3Q FY 2024
Expected Useful Life (number of years)	25
Expected Future Start of D&D of this capital asset (fiscal quarter)	4Q FY 2049

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	2.1	N/A	63.9

7. D&D Information

The new area being constructed in this project replaces existing facilities. The project scope includes the removal and disposition of approximately 8,000 linear feet of legacy PIDAS once WEPAR is certified. This demolition includes removal of a legacy entry portal as well.

	Square Feet
New area being constructed by this project at Y-12	4,875
Area of D&D in this project at Y-12	906
Area at Y-12 to be transferred, sold, and/or D&D outside the project, including area previously "banked"	0
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	0
Total area eliminated	0

8. Acquisition Approach

The NNSA Federal Project Director and the Integrated Project Team are responsible for the execution of the project. The Management and Operating (M&O) contractor for Y-12 is the designated design authority, while the Sandia M&O contractor's Physical Security Center of Excellence (PSCOE) is the design agent. The NNSA Office of Defense Nuclear Security is responsible for defining program requirements, selecting the preferred alternatives, and for any project scope changes. The NNSA Office of Acquisition and Project Management is responsible for providing support for alternative studies, and serves as the lead NNSA office during design and construction of the project. The WEPAR Project may be executed through several acquisition strategies, to include firm-fixed-price design-bid-build and design-build contracts, and cost-plus design-build contracts. PSCOE will play a vital role in the integration of the security features. Significant coordination with the Y-12 M&O contractor will be required for physical and technical tie-ins to current systems. As part of acquisition planning, NNSA will identify the most appropriate performance measures and align applicable contract incentives to those measures. The use of objective performance measures that focus on outcomes which balance considerations of cost control, schedule achievement, and technical performance will be implemented.

Information Technology and Cybersecurity

Overview

The Office of the Associate Administrator for Information Management and Chief Information Officer (OCIO) is responsible for information sharing and information safeguarding to support the mission of NNSA. The OCIO supports Information Technology (IT) and cybersecurity solutions, including continuous monitoring, cloud-based technologies, and enterprise security technologies (i.e., identity, credential, and access management) to help meet security challenges. The Information Technology and Cybersecurity Program is firmly based on practical principles that will provide superior information management support to current operations while implementing unclassified and classified cloud-based technologies to support the NNSA Nuclear Security Enterprise (NSE). The program collaborates and coordinates with the DOE Office of the Chief Information Officer (OCIO) on the development and deployment of cybersecurity and information technology solutions providing protection for DOE information and information assets.

The requested funds for the Information Technology and Cybersecurity Program are used to operate cyber infrastructure at NNSA sites, implement requirements for the classified computing environment directed by the Committee on National Security Systems (CNSS) that supports DOE enterprise wide activities, and execute IT services, software and hardware solutions for both unclassified and classified computing environments. NA-IM's FY 2021 priorities span both IT and cybersecurity. These are interconnected, vital initiatives that enable and underpin the DOE/NNSA mission, as every capability in the nuclear security enterprise depends on IT and cybersecurity to keep information and related assets securely protected and well managed. Together, IT and cybersecurity directly support the DOE/NNSA mission and statutory requirements governing classified data protections and information assurance. The FY 2021 priorities reflect key initiatives where IT and cybersecurity work hand-in-hand to not only enable the NNSA mission, but also to serve as the first lines of defense against known adversaries and emerging threats.

The NNSA Information Technology and Cybersecurity Program focuses on the development of integrated IT initiatives that provide an effective technology infrastructure and support to the NNSA NSE shared services. These initiatives will fundamentally redesign the NNSA IT environments to provide a more secure and agile set of capabilities including unified communication, agile cloud infrastructure, and next-generation collaboration services across the NSE which includes headquarters, laboratories, and plants. The approach will provide commodity services that can be used in the future with NNSA Management and Operating (M&O) partners to improve security of sensitive unclassified and classified NNSA data and host shared services. Additionally, the NNSA Information Technology and Cybersecurity Program will create a plan to explore information technology application capabilities, operational technology, and artificial intelligence in order to implement tools and capabilities to secure future NNSA operations.

The Information Technology and Cybersecurity Program sets forth goals and objectives to guide the execution of the NNSA Information Management Program in support of the NNSA mission and objectives. By achieving these goals and objectives, NNSA will improve protection of information and information assets, counter new and evolving threats, educate and aid its workforce, and support the development of mission-oriented requirements that effectively integrate security into everyday operations.

Achieving and maintaining a secure NNSA information environment for the enterprise requires an approach that combines defense-in-depth and defense-in-breadth principles with essential guiding tenets that align the Information Technology and Cybersecurity Program with NNSA cultural and business drivers. The underlying set of four guiding tenets of risk management, agility, trust, and partnership align with the people, processes, and technology elements to support the defense-in-depth values of achieving mission effectiveness and are integral to the success of the Information Technology and Cybersecurity Program.

The OCIO engages with other NNSA program elements to manage supply chain risk to the enterprise specifically by implementing new software scanning techniques for patches and version updates, modernizing network architecture for classified systems, and including vendor cybersecurity requirements in NNSA's acquisition processes. The OCIO works closely with partner agencies/organizations to share information and security protocols to minimize vulnerabilities across the NSE and defense industrial base.

While facing the current challenges, the NNSA Information Technology and Cybersecurity Program will continue to focus on improving the performance and the security of the IT environment across the NSE. The program will also continue maintaining and modernizing the IT and cybersecurity infrastructure that supports mission activities within the weapons program classified information processing environment, nuclear material transport, weapon modernization, and incident response. The NNSA Information Technology and Cybersecurity Program will continue to evaluate risk and allocate resources to reduce threats and support the mission of the NSE.

Information Technology and Cybersecurity
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Information Technology and Cybersecurity				
Cybersecurity				
Site Infrastructure	81,432	100,000	109,651	+9,651
Enterprise Operations	90,595	114,361	151,099	+36,738
Subtotal, Cybersecurity	**172,027**	**214,361**	**260,750**	**+46,389**
Information Technology	49,148	85,639	114,761	+29,122
Total, Information Technology and Cybersecurity	**221,175**	**300,000**	**375,511**	**+75,511**

Outyears for Information Technology and Cybersecurity

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Information Technology and Cybersecurity				
Cybersecurity				
Site Infrastructure	129,920	134,959	140,960	142,970
Enterprise Operations	136,101	135,241	138,979	150,036
Subtotal, Cybersecurity	**266,021**	**270,200**	**279,939**	**293,006**
Information Technology	121,287	123,845	123,435	122,159
Total, Information Technology and Cybersecurity	**387,308**	**394,045**	**403,374**	**415,165**

Information Technology and Cybersecurity
Explanation of Major Changes

	FY 2021 Request vs FY 2020 Enacted
Information Technology and Cybersecurity	
Cybersecurity: The increase for Site Infrastructure and Enterprise Operations continues cyber security modernization at the NNSA sites and the NNSA Information Assurance Response Center. The increase implements the TEMPEST (electronic and electromechanical telecommunications and automated information processing equipment can produce unintentional, intelligence-bearing emanations) portion of DOE Order 470.6, the sustainment of Cybersecurity Site Infrastructure operations, and Cyber related requirements associated with implementing the classified infrastructure modernization effort.	**+46,389**
Information Technology: The increase reflects additional IT modernization, with an emphasis on addressing risks related to software assurance and supply chain management, and IT related requirements associated with implementing the classified infrastructure modernization effort.	**+29,122**
Total, Information Technology and Cybersecurity	**+75,511**

Description

The Site Infrastructure subprogram supports the cybersecurity operations and activities at NNSA M&O and Federal sites. The subprogram is built around a defense-in-depth approach for achieving cybersecurity in a highly networked environment. The defense-in-depth approach is a combination of best practices and a cost strategy that relies on the intelligent application of techniques and technologies that exist today to address the increasing number and complexity of cybersecurity threats, vulnerabilities, and risks.

Enterprise Operations provides essential cybersecurity support and operations to the NNSA enterprise through the Information Assurance Response Center (IARC) monitoring services including audits, assessments, policy, management, planning and training. The IARC is responsible for providing 24/7/365 cybersecurity services to NNSA and DOE networking enclaves. The IARC's services and service levels meet strict Federal requirements that permit sites to maintain mission-essential access to the Federal classified networks, Secret Internet Protocol Router Network (SIPRNET), and Enterprise Secure Network (ESN). The IARC also provides near real-time network defense and incident response services that protect these classified and unclassified enclaves and information from attacks. As a participant with the Integrated Joint Cybersecurity Coordination Center (iJC3) Program, the IARC also supports enterprise-level cyber threat management and situational awareness for the Department. The procurement of cybersecurity tools supports intrusion prevention and the detection and prevention of unauthorized users and systems from gaining access to NNSA networks and data. Enterprise Operations is responsible for developing and advancing policies and initiatives that support short and long-term solutions to specific cybersecurity needs at NNSA sites and headquarters locations. Enterprise Operations also focuses on emerging technologies and leveraging existing technology resources to create a more secure environment.

The protection of the core information assets, networks, applications, and systems includes an enterprise-level identity model, strong (two-factor) authentication, and a centralized monitoring and analysis capability. These components provide the necessary secure infrastructure and cybersecurity systems required to support the science-based stockpile stewardship program with a modeling and simulation-based science and engineering environment. The protected networks provide a broad base of security and network services that include application integration, authentication services, directory services, enterprise data resource management, IARC Security Operations Center and Network Operations Center, Identity and Access Management, PKI, and security monitoring and intrusion detection. An example of this is the ongoing project to deploy and implement PKI smart cards. This effort will result in the issuance of tokens, enabling network login to the Department of Energy (DOE) Secret Fabric users to meet the Committee on National Security Systems (CNSS) requirements.

Highlights of the FY 2021 Budget Request

- Continue modernization and develop phase two of the Enterprise Secure Computing (ESC) environments by enhancing the core services and collaborative capabilities and consolidating disparate networks.
- Complete the modernization of the IARC cybersecurity infrastructure, comprised of almost 100 sensors and over 70 data acquisition servers dispersed nationwide.
- Implement Special Network Access in order to ensure the availability of secure infrastructure for mission support and information sharing across the NSE. This is a key enabler and transformational agent to ensure program, operational, and business excellence.
- Sustain Cybersecurity Site Infrastructure Operations, Cybersecurity Enterprise Operations, and both classified and unclassified Information Technology mission based requirements.
- Begin development of the architecture for the classified wireless network for non-pit production facilities.
- Complete phase one of the security architecture for the Wireless Pit Production Network.
- Deploy Kansas City National Security Campus hybrid cloud platform in support of Joint Technology Demonstrator Project.
- Implement a Telecommunications Security Program within NNSA to deliver more effective oversight, greatly reducing negative impacts to the mission programs while increasing visibility, oversight of risks, and governance of this critical function.

FY 2022 – FY 2025 Key Milestones

- Implement solutions for audit recommendation identified during the Defense Information Systems Agency (DISA) Cyber Security Service Provider (CSSP) assessment.
- Develop the architecture of the classified wireless network for non-pit production facilities and complete phase I security architecture of the Wireless Pit Production Network.
- Development and implementation of the Department of Homeland Security Continuous Diagnostics & Mitigation Program.
- Complete the security architecture for the classified wireless network.
- Initiate Joint Development Environment to facilitate strategic partnerships.
- Establish Centers of Excellence to improve and enhance cybersecurity operations throughout the NNSA nuclear security enterprise.

FY 2019 Accomplishments

- Launched first phase of multi-year effort to modernize NNSA classified infrastructure.
- Represented NNSA mission equities in the development of the DOE Enterprise Architecture Roadmap.
- Received Approval to Connect for REDNET to JODE. Approved UK JODE users will be able to access JODE from their REDNET desktops.
- Launched the pilot for consolidated general cybersecurity awareness training with select NNSA program offices.

Cybersecurity
Funding

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Cybersecurity $214,361,000	**Cybersecurity $260,750,000**	**Cybersecurity +$46,389,000**
Site Infrastructure $100,000,000	**Site Infrastructure $109,651,000**	**Site Infrastructure +$9,651,000**
• Funding supported cybersecurity operations of the NNSA sites. • Continued modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats. • Further strengthened the M&O Cyber operations at each NNSA site along the defense-in-depth approach.	• Funding supports cybersecurity operations of the NNSA sites. • Continues modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats. • Further strengthens the M&O Cyber operations at each NNSA site along the defense-in-depth approach.	• Maintains execution requirements amidst forecasted escalation rate increases at the NNSA sites. • Supports implementation of TEMPEST portion of DOE Order 470.6 Technical Security Program. • Implements the classified enhanced infrastructure. • Implements Phase one of the IT Modernization Project.
Enterprise Operations $114,361,000	**Enterprise Operations $151,099,000**	**Enterprise Operations +$36,738,000**
• Supported the Enterprise Operations and procurement of cybersecurity tools for protection of the NNSA Cybersecurity Infrastructure. • Bolstered the enterprise network security posture by continuing to address known critical capability gaps at the IARC. • Initiated modern cross-domain solution to replace the last legacy gateways currently in production. • Expanded the application of Digital Rights Management (DRM)/Data Loss Protection (DLP) Technology.	• Supports the Enterprise Operations and procurement of cybersecurity tools for protection of the NNSA Cybersecurity Infrastructure. • Bolsters the enterprise network security posture by continuing to address known critical capability gaps at the IARC. • Initiates modern cross-domain solution to replace the last legacy gateways currently in production. • Expands the application of Digital Rights Management (DRM)/Data Loss Protection (DLP) Technology.	• Supports Phase three of IARC modernization and maintains IARC capability gaps. • Addresses risks related to software assurance and supply chain management. • Supports Cybersecurity related requirements associated with the implementation of a classified infrastructure modernization effort consisting of cloud procurements, application rationalization, enterprise desktop, network bandwidth, endpoint security, cross domain solutions, and site operations. • Bolsters Cybersecurity posture in the realm of IDS, IPS, DRM, CDM, and DLP, and required enhancements for addressing capability gaps at the IARC. • Implements IARC Phase two Classified Enhanced Infrastructure Project.

Information Technology and Cybersecurity
Information Technology

Description

Information Technology provides enterprise-level classified computing infrastructure, and unclassified commodity and applications services to NNSA Federal staff in support of the NNSA mission. Information Technology leverages cloud based solution whenever possible to support infrastructure hosting and application development, operations and maintenance. Commodity Information Technology services provided includes, but is not limited to, application hosting, unified communications, and desktop services.

Information Technology classified computing has two main components that enable DOE/NNSA laboratories and sites to communicate and share information regarding NNSA's mission.

- The NNSA Secret Network (NSN) supports the processing of Secret/National Security Information (NSI) and the interconnection with the Department of Defense (DOD) SIPRNET.
- The ESC environment operates at the Secret/Restricted Data level and consists of independent site installations of standardized hardware and software integrated through a common infrastructure and shared policies and procedures.

In order to think, behave, and respond as one cohesive agency with a shared, critical national security mission, it is necessary to re-engineer the telecommunications networks and improve service offerings to remove technical barriers to collaboration and outfit employees with effective communication tools to maximize efficiency and lower operational costs. To that end, the Information Technology program enhances enterprise services to support emerging technologies and the NNSA mission. Classified computing is currently deployed at NNSA and multiple DOE sites, other departments and organizations, and select allied nations. The footprint of the enterprise networks continue to expand as NNSA's mission requirements increase and/or change.

The ESN serves as the base network for the classified commodity services, which entails an approach to classified collaborative computing that uses a secure Virtual Desktop Infrastructure (VDI) to facilitate information sharing among disparate DOE/NNSA entities. The Information Technology program consistently evaluates the site installations for areas that can be consolidated to enterprise services and could be centrally hosted and managed. With this approach, the NNSA Information Technology and Cybersecurity Program more effectively manages the information security posture for the agency and maximizes investment allocation across multiple program areas.

Unclassified Federal Information Technology provides commodity-based computing infrastructure, which facilitates effective collaboration and information sharing for NNSA Federal employees and support contractors to execute the NNSA mission. Through regular communication with DOE/NNSA leadership, DOE Information Technology organizations, contract partners in the labs and field, and associates across the Federal Information Technology community, NNSA has identified an opportunity to push modernization efforts to implement an Information Technology strategy that leverages managed services and cloud technologies. NNSA's focus on a managed service model enables NNSA to take advantage of new and emerging technologies while maximizing efficient use of resources. The strategy presents many opportunities to participate in economies of scale and rely on industry's rapid development and testing practices to ensure NNSA is using secure, modern technology.

Highlights of the FY 2021 Budget Request

- Continue modernization and develop phase two of the ESC environments by enhancing the core services and collaborative capabilities and consolidating disparate networks.
- Implement Special Network Access in order to ensure the availability of secure infrastructure for mission support and information sharing across the NSE. This is a key enabler and transformational agent to ensure program, operational, and business excellence.
- Sustain both classified and unclassified mission based Information Technology requirements.
- Enable commodity IT desktop services, network monitoring and response, enterprise license fees, programmatic mission enabling support, and critical cybersecurity tools in order to provide a secure nuclear security enterprise.

- Implement phase two of DOE/NNSA's Information Technology Modernization Plan in order to ensure NNSA has a modern, well-managed, secure computing environment that eliminates many of the inefficiencies and performance degradations currently experienced by the workforce and allows NNSA to grow cloud services over time.
- Begin development of the architecture for the classified wireless network for non-pit production facilities.
- Complete phase one of the security architecture for the Wireless Pit Production Network.
- Deploy Kansas City National Security Campus hybrid cloud platform in support of Joint Technology Demonstrator Project.
- Implement the NNSA Application Modernization Strategy, which seeks to minimize the number of disparate NNSA federal business and mission support IT applications in favor of a platform-based approach. The strategy facilitates the use of cloud based technologies. The strategy is also an organized effort to cultivate enterprise-wide adoption of shared infrastructure capabilities by the NNSA federal and M&O communities.

FY 2022 – FY 2025 Key Milestones
- Delivery of classified unified communications.
- Implementation of an enterprise classified electronic records system service.
- Implement an IT Modernization strategy which will incorporate an NNSA managed model that will enable and support new technologies.
- Implement a modernized network solution to address current supply chain and software assurance issues.

FY 2019 Accomplishments
- Launched first phase of multi-year effort to modernize NNSA classified infrastructure.
- Represented NNSA mission equities in the development of the DOE Enterprise Architecture Roadmap.
- Received Approval to Connect for REDNET to JODE. Approved UK JODE users will be able to access JODE from their REDNET desktops.
- Continued application modernization efforts for integration with other enterprise applications, such as PAMS 2.0 and E-810.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Information Technology $85,639,000	**Information Technology $114,761,000**	**Information Technology +$29,122,000**
• Continued to support the deployment of information technology enhancements that facilitate effective collaboration and information sharing necessary for NNSA federal employees and support contractors to carry out the NNSA's mission. • Continued to provide Information Technology technical services, incidental advisory, and assistance services. • Continued to oversee the implementation of hardware and software licensing, maintenance, and refresh. • Continued providing funding support for NNSA field office Information Technology services provisioned by M&O partners. • Continued oversight of the M&O partners' unclassified Information Technology programs. • Continued implementation of the application modernization project. • Continued implementation of Enterprise VoIP as a service. • Provided oversight of activities related to, and ensured agency compliance with, the provisions of FITARA. • Enabled Information Technology operations and maintenance of the Secret and Restricted Data infrastructure, Enterprise Secure Network, NNSA Secret Network, and utilization of the ESNet infrastructure for the network transport layer.	• Continue to support the deployment of information technology enhancements that facilitate effective collaboration and information sharing necessary for NNSA federal employees and support contractors to carry out the NNSA's mission. • Continue to provide Information Technology technical services, incidental advisory, and assistance services. • Continue to oversee the implementation of hardware and software licensing, maintenance, and refresh. • Continue providing funding support for NNSA field office Information Technology services provisioned by M&O partners. • Continue oversight of the M&O partners' unclassified Information Technology programs. • Continue implementation of the application modernization project. • Continue implementation of Enterprise VoIP as a service. • Provide oversight of activities related to, and ensure agency compliance with, the provisions of FITARA. • Enable Information Technology operations and maintenance of the Secret and Restricted Data infrastructure, Enterprise Secure Network, NNSA Secret Network, and utilization of the ESNet infrastructure for the network transport layer.	• Addresses risks related to software assurance and supply chain management. • Supports Information Technology related requirements associated with the implementation of a classified infrastructure modernization effort consisting of cloud procurements, application rationalization, enterprise desktop, network bandwidth, unclassified infrastructure modernization, endpoint security, cross domain solutions, and site operations. • Implements Phase two of the Information Technology Modernization Effort.

Information Technology and Cybersecurity
Other Information

Full Cost Recovery Estimates

The FY 2021 Budget Request provides direct funding for mission-driven activities to achieve IT and cybersecurity solutions. Because some support is directed to other programs for materials and services provided to agencies outside the Department, these costs will be allocated to the Strategic Partnership Program (SPP) customers as work is accomplished at the contractor site. The table below provides an estimate of costs that will be recovered from SPP customers.

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Site				
Kansas City National Security Campus	250	350	450	+100
Lawrence Livermore National Laboratory	2,500	2,500	2,500	0
Los Alamos National Laboratory	1,000	1,200	1,250	+50
Nevada National Security Site	500	400	400	0
Pantex	60	70	60	- 10
Sandia National Laboratories	6,000	5,000	5,500	+500
Total	**10,310**	**9,520**	**10,160**	**+640**

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Argonne National Laboratory			
Tritium and Domestic Uranium Enrichment	0	30	47
Production Modernization	0	30	47
Assessment Science	532	1,500	3,750
Stockpile Research, Technology, and Engineering	532	1,500	3,750
Safety and Environmental Operations	0	0	30
Infrastructure and Safety	1,650	0	0
Recapitalization	1,650	0	0
Operating	1,650	0	30
Infrastructure and Operations	1,650	0	30
Total Argonne National Laboratory	**2,182**	**1,530**	**3,827**
Brookhaven National Laboratory			
Safety and Environmental Operations	325	427	445
Operating	325	427	445
Infrastructure and Operations	325	427	445
Total Brookhaven National Laboratory	**325**	**427**	**445**
Chicago Operations Office			
Advanced Simulation and Computing	2,000	2,000	0
Stockpile Research, Technology, and Engineering	2,000	2,000	0
Total Chicago Operations Office	**2,000**	**2,000**	**0**
Idaho National Laboratory			
Stockpile Sustainment	200	200	200
Production Operations	0	75	0
Stockpile Management	200	275	200
Tritium and Domestic Uranium Enrichment	2,198	2,114	1,905
Production Modernization	2,198	2,114	1,905
Safety and Environmental Operations	0	1,476	400
Operating	0	1,476	400
Infrastructure and Operations	0	1,476	400
Total Idaho National Laboratory	**2,398**	**3,865**	**2,505**
Kansas City National Security Complex (KCNSC)			
B61 Life Extension Program	180,900	252,228	276,000
W88 Alteration Program	111,375	150,357	115,809
W80-4 Life Extension Program	47,800	124,455	150,343
W87-1 Modification Program	2,000	3,000	35,000
W93	0	0	2,000
Stockpile Major Modernization	342,075	530,040	579,152
Stockpile Sustainment	121,657	112,008	129,386
Weapons Dismantlement and Disposition	500	630	500
Production Operations	67,550	85,487	92,340
Stockpile Management	531,782	728,165	801,378
Enterprise Plutonium Support	3,356	7,446	7,993
Plutonium Modernization	3,356	7,446	7,993
Primary Capability Modernization	3,356	7,446	7,993
Non-Nuclear Capability Modernization	2,569	3,894	30,000
Production Modernization	5,925	11,340	37,993
Engineering and Integrated Assessments	2,161	4,375	5,026
Advanced Simulation and Computing	1,250	2,500	0
Weapons Technology and Manufacturing Maturation	16,020	16,288	25,000
Stockpile Research, Technology, and Engineering	19,431	23,163	30,026

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Operations of Facilities	82,000	78,000	110,000
Safety and Environmental Operations	600	100	7,391
Maintenance and Repair of Facilities	29,000	24,000	34,000
Infrastructure and Safety	11,635	28,700	49,168
Capabilities Based Investments	2,931	18,046	13,000
Recapitalization	14,566	46,746	62,168
Infrastructure and Operations	126,166	148,846	213,559
Secure Transportation Asset	20,277	25,894	30,286
Defense Nuclear Security	12,692	12,946	13,973
Information Technology and Cyber Security	7,217	7,217	7,217
Total Kansas City National Security Complex (KCNSC)	**723,490**	**957,571**	**1,134,432**
Kansas City Site Office			
Information Technology and Cyber Security	130	130	130
Total Kansas City Site Office	**130**	**130**	**130**
Lawrence Berkeley National Laboratory			
Weapons Technology and Manufacturing Maturation	0	350	0
Stockpile Research, Technology, and Engineering	0	350	0
Information Technology and Cyber Security	650	650	650
Total Lawrence Berkeley National Laboratory	**650**	**1,000**	**650**
Lawrence Livermore National Laboratory			
B61 Life Extension Program	3,700	2,200	695
W88 Alteration Program	871	0	0
W80-4 Life Extension Program	163,064	176,637	189,941
W87-1 Modification Program	17,000	44,000	200,000
W93	0	0	4,000
Stockpile Major Modernization	184,635	222,837	394,636
Stockpile Sustainment	81,909	88,554	88,175
Weapons Dismantlement and Disposition	2,000	3,900	2,000
Production Operations	0	5,955	5,955
Stockpile Management	268,544	321,246	490,766
Enterprise Plutonium Support	31,233	36,755	51,361
Plutonium Modernization	31,233	36,755	51,361
High Explosives & Energetics	6,856	8,068	11,000
Primary Capability Modernization	38,089	44,823	62,361
Secondary Capability Modernization	1,600	3,905	13,935
Tritium and Domestic Uranium Enrichment	0	37	47
Production Modernization	39,689	48,765	76,343
Assessment Science	118,265	146,528	181,481
Engineering and Integrated Assessments	53,754	74,143	91,450
Inertial Confinement Fusion	344,000	335,876	339,346
Advanced Simulation and Computing	185,721	288,442	178,024
Weapons Technology and Manufacturing Maturation	26,394	43,850	37,100
Academic Programs	2,000	2,000	1,000
Stockpile Research, Technology, and Engineering	730,134	890,839	828,401
Operations of Facilities	77,000	75,000	80,000
Safety and Environmental Operations	31,215	18,218	35,436
Maintenance and Repair of Facilities	24,000	16,000	36,000
Infrastructure and Safety	55,428	55,458	62,640
Capabilities Based Investments	13,790	17,662	30,430
Recapitalization	69,218	73,120	93,070
Operating	201,433	182,338	244,506

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
18-D-620, Exascale Computing Facility Modernization Project, LLNL	23,000	50,000	29,200
15-D-612, Emergency Operations Center, LLNL	0	5,000	27,000
I&O - Construction	23,000	55,000	56,200
Infrastructure and Operations	224,433	237,338	300,706
Defense Nuclear Security	67,162	67,135	69,699
Information Technology and Cyber Security	17,515	28,515	28,515
Total Lawrence Livermore National Laboratory	**1,347,477**	**1,593,838**	**1,794,430**
Los Alamos National Laboratory			
B61 Life Extension Program	84,170	73,000	65,500
W76 Life Extension Program	30,000	0	0
W76-2 Modification Program	1,367	0	0
W88 Alteration Program	42,591	32,330	22,072
W80-4 Life Extension Program	19,032	24,721	25,098
W87-1 Modification Program	8,000	3,250	10,000
W93	0	0	17,000
Stockpile Major Modernization	185,160	133,301	139,670
Stockpile Sustainment	147,409	153,202	182,423
Weapons Dismantlement and Disposition	2,000	7,600	2,000
Production Operations	39,493	47,235	47,358
Stockpile Management	374,062	341,338	371,451
Los Alamos Plutonium Operations	271,564	286,975	610,599
21-D-512, Plutonium Pit Production Project, LANL	5,000	21,156	226,000
Los Alamos Plutonium Modernization	276,564	308,131	836,599
Plutonium Modernization	276,564	308,131	836,599
High Explosives & Energetics	0	0	8,000
Primary Capability Modernization	276,564	308,131	844,599
Secondary Capability Modernization	10,333	7,598	2,122
Tritium and Domestic Uranium Enrichment	0	230	47
Production Modernization	286,897	315,959	846,768
Assessment Science	146,385	200,339	361,383
Engineering and Integrated Assessments	67,665	86,342	99,050
Inertial Confinement Fusion	18,500	18,781	20,000
Advanced Simulation and Computing	181,752	221,300	184,054
Weapons Technology and Manufacturing Maturation	33,100	49,648	59,500
Stockpile Research, Technology, and Engineering	447,402	576,410	723,987
Operations of Facilities	227,000	231,000	310,000
Safety and Environmental Operations	14,237	15,813	15,857
Maintenance and Repair of Facilities	97,000	82,000	153,000
Infrastructure and Safety	67,964	78,150	87,504
Capabilities Based Investments	15,640	12,692	15,510
Recapitalization	83,604	90,842	103,014
Operating	421,841	419,655	581,871
18-D-670, Exascale Class Computer Cooling Equipment, LANL	24,000	0	0
15-D-302, TA-55 Reinvestment Project - Phase 3, LANL	0	0	30,000
07-D-220-04, Transuranic Liquid Waste Facility, LANL	0	0	36,687
04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL	237,019	168,444	169,427
I&O - Construction	261,019	168,444	236,114
Infrastructure and Operations	682,860	588,099	817,985
Defense Nuclear Security	112,475	112,430	129,518
Information Technology and Cyber Security	17,760	17,760	17,760
Total Los Alamos National Laboratory	**1,921,456**	**1,951,996**	**2,907,469**

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Los Alamos Site Office			
Information Technology and Cyber Security	51	51	51
Total Los Alamos Site Office	**51**	**51**	**51**
National Energy Technology Lab			
B61 Life Extension Program	5,000	5,130	6,000
W76 Life Extension Program	610	0	0
W76-2 Modification Program	0	2,528	0
W88 Alteration Program	7,282	2,218	6,921
W80-4 Life Extension Program	0	8,196	10,746
W87-1 Modification Program	1,910	2,178	30,270
Stockpile Major Modernization	14,802	20,250	53,937
Stockpile Sustainment	1,944	9,178	491
Production Operations	0	2,065	0
Stockpile Management	16,746	31,493	54,428
Enterprise Plutonium Support	555	2,322	2,000
Plutonium Modernization	555	2,322	2,000
Primary Capability Modernization	555	2,322	2,000
Secondary Capability Modernization	382	471	1,350
Tritium and Domestic Uranium Enrichment	763	2,725	3,734
Production Modernization	1,700	5,518	7,084
Engineering and Integrated Assessments	265	1,893	0
Weapons Technology and Manufacturing Maturation	843	3,295	0
Stockpile Research, Technology, and Engineering	1,108	5,188	0
Capabilities Based Investments	0	300	0
Recapitalization	0	300	0
Infrastructure and Operations	0	300	0
Total National Energy Technology Lab	**19,554**	**42,499**	**61,512**
Naval Research Laboratory			
Assessment Science	3,750	4,600	4,590
Inertial Confinement Fusion	6,500	6,000	4,000
Stockpile Research, Technology, and Engineering	10,250	10,600	8,590
Total Naval Research Laboratory	**10,250**	**10,600**	**8,590**
Nevada Field Office			
Engineering and Integrated Assessments	675	0	0
Weapons Technology and Manufacturing Maturation	675	0	0
Stockpile Research, Technology, and Engineering	1,350	0	0
Defense Nuclear Security	80,559	80,527	84,537
Information Technology and Cyber Security	79	79	79
Total Nevada Field Office	**81,988**	**80,606**	**84,616**
Nevada National Security Site			
B61 Life Extension Program	0	500	0
Stockpile Major Modernization	0	500	0
Stockpile Sustainment	688	300	1,652
Stockpile Management	688	800	1,652
Enterprise Plutonium Support	5,082	8,858	13,600
Plutonium Modernization	5,419	11,100	14,500
Primary Capability Modernization	5,419	11,100	14,500
Tritium and Domestic Uranium Enrichment	78	75	153
Production Modernization	5,497	11,175	14,653
Assessment Science	53,099	88,225	99,438

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Engineering and Integrated Assessments	15,105	13,761	7,600
Inertial Confinement Fusion	0	0	7,800
Stockpile Research, Technology, and Engineering	68,204	101,986	114,838
Operations of Facilities	95,000	102,000	105,000
Safety and Environmental Operations	6,107	4,535	4,513
Maintenance and Repair of Facilities	34,000	38,000	65,000
Infrastructure and Safety	35,400	42,626	45,790
Capabilities Based Investments	7,700	7,960	10,720
Recapitalization	43,100	50,586	56,510
Operating	178,207	195,121	231,023
17-D-640, U1a Complex Enhancements Project, NNSS	20,000	35,000	160,600
19-D-670, 138kV Power Transmission System Replacement, NNSS	0	6,000	59,000
I&O - Construction	20,000	41,000	219,600
Infrastructure and Operations	198,207	236,121	450,623
Information Technology and Cyber Security	6,622	6,622	6,622
Total Nevada National Security Site	**279,218**	**356,704**	**588,388**
NNSA Albuquerque Complex			
B61 Life Extension Program	103,543	106,405	115,865
W76 Life Extension Program	1,890	0	0
W76-2 Modification Program	0	3,866	0
W88 Alteration Program	22,529	27,965	23,007
W80-4 Life Extension Program	51,371	42,447	35,102
W87-1 Modification Program	1,036	500	500
W93	0	0	3,410
Stockpile Major Modernization	180,369	181,183	177,884
Stockpile Sustainment	32,829	38,698	9,037
Weapons Dismantlement and Disposition	13,000	1,113	0
Production Operations	0	3,796	10,105
Stockpile Management	226,198	224,790	197,026
Enterprise Plutonium Support	7,504	7,237	364
Plutonium Modernization	7,504	7,237	364
Primary Capability Modernization	7,504	7,237	364
Secondary Capability Modernization	4,488	550	550
Tritium and Domestic Uranium Enrichment	115,887	165,000	148,272
Production Modernization	127,879	172,787	149,186
Assessment Science	62,890	69,277	5,000
Engineering and Integrated Assessments	37,302	48,677	27,932
Inertial Confinement Fusion	16,971	45,563	0
Advanced Simulation and Computing	750	0	0
Weapons Technology and Manufacturing Maturation	32,670	8,206	20,046
Academic Programs	70,856	84,492	85,912
Stockpile Research, Technology, and Engineering	221,439	256,215	138,890
Safety and Environmental Operations	530	25	550
Infrastructure and Safety	24,600	2,832	993
Recapitalization	24,600	2,832	993
Operating	25,130	2,857	1,543
16-D-515, Albuquerque Complex Project	47,953	0	0
I&O - Construction	47,953	0	0
Infrastructure and Operations	73,083	2,857	1,543
Secure Transportation Asset	101,421	88,432	140,735
Defense Nuclear Security	7,573	7,767	8,949
Total NNSA Albuquerque Complex	**757,593**	**752,848**	**636,329**

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
NNSA Production Office (NPO)			
Tritium and Domestic Uranium Enrichment	0	275	0
Production Modernization	0	275	0
Total NNSA Production Office (NPO)	**0**	**275**	**0**
Oak Ridge Institute for Science & Education			
Assessment Science	100	100	0
Inertial Confinement Fusion	260	0	0
Stockpile Research, Technology, and Engineering	360	100	0
Total Oak Ridge Institute for Science & Education	**360**	**100**	**0**
Oak Ridge National Laboratory			
Tritium and Domestic Uranium Enrichment	44,477	40,855	42,822
Production Modernization	44,477	40,855	42,822
Advanced Simulation and Computing	30	608	0
Stockpile Research, Technology, and Engineering	30	608	0
Safety and Environmental Operations	6,640	8,395	8,550
Infrastructure and Safety	9,350	0	0
Recapitalization	9,350	0	0
Infrastructure and Operations	15,990	8,395	8,550
Total Oak Ridge National Laboratory	**60,497**	**49,858**	**51,372**
Office of Scientific & Technical Information			
Assessment Science	212	220	220
Stockpile Research, Technology, and Engineering	212	220	220
Information Technology and Cyber Security	213	213	213
Total Office of Scientific & Technical Information	**425**	**433**	**433**
Pacific Northwest National Laboratory			
Production Operations	0	50	0
Stockpile Management	0	50	0
Secondary Capability Modernization	0	756	756
Tritium and Domestic Uranium Enrichment	40,688	54,279	56,186
Production Modernization	40,688	55,035	56,942
Engineering and Integrated Assessments	20	35	0
Weapons Technology and Manufacturing Maturation	20	35	0
Stockpile Research, Technology, and Engineering	40	70	0
Safety and Environmental Operations	6,275	3,150	7,536
Capabilities Based Investments	0	100	0
Recapitalization	0	100	0
Infrastructure and Operations	6,275	3,250	7,536
Total Pacific Northwest National Laboratory	**47,003**	**58,405**	**64,478**
Pantex Plant			
B61 Life Extension Program	60,100	55,552	47,000
W76 Life Extension Program	5,000	0	0
W76-2 Modification Program	2,026	0	0
W88 Alteration Program	40,432	34,660	44,685
W80-4 Life Extension Program	27,500	35,410	40,490
W87-1 Modification Program	500	500	4,000
W93	0	0	500
Stockpile Major Modernization	135,558	126,122	136,675
Stockpile Sustainment	107,178	128,129	128,881

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Weapons Dismantlement and Disposition	26,000	27,940	30,000
Production Operations	118,826	116,066	119,818
Stockpile Management	387,562	398,257	415,374
High Explosives & Energetics	1,557	3,047	30,409
Primary Capability Modernization	1,557	3,047	30,409
Production Modernization	1,557	3,047	30,409
Engineering and Integrated Assessments	2,212	4,284	3,730
Weapons Technology and Manufacturing Maturation	863	5,396	10,700
Stockpile Research, Technology, and Engineering	3,075	9,680	14,430
Operations of Facilities	65,000	67,000	68,000
Safety and Environmental Operations	13,485	6,915	26,174
Maintenance and Repair of Facilities	96,000	82,000	125,000
Infrastructure and Safety	63,100	62,071	72,367
Capabilities Based Investments	10,743	17,103	8,130
Recapitalization	73,843	79,174	80,497
Operating	248,328	235,089	299,671
21-D-510, HE Synthesis, Formulation, and Production Facility, PX	0	0	31,000
18-D-680, Material Staging Facility, PX	24,000	0	0
15-D-301, HE Science & Engineering Facility, PX	0	80,000	43,000
I&O - Construction	24,000	80,000	74,000
Infrastructure and Operations	272,328	315,089	373,671
Secure Transportation Asset	7,317	7,431	7,930
Defense Nuclear Security	138,903	138,847	143,247
Information Technology and Cyber Security	7,572	7,572	7,572
Total Pantex Plant	**818,314**	**879,923**	**992,633**
Princeton Plasma Physics Laboratory			
Assessment Science	0	10	0
Stockpile Research, Technology, and Engineering	0	10	0
Total Princeton Plasma Physics Laboratory	**0**	**10**	**0**
Sandia National Laboratories			
B61 Life Extension Program	249,300	231,270	198,000
W76 Life Extension Program	8,377	0	0
W76-2 Modification Program	3,541	0	0
W88 Alteration Program	70,754	44,971	35,327
W80-4 Life Extension Program	315,500	422,389	467,740
W87-1 Modification Program	21,500	52,950	180,000
W93	0	0	24,000
Stockpile Major Modernization	668,972	751,580	905,067
Stockpile Sustainment	309,435	326,450	339,077
Weapons Dismantlement and Disposition	2,000	3,600	2,000
Production Operations	134,423	136,254	142,420
Stockpile Management	1,114,830	1,217,884	1,388,564
High Explosives & Energetics	0	411	11,700
Primary Capability Modernization	0	411	11,700
Tritium and Domestic Uranium Enrichment	783	448	458
Non-Nuclear Capability Modernization	4,709	7,138	55,000
Production Modernization	5,492	7,997	67,158
Assessment Science	66,786	65,398	55,735
Engineering and Integrated Assessments	65,457	81,313	88,601
Inertial Confinement Fusion	63,100	65,957	65,644
Advanced Simulation and Computing	167,314	182,836	151,310
Weapons Technology and Manufacturing Maturation	62,099	78,715	121,000
Stockpile Research, Technology, and Engineering	424,756	474,219	482,290

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Operations of Facilities	119,000	130,000	126,000
Safety and Environmental Operations	10,068	10,110	9,895
Maintenance and Repair of Facilities	11,000	19,000	46,000
Infrastructure and Safety	46,445	35,600	43,050
Capabilities Based Investments	18,991	10,482	16,410
Recapitalization	65,436	46,082	59,460
Operating	205,504	205,192	241,355
15-D-611, Emergency Operations Center, SNL	0	4,000	36,000
I&O - Construction	0	4,000	36,000
Infrastructure and Operations	205,504	209,192	277,355
Secure Transportation Asset	47,597	63,243	87,439
Defense Nuclear Security	65,884	67,088	67,175
Information Technology and Cyber Security	24,888	26,888	26,888
Total Sandia National Laboratories	**1,888,951**	**2,066,511**	**2,396,869**
Savannah River Operations Office			
Tritium and Domestic Uranium Enrichment	1,159	0	1,987
Production Modernization	1,159	0	1,987
Total Savannah River Operations Office	**1,159**	**0**	**1,987**
Savannah River Site			
B61 Life Extension Program	5,000	3,000	6,500
W76 Life Extension Program	3,011	0	0
W76-2 Modification Program	813	0	0
W80-4 Life Extension Program	1,850	2,728	2,685
W87-1 Modification Program	0	500	20,000
Stockpile Major Modernization	10,674	6,228	29,185
Stockpile Sustainment	36,856	46,988	41,227
Weapons Dismantlement and Disposition	500	650	500
Production Operations	24,719	28,193	25,139
Stockpile Management	72,749	82,059	96,051
Savannah River Plutonium Operations	76,410	410,458	200,000
21-D-511, Savannah River Plutonium Processing Facility, SRS	0	0	241,896
Savannah River Plutonium Modernization	76,410	410,458	441,896
Plutonium Modernization	76,410	410,458	441,896
Primary Capability Modernization	76,410	410,458	441,896
Tritium and Domestic Uranium Enrichment	49,088	58,984	89,804
Production Modernization	125,498	469,442	531,700
Assessment Science	0	1,800	1,500
Engineering and Integrated Assessments	1,356	3,500	2,700
Stockpile Research, Technology, and Engineering	6,802	11,053	11,550
Operations of Facilities	92,000	93,000	92,000
Safety and Environmental Operations	8,815	9,170	8,612
Maintenance and Repair of Facilities	34,500	31,000	55,000
Infrastructure and Safety	17,611	15,700	22,756
Capabilities Based Investments	0	320	7,500
Recapitalization	17,611	16,020	30,256
Operating	152,926	149,190	185,868
18-D-650, Tritium Finishing Facility, SRS	0	27,000	27,000
I&O - Construction	0	27,000	27,000
Infrastructure and Operations	152,926	176,190	212,868
Defense Nuclear Security	7,537	7,688	7,841
Information Technology and Cyber Security	6,786	6,786	6,786
Total Savannah River Site	**372,298**	**753,218**	**866,796**

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Savannah River Site Office			
Information Technology and Cyber Security	50	200	100
Total Savannah River Site Office	**50**	**200**	**100**
SLAC National Accelerator Laboratory			
Assessment Science	90	210	0
Inertial Confinement Fusion	0	0	180
Stockpile Research, Technology, and Engineering	90	210	180
Total SLAC National Accelerator Laboratory	**90**	**210**	**180**
University of Rochester			
Inertial Confinement Fusion	80,000	76,480	75,000
Stockpile Research, Technology, and Engineering	80,000	76,480	75,000
Total University of Rochester	**80,000**	**76,480**	**75,000**
Washington Headquarters			
B61 Life Extension Program	8,306	8,019	8,150
W76-2 Modification Program	0	3,606	0
W88 Alteration Program	3,183	3,077	4,978
W80-4 Life Extension Program	6,849	9,090	15,005
W87-1 Modification Program	554	1,133	16,230
W93	0	0	1,590
Stockpile Major Modernization	18,892	24,925	45,953
Stockpile Sustainment	31,756	13,193	41,135
Weapons Dismantlement and Disposition	0	567	1,500
Production Operations	12,471	14,079	17,068
Stockpile Management	63,119	52,764	105,656
Enterprise Plutonium Support	5,980	16,598	15,464
Plutonium Modernization	5,980	16,598	15,464
High Explosives & Energetics	0	0	5,361
Primary Capability Modernization	5,980	16,598	20,825
Secondary Capability Modernization	15,858	31,259	67,431
Tritium and Domestic Uranium Enrichment	68,558	96,448	89,983
Non-Nuclear Capability Modernization	1,895	2,873	22,137
Production Modernization	92,291	147,178	200,376
Assessment Science	17,219	16,627	60,014
Engineering and Integrated Assessments	3,106	3,325	5,134
Inertial Confinement Fusion	7,111	7,851	42,755
Advanced Simulation and Computing	119,802	69,663	218,626
Weapons Technology and Manufacturing Maturation	2,526	2,662	4,469
Stockpile Research, Technology, and Engineering	149,764	100,128	330,998
Operations of Facilities	9,000	25,000	14,000
Safety and Environmental Operations	9,129	38,361	17,434
Maintenance and Repair of Facilities	89,500	69,000	146,000
Infrastructure and Safety	36,860	52,697	209,185
Capabilities Based Investments	16,412	15,898	28,017
Planning for Programmatic Construction (Pre-CD-1)	0	0	84,787
Recapitalization	53,272	68,595	321,989
Infrastructure and Operations	160,901	200,956	499,423
Secure Transportation Asset	102,022	107,660	123,684
Defense Nuclear Security	30,321	88,107	117,141
Information Technology and Cyber Security	124,070	189,745	265,356
Legacy Contractor Pensions (WA)	162,292	91,200	101,668
Total Washington Headquarters	**884,780**	**977,738**	**1,744,302**

DEPARTMENT OF ENERGY
Funding by Site Detail
Weapons Activities
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Y-12 National Security Complex			
B61 Life Extension Program	94,030	55,307	92,000
W76-2 Modification Program	57,253	0	0
W88 Alteration Program	5,268	8,608	4,123
W80-4 Life Extension Program	21,800	52,478	63,164
W87-1 Modification Program	500	4,000	45,000
W93	0	0	500
Stockpile Major Modernization	178,851	120,393	204,787
Stockpile Sustainment	45,941	45,828	36,673
Weapons Dismantlement and Disposition	10,000	10,000	11,500
Production Operations	112,518	104,709	108,738
Stockpile Management	347,310	280,930	361,698
Secondary Capability Modernization	217,328	249,006	370,860
Tritium and Domestic Uranium Enrichment	26,472	25,000	21,667
Production Modernization	243,800	274,006	392,527
Engineering and Integrated Assessments	2,332	3,486	6,181
Advanced Simulation and Computing	500	500	0
Weapons Technology and Manufacturing Maturation	4,483	8,104	12,800
Stockpile Research, Technology, and Engineering	7,315	12,090	18,981
Operations of Facilities	104,000	99,000	109,000
Safety and Environmental Operations	21,800	14,275	22,095
Maintenance and Repair of Facilities	100,000	95,000	132,000
Infrastructure and Safety	79,957	73,823	76,547
Capabilities Based Investments	9,100	11,910	19,400
Recapitalization	89,057	85,733	95,947
Operating	314,857	294,008	359,042
18-D-690, Lithium Processing Facility, Y-12	19,000	32,000	109,405
06-D-141, Uranium Processing Facility, Y-12	703,000	745,000	750,000
I&O - Construction	722,000	777,000	859,405
Infrastructure and Operations	1,036,857	1,071,008	1,218,447
Secure Transportation Asset	5	0	0
Defense Nuclear Security (DNS)	167,532	167,465	173,815
17-D-710, West End Protected Area Reduction Project, Y-12	0	25,000	11,000
Construction - Defense Nuclear Security	0	25,000	11,000
Defense Nuclear Security	167,532	192,465	184,815
Information Technology and Cyber Security	7,572	7,572	7,572
Total Y-12 National Security Complex	**1,810,391**	**1,838,071**	**2,184,040**
Grants			
Safety and Environmental Operations	0	0	436
Operating	0	0	436
Infrastructure and Operations	0	0	436
Total Grants	**0**	**0**	**436**

Defense Nuclear Nonproliferation

Defense Nuclear Nonproliferation

FY 2021 Congressional Budget Justification

Defense Nuclear Nonproliferation

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Defense Nuclear Nonproliferation
Proposed Appropriation Language

For Department of Energy expenses, including the purchase, construction, and acquisition of plant and capital equipment and other incidental expenses necessary for defense nuclear nonproliferation activities, in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion[, and the purchase of not to exceed three aircraft], [$2,164,400,000]*$2,031,000,000*, to remain available until expended.

Explanation of Change

FY 2021 changes to appropriations language consist of a change to the amount and the removal of aircraft procurement authority. The FY 2021 Budget Request for Defense Nuclear Nonproliferation (DNN) reflects a 6.2% decrease from the FY 2020 Enacted level. This decrease is mainly due to the completion of funding for contractual termination of the Mixed Oxide Fuel Fabrication Facility (MOX) Project at the Savannah River Site in Aiken, South Carolina.

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-92, National Defense Authorization Act for Fiscal Year 2020
- P.L. 116-94, Further Consolidated Appropriations Act, 2020

Defense Nuclear Nonproliferation

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Nonproliferation	1,974,000	2,164,400	2,052,000	-112,400
Use of Prior Year Balances	-25,000	0	-21,000	-21,000
Rescission of Prior Year Balances	-19,000	0	0	0
Total, Defense Nuclear Nonproliferation	**1,930,000**	**2,164,400**	**2,031,000**	**-133,400**

Overview

The National Nuclear Security Administration's (NNSA) nonproliferation, counterproliferation and counterterrorism activities extend the nation's defenses far beyond America's borders. These programs help keep the United States safe by preventing adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise; countering efforts to acquire such weapons or materials; and responding to nuclear or radiological incidents and accidents domestically and abroad. NNSA shares knowledge accrued through the United States' long experience in managing special nuclear materials with partners around the world to achieve international nonproliferation and nuclear security goals. NNSA leverages the unique technical and scientific knowledge that underpins the Stockpile Stewardship Program for a range of nonproliferation missions, from assessing foreign weapons programs and potential terrorist devices to managing the proliferation risks posed by civil nuclear applications. DNN's efforts reduce the danger that hostile nations or terrorist groups may acquire nuclear or radiological devices, weapons-usable nuclear material, nuclear and dual-use commodities and technology, and nuclear-related expertise. By limiting the number of nuclear-capable states and preventing terrorist access to materials and technology that can threaten the United States and its allies, NNSA plays a critical role in enhancing global stability and constrains the range of potential threats facing the nation, our allies, and partners.

This appropriation funds five existing programs and a new National Technical Nuclear Forensics initiative. These six programs, as part of a whole-of-government approach, provide policy and technical leadership to prevent or limit the spread of weapons of mass destruction (WMD)-related materials, technology, and expertise; develop technologies to detect nuclear proliferation; secure or eliminate inventories of nuclear weapons-related materials and infrastructure; and ensure that technically trained emergency management personnel are available to respond to nuclear and radiological incidents and accidents domestically and overseas. As part of the Department of Energy's (DOE) emergency response posture, these programs ensure that a worldwide interoperable, secure, and trusted emergency communications infrastructure is in place, in addition to, maintaining the health of Emergency Management programs across DOE.

DNN's mission is complementary to Defense Programs' Stockpile Stewardship Program at NNSA. Together, they form basis of providing a strong nuclear defense, as called for in the 2018 Nuclear Posture Review (NPR). The 2017 National Security Strategy (NSS) and NPR reinforce the important work of NNSA's nonproliferation programs, including committing to "augment measures to secure, eliminate, and prevent the spread of WMD and related materials." These activities are carried out within a dynamic global security environment, as described in NNSA's annual report *Prevent, Counter, and Respond–A Strategic Plan to Reduce Global Nuclear Threats*[a].

This environment is characterized by the persistent threat of state and non-state actors seeking to obtain nuclear and radioactive materials; state actors potentially undermining arms control agreements to which the United States is adherent; and nonproliferation regimes. There is also an increased risk of the availability of nuclear and radioactive materials as a result of the global expansion of commercial nuclear power and possible spread of fuel cycle technology, increased opportunities for illicit nuclear material trafficking and sophisticated procurement networks, and technology advances (including cyber-related tools) that may shorten nuclear weapon development timelines and complicate nuclear safeguards and security missions.

DNN and NCTIR execute their mission in partnership with other U.S. Government agencies, most notably the Departments of State, Defense, Homeland Security, and the Nuclear Regulatory Commission. Internationally, DNN has a strong and long-

[a] *https://www.energy.gov/nnsa/downloads/prevent-counter-and-respond-strategic-plan-reduce-global-nuclear-threats-npcr*

established partnership with the International Atomic Energy Agency (IAEA). NNSA has active bilateral and multilateral program coordination, through forums such as the Nuclear Security Conference (held biennially by the IAEA), the Global Initiative to Combat Nuclear Terrorism, and the Global Partnership against the Spread of Weapons and Materials of Mass Destruction.

In carrying out nuclear threat reduction, DNN and NCTIR depend on the scientific and technical expertise of the Department and its National Laboratories, as well as the capacity for international outreach, engagement and project management, implementation, and policy expertise. DNN also relies on competencies of other elements of NNSA and DOE, particularly the Office of Nuclear Energy, the Office of Environmental Management, and the Office of Science.

The major elements of the appropriation account include the following:

Material Management and Minimization (M^3)
M^3 programs minimize and, when possible, eliminate weapons-usable nuclear material around the world to achieve permanent threat reduction. The FY 2021 Budget Request supports the conversion or shutdown of research reactors and isotope production facilities that use highly enriched uranium (HEU), the continued support of non-HEU-based Molybdenum-99 (Mo-99) production facilities in the United States, the removal and disposal of weapons-usable nuclear material, the continuation of activities to expedite the removal of plutonium from the state of South Carolina and implement the dilute and dispose strategy for plutonium disposition, and costs to downblend HEU.

Global Material Security (GMS)
GMS directly contributes to national security efforts to reduce global nuclear security threats. The FY 2021 Budget Request supports programs to prevent terrorists and other actors from obtaining nuclear and radioactive material to use in an improvised nuclear device (IND) or a radiological dispersal device (RDD) by working with partner countries to improve the security of vulnerable materials and facilities and to improve partners' capacity to detect, disrupt, and investigate illicit trafficking of these materials. GMS works with countries in bilateral partnerships, and with multilateral partners such as the International Atomic Energy Agency (IAEA) and International Criminal Police Organization (INTERPOL). As part of an ongoing strategic analysis process, GMS is also exploring innovative approaches, technologies, and tools to adapt to emerging threats. GMS supports national security priorities to reduce global nuclear security threats, and is a key component of NNSA's integrated nonproliferation, counterterrorism, and emergency response strategies.

Nonproliferation and Arms Control (NPAC)
NPAC supports activities to prevent the proliferation of WMD by state and non-state actors. The FY 2021 Budget Request supports efforts to develop and implement programs and strategies to strengthen international nuclear safeguards; control the spread of dual-use WMD material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and address enduring and emerging nonproliferation and arms control challenges and opportunities.

National Technical Nuclear Forensics Research and Development (NTNF R&D) – New Initiative
NTNF R&D develops and maintains advanced technical nuclear forensics analysis capabilities at the National Laboratories that can support time-critical decisions in the event of a nuclear or radiological incident and provide new or advanced techniques to determine the origin of interdicted materials or devices. NNSA leverages this expertise at the National Laboratories to maintain a field response capability in the event of an incident requiring nuclear forensics analysis capabilities.

The FY 2021 Budget Request supports the establishment of this new program in FY 2021 as NNSA takes on a more active leadership role in NTNF.

Defense Nuclear Nonproliferation Research and Development (DNN R&D)
DNN R&D drives the innovation of U.S. technical capabilities to detect nuclear detonations; foreign nuclear weapons programs' activities; and the presence, movement, or diversion of special nuclear materials. To meet national and departmental nuclear security requirements, DNN R&D leverages the unique facilities and scientific skills of DOE, academia, and industry to perform research, conduct technology demonstrations, develop prototypes, and produce and deliver sensors for integration into operational systems. The FY 2021 Budget Request supports planned activities for early

detection of proliferation-related R&D and continued production of nuclear detonation detection satellite payloads. The request also supports continued efforts establishing a nonproliferation stewardship initiative to build and sustain requisite technical competencies, based on enabling infrastructure, science and technology, and workforce expertise, that are needed to meet future nonproliferation goals and unanticipated threats.

Nonproliferation Construction (supports Material Management and Minimization)
Nonproliferation Construction consolidates construction costs for DNN projects. The FY 2021 Budget Request supports the continuation of the dilute and dispose strategy. The FY 2021 Request will support the continuation of preliminary design for the Surplus Plutonium Disposition (SPD) project, as well as long lead procurements. The SPD project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the state of South Carolina. With available prior year balances, termination activities for the Mixed Oxide Fuel Fabrication Facility (MOX) Project at the Savannah River Site in Aiken, South Carolina will be completed in FY 2021.

Nuclear Counterterrorism and Incident Response Program (NCTIR)
The NCTIR program sustains the United States' nuclear counterterrorism activities and operational nuclear incident and accident response capabilities, while supporting DOE's all-hazards emergency management system. The Counterterrorism and Counterproliferation (CTCP) subprogram provides the nation's technical capability to understand and defeat nuclear devices, including INDs and lost or stolen foreign nuclear weapons. This knowledge in turn informs United States Government policies, agencies, and key Department of Defense (DoD) mission partners on terrorist and proliferant state nuclear threats and related contingency planning. In support of this mission, the FY 2021 Request for NCTIR supports programs to strategically manage and deploy expert scientific teams and equipment to provide a technically trained, rapid response to nuclear or radiological incidents and accidents worldwide and to educate international partners to effectively respond to nuclear or radiological incidents in their countries.

Additionally, NCTIR executes the DOE/NNSA's Emergency Operations (EO) subprogram which administers and directs the implementation and integration of emergency management programs across the Department. EO develops, coordinates, issues, and administers all DOE and NNSA emergency management policy, technical guidance and support. EO implements, manages, and coordinates readiness assurance, training, and exercise programs to ensure the Department is prepared to respond and recover from all-hazards emergencies. EO executes DOE and NNSA Continuity of Operations, Continuity of Government, and Enduring Constitutional Government programs to advance the National Continuity Policy. EO provides 24/7/365 operations and communications support for DOE/NNSA Emergency Management Enterprise and senior leadership.

Highlights and Major Changes in the FY 2021 Budget
The reduced FY 2021 DNN appropriation reflects the completion of work (e.g., MOX termination and the recapitalization of NNSA's Aerial Measuring System (AMS) aircraft fleet). When MOX termination is excluded, the overall request for the DNN appropriation represents an $86.6 million (4.5%) increase above FY 2020 enacted.

Specifically, the FY 2021 request includes:
- DNN programs: $1.639 billion, a decrease of $139.5 million, or 7.8% from the FY 2020 enacted level due to the completion of funding for MOX termination
- NCTIR: $377.5 million, an increase of $5.4 million, or 1.5%, from the FY 2020 enacted level
- Legacy Contractor Pensions $14.4 million, a decrease of $0.6 million, or 4.7%, from the FY 2020 enacted level

The DNN FY 2021 Budget Request supports the following key priorities:

Defense Nuclear Nonproliferation Programs
- Convert and/or verify the shutdown of two research reactors and isotope production facilities
- Identify and eliminate excess HEU and plutonium, including removing and/or disposing of 90 kilograms of material
- Continue to expedite the removal of plutonium from the state of South Carolina and pursue the dilute and dispose strategy to dispose of 34 metric tons of plutonium
- Lead high priority nuclear security initiatives to improve cyber security for nuclear facilities, mitigate insider threats, and improve transportation security practices

- Secure an additional 60 buildings with high-priority radioactive sources (30 domestic buildings and 30 international buildings)
- Deploy radiation detection equipment along critical pathways, to counter the threat of illicit trafficking of special nuclear material, to include the necessary training, maintenance support, and technical exchanges for foreign partners
- Provide critical mission support to the IAEA, including strengthening the international nuclear safeguards system and supporting their expanding nuclear security activities
- Facilitate legitimate U.S. trade by annually providing roughly 6,000 technical reviews of U.S. export license applications, and technical support and training to U.S. law enforcement to help prevent the exploitation of the U.S. industrial base;
- Work with roughly 35 countries each year to build global export control capacity through training, technical exchanges and train-the-trainer approaches
- Demonstrate new U.S. capabilities for detecting foreign material and weapons production processes
- Demonstrate new capabilities for weapons and material security applications, including detecting special nuclear material movement and diversion and nuclear safeguards
- Sustain and improve U.S. capabilities in nuclear explosion monitoring, including delivering the nation's space-based nuclear detonation detection payloads and related activities that support treaty monitoring and military missions
- Support efforts to continue establishing a nonproliferation stewardship initiative, which will build and sustain the requisite technical competencies needed to support policymakers and future nonproliferation missions
- Develop advanced technical nuclear forensics analysis capabilities that support U.S. Government response to a nuclear event

Nuclear Counterterrorism and Incident Response Program

- Provide expertise and equipment to 1) detect and identify nuclear or radioactive materials during high-profile public events or in response to a threat; 2) rapidly respond to disable a potentially yield producing nuclear device; and 3) lead the United States Government's monitoring and technical assessment efforts after a nuclear or radiological incident or accident, saving lives
- Detect, measure, and track radioactive material in an emergency to determine contamination levels through the Aerial Measuring System.
- Conduct Nuclear Emergency Support Team (NEST) activities that provide technical assistance to the FBI to respond to WMD devices by providing specialized technology and training for regional teams, including the "Capability Forward" initiative
- Provide technical expertise, facilities, and equipment to examine interdicted nuclear devices or materials; collect and process debris samples following a nuclear detonation; support device assessment and reverse engineering; continue to identify, consolidate, and analyze historical nuclear material samples of value to the technical nuclear forensics program for the National Nuclear Materials Archive (NNMA) within NNSA
- Lead coordination of the interagency National Technical Nuclear Forensics mission; and improve methodologies used for the analysis of interdicted nuclear materials
- Commence focused science on explosive and nuclear material behaviors, applying research concluded under DNN.
- Advance the nation's technical capability to understand and defeat nuclear devices , including INDs, and lost or stolen nuclear weapons; advise on protection requirements for nuclear materials; and prevent nuclear terrorism through Nuclear Threat Reduction channels with the United Kingdom and France
- Strengthen U.S. national security by increasing partner capabilities to counter and respond to radiological and nuclear incidents and accidents worldwide through policy, training, exercises, technical exchanges, and equipment provisioning
- Support to global coverage for emergency communications
- Upgrade Emergency Communications Network (ECN) capability to provide five times the capacity at one third cost
- Implement a Readiness Assurance Program depicting the "health" of the Emergency Management System
- Develop strategic Emergency Management exercise program, including National Level Exercises
- Develop strategic Emergency Management training & certification program
- Serve as the focal point of the DOE and NNSA Continuity Programs and higher level continuity programs, assisting the Secretary of Energy, NNSA Administrator, and their staffs or higher designated officials, in executing the National Continuity Policy

Major Out-year Priorities and Assumptions

Out-year funding levels for the DNN appropriation total $8,561,000 for FY 2022 through FY 2025, based on the following priorities and assumptions.

Defense Nuclear Nonproliferation Programs

- Play a key role in the domestic and international effort to secure vulnerable nuclear and radioactive materials around the world, promote material security best practices, prevent illicit trafficking, and promote long-term risk reduction through alternatives to radioisotopic source-based devices and technologies
- Cooperate with private industry and international partners, such as the Global Partnership, the IAEA, INTERPOL, and the Global Initiative to Combat Nuclear Terrorism, and implement an engagement strategy with partner countries that carefully balances threats and indigenous resources
- Develop approaches, technology, human capital and international infrastructure to strengthen the international nuclear safeguards system and provide the IAEA with necessary resources to implement the evolving nuclear safeguards regime
- Work with foreign partners at all stages of nuclear development to enhance their ability to meet their safeguards and security obligations
- Work domestically and abroad to minimize and, when possible, eliminate nuclear and radioactive materials and ensure sound management principles for materials that remain
- Support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium threat reduction and furthering deployment of peaceful uses technology
- Support U.S. industry partners to establish a reliable commercial supply of Mo-99 produced without HEU
- Facilitate legitimate nuclear cooperation by building domestic and global capacity to detect and prevent illicit transfers of WMD-related materials, equipment, and technology by providing technical reviews of U.S. export licenses; conducting technical analyses of interdiction cases; providing technical support to multilateral nonproliferation export control regimes (such as the Nuclear Suppliers Group, the Australia Group, and the Missile Technology Control Regime); and working with foreign partners to strengthen their national systems of export control
- Develop and demonstrate U.S. capabilities in DOE national laboratories, academia, and industry for detecting nuclear material production and weapons development, monitoring nuclear explosions, preparing for future arms control, supporting nuclear security broadly, and producing the nation's space-based global nuclear detonation detection capability as required by law

Nuclear Counterterrorism and Incident Response Program

- Maintain and strengthen nuclear/radiological incident response capabilities, Emergency Operations Center, and the Department's capabilities to manage accidents and emergencies at all DOE/NNSA headquarters and field sites
- Sustain existing deployable capabilities, understanding and adapting to changes in proliferation and nuclear terrorism threats, and sustaining unique modeling and device assessment capabilities
- Build and sustain classified emergency response communications network, interconnected to the Federal Government for critical real-time operational information sharing
- Transition mature diagnostics, high explosives, and nuclear material science research and development into validated operational capabilities beginning in FY 2021
- Continue Stabilization Operations activities to include training facility upgrades, applied science, and technical bench depth building
- Sustain existing nuclear counterterrorism capabilities in 11 cities (Stabilization), and establish the capability in one additional city each year
- Continue implementation and sustainment of Capability Forward, resulting in a sustained 14 cities with directed render safe capability
- Enhance international nuclear/radiological preparedness and response training programs and support, including implementation of the 2019 Nuclear Threat Reduction (NTR) Work Plan with United Kingdom and France, and sharing of best practices to domestic and foreign partners to reduce terrorism risks to nuclear material and facilities
- Enhance the technical nuclear forensics capabilities by leveraging expertise from the national laboratories to analyze and determine the origin of interdicted nuclear materials and nuclear devices, and in the case of a nuclear attack, the device design and origin of the nuclear materials used

FY 2022 - FY 2025 Key Milestones

- (2022) Complete the conversion of all the major global producers of Mo-99
- (2022) Complete Critical Decision (CD) – 2/3, Approve Performance Baseline/Approve Start of Construction, for the Surplus Plutonium Disposition (SPD) Project
- (2022) Conduct a mock deployment of the emerging threats capabilities
- (2022) Complete the Tier Threat Modeling Archive Validation project to assess the national 3-D predictive modeling capability using four different experimental series in support of nuclear incident response requirements.
- (2022) Complete physical protection upgrades at South Ukraine Nuclear Power Plant.
- (2022) Continues National Nuclear Materials Archive (NNMA) materials identification to protect from disposal, and fully analyzing approximately 30 samples per year
- (2023) Demonstrate new capabilities for early detection of special nuclear material (SNM) production
- (2023) Demonstrate new capabilities for detecting the presence, movement and diversion of SNM, including through remote detection and advanced nuclear safeguards
- (2024) Conduct a mock deployment of the emerging threats capabilities
- (2024) Complete DNN's portion of Area 5 De-inventory (A5D) and Building 9212 low equity discards at Y-12
- (2024) Consolidate NNMA high priority items at disposal risk to DOE/NNSA material vaults
- (2025) Complete security upgrades at a total of 2,863 buildings that contain radioactive material.
- (2025) Establish counter nuclear smuggling capability in 95 countries.
- (2025) Complete final excess HEU shipment from Y-12 included in the Down-blending Offering for Tritium (DBOT) contract
- Conduct four physical security assessment visits per year for U.S.-obligated nuclear materials at foreign facilities
- Transfer five safeguards tools per year to foreign partners or international organization to meet identified safeguards deficiencies
- In partnership with the Department of State's Export Control and Related Border Security program, engage 25 to 35 foreign partners per year to strengthen national systems of export control and prevent illicit trafficking in nuclear and dual-use commodities through export licensing and enforcement training programs, and advancing sustainability through train-the-trainer approaches
- Perform approximately 6,000 technical reviews per year of U.S. export licenses for nuclear and dual-use commodities
- Provide approximately 3,000 real time technical analyses to the U.S. enforcement community per year for interdiction cases
- Conduct three monitoring visits per year in Russia under the terms of the Plutonium Production Reactor Agreement (PPRA) to ensure the non-weapons use of Russian plutonium oxide and non-operational status of shutdown Russian plutonium production reactors and host Russian monitors on their annual monitoring visit to U.S. facilities falling under the PPRA
- Process 40 to 50 Part 810 specific authorization applications and requests for amendments per year and review over 100 Part 810 general authorization reports for compliance with Part 810 regulations per year
- Produce nuclear detonation detection satellite payloads in accordance with the negotiated schedule with the United States Air Force (USAF).
- Continue NNMA materials identification and characterization to protect from disposal.

DOE Working Capital Fund (WCF) Support

The NNSA DNN appropriation projected contribution to the DOE WCF for FY 2021 is $4,860,000. This funding covers shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

Legacy Contractor Pensions

Funding provides the annual DNN share of the DOE's reimbursement of payments made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The UCRP benefit for these individuals is a legacy cost and DOE's annual payment to the UC is required by contract. The amount of the annual payment is based on the actuarial valuation report and is covered by the terms described in the contracts. NNSA's budget request supports a readjusted the split between Weapons and DNN to reflect the changes in relative shares of total NNSA funding in FY 2021. These contracts will be paid through the Legacy Contractor Pension line item.

Entry Level Hires

NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), and, where appropriate, the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment within the nuclear security enterprise. In FY 2021, the DNN appropriation projects providing for NGFP support and development activities.

Defense Nuclear Nonproliferation
Funding by Congressional Control

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation				
Material Management and Minimization				
Conversion	0	99,000	170,000	+71,000
Nuclear Material Removal	32,925	32,925	40,000	+7,075
Material Disposition	225,869	186,608	190,711	+4,103
Laboratory and Partnership Support	35,000	45,000	0	-45,000
Total, Material Management and Minimization	**293,794**	**363,533**	**400,711**	**37,178**
Global Material Security				
International Nuclear Security	46,339	58,000	66,391	8,391
Domestic Radiological Security	127,433	147,002	101,000	-46,002
International Radiological Security	78,907	78,907	73,340	-5,567
Nuclear Smuggling Detection	154,429	159,000	159,749	749
International Contributions *[non-add]	[5,399]	0	0	0
Total, Global Material Security	**407,108**	**442,909**	**400,480**	**-42,429**
Nonproliferation and Arms Control	**129,703**	**140,000**	**138,708**	**-1,292**
National Technical Nuclear Forensics R&D	**0**	**0**	**40,000**	**40,000**
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	281,521	299,046	235,220	-63,826
Nuclear Detonation Detection	195,749	196,617	236,531	39,914
Nonproliferation Fuels Development	98,300	15,000	0	-15,000
Nonproliferation Stewardship Program	0	22,500	59,900	37,400
Total, Defense Nuclear Nonproliferation R&D	**575,570**	**533,163**	**531,651**	**-1,512**
Nonproliferation Construction				
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	220,000	220,000	0	-220,000
18-D-150, Surplus Plutonium Disposition Project	0	79,000	148,589	+69,589
Total, Nonproliferation Construction	**220,000**	**299,000**	**148,589**	**-150,411**
Total, Defense Nuclear Nonproliferation Programs	**1,626,175**	**1,778,605**	**1,660,139**	**-118,466**

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020
Nuclear Counterterrorism Incident Response Program				
Emergency Operations		35,545	36,000	+455
Counterterrorism and Counterproliferation		336,550	341,513	+4,963
Total, Nuclear Counterterrorism Incident Response Program	**319,185**	**372,095**	**377,513**	**+5,418**
Legacy Contractor Pensions	**28,640**	**13,700**	**14,348**	**+648**
Subtotal, Defense Nuclear Nonproliferation Appropriation	**1,974,000**	**2,164,400**	**2,052,000**	**-112,400**
Use of Prior Year Balances	**-25,000**	**0**	**-21,000**	**-21,000**
Rescission of Prior Year Balances	**-19,000**	**0**	**0**	**0**
Total, Defense Nuclear Nonproliferation Appropriation	**1,930,000**	**2,164,400**	**2,031,000**	**-133,400**

***** The international contributions received by the GMS program shown in the FY 2019 Enacted column are a non-add to the FY 2019 Appropriation. The amount received in FY 2019 totaled $5,398,655, including $3,294,559 from the United Kingdom, $1,759,390 from Canada, and $344,706 from Finland.

SBIR/STTR:

- FY 2019 Transferred: SBIR: $10,491; STTR: $0
- FY 2020 Projected: SBIR: $11,214; STTR: $0
- FY 2021 Request: SBIR: $12,995; STTR: $0

Out-years for Defense Nuclear Nonproliferation
Funding by Congressional Control

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Defense Nuclear Nonproliferation				
Material Management and Minimization	410,230	415,297	422,066	441,389
Global Material Security	408,890	413,797	419,590	438,472
Nonproliferation and Arms Control	141,621	143,320	145,326	151,866
National Technical Nuclear Forensics R&D	40,840	41,330	41,909	43,795
Defense Nuclear Nonproliferation R&D	542,816	549,330	557,021	593,798
Nonproliferation Construction				
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	0	0	0	0
18-D-150, Surplus Plutonium Disposition Project	115,705	101,779	101,192	36,345
22-D-XXX, LANL Project	16,657	50,781	67,069	84,368
Total, Nonproliferation Construction	**132,362**	**152,560**	**168,261**	**120,713**
Total, Defense Nuclear Nonproliferation Programs	**1,676,759**	**1,715,634**	**1,754,173**	**1,778,322**
Nuclear Counterterrorism Incident Response Program				
Emergency Operations	36,756	37,197	37,718	39,415
Counterterrorism and Counterproliferation	348,685	352,869	357,809	362,199
Total, Nuclear Counterterrorism Incident Response Program	**385,441**	**390,066**	**395,527**	**401,614**
Legacy Contractor Pensions	**11,800**	**12,300**	**12,300**	**15,353**
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,074,000**	**2,118,000**	**2,162,000**	**2,207,000**
Use of Prior Year Balances	**0**	**0**	**0**	**0**
Total, Defense Nuclear Nonproliferation Appropriation	**2,074,000**	**2,118,000**	**2,162,000**	**2,207,000**

Research and Development

The Office of Management and Budget (OMB) Circular No. A-11, "Preparation, Submission, and Execution of the Budget," requires the reporting of research and development (R&D) data. Consistent with this requirement, R&D activities funded by NNSA Defense Nuclear Nonproliferation programs are displayed below.

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request[a]	FY 2021 Request vs FY 2020 Enacted
Research and Development (R&D)				
Basic	131,987	138,744	171,540	+32,796
Applied	176,536	170,053	185,028	+14,975
Development	69,985	84,158	95,702	+11,544
Subtotal, R&D	**378,508**	**392,955**	**452,270**	**+59,315**
Equipment	0	0	0	0
Construction	0	17,900	0	-17,900
Total, R&D	**378,508**	**410,855**	**452,270**	**+41,415**

[a] R&D funding for FY 2021 does not match amounts included in the President's Budget. NNSA updated its numbers after the President's Budget went to print.

Material Management and Minimization

Overview

The Material Management and Minimization (M^3) program aims to minimize and, when possible, eliminate nuclear materials and ensure sound management principles for materials that remain. This includes minimizing the civilian use of highly enriched uranium (HEU); removing or eliminating the world's most vulnerable weapons-usable nuclear material; and disposing of excess nuclear material in the United States. The M^3 Budget Request presents an integrated approach to addressing the persistent threat posed by the global stockpile of nuclear materials.

M^3 directly contributes to and plays a critical role in reducing global nuclear security threats and promoting U.S. national security. The M^3 program is a key component of the Department of Energy/National Nuclear Security Administration (DOE/NNSA) integrated nonproliferation, counterterrorism, and emergency response strategies. M^3 makes these strategic contributions through the conversion of research reactors and medical isotope production facilities from the use of High Enriched Uranium (HEU) to the use of Low Enriched Uranium (LEU) fuels and targets, the removal of excess HEU and separated plutonium, and the disposition of HEU and plutonium.

Material Management and Minimization
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Material Management and Minimization				
Conversion	0	99,000	170,000	+71,000
Nuclear Material Removal	32,925	32,925	40,000	+7,075
Material Disposition	225,869	186,608	190,711	+4,103
Laboratory and Partnership Support	35,000	45,000	0	-45,000
Total, Material Management and Minimization	**293,794**	**363,533**	**400,711**	**+37,178**

Outyears for Material Management and Minimization
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Material Management and Minimization				
Conversion	173,570	175,653	178,112	186,127
Nuclear Material Removal	40,840	41,330	41,909	43,795
Material Disposition	195,820	198,315	202,046	211,468
Laboratory and Partnership Support	0	0	0	0
Total, Material Management and Minimization	**410,230**	**415,298**	**422,067**	**441,390**

Material Management and Minimization
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Material Management and Minimization	
Conversion: The increase supports DNN's contribution to the Office of Defense Program's (DP) domestic uranium enrichment project, which includes a high-assay low-enriched uranium (LEU) requirement to support DNN programs, and to procure and install additional equipment at BWX Technologies, Inc. (BWXT) to establish a commercial fabrication capability for U-Mo LEU fuel. In addition, this increase also reflects realigning the Laboratory and Partnership Support (LAPS) program, which supports Molybdenum-99 (Mo-99) activities, back into the single Conversion control point (see below).	+71,000
Nuclear Material Removal: The increase supports scaling up development of a mobile capability to address problematic fuels (Mobile Melt-Consolidate system), replaces end-of-life equipment for the Mobile Plutonium Facility (MPF) and the Mobile Uranium Facility (MUF), and funds a deployable communications system and related support for the MPF and MUF.	+7,075
Material Disposition: The overall increase supports the ramping up of new hires and training at Los Alamos National Laboratory (LANL) to support the Dilute and Dispose (D&D) strategy and activities associated with the acceleration of removing plutonium from the state of South Carolina offset by the completion of the Repurposed Excess Uranium (REU) campaign.	+4,103
Laboratory and Partnership Support (LAPS): The decrease reflects the realignment of these activities, which support the Mo-99 cooperative agreements, back into the Conversion program. This program previously was a part of the Convert subprogram until FY 2018. The Convert subprogram manages all Mo-99 related activities.	-45,000
Total, Material Management and Minimization	**+37,178**

Material Management and Minimization
Conversion

Description

The Conversion subprogram, referred to as the Convert subprogram, supports the conversion of domestic and international civilian research reactors and isotope production facilities to non-weapons-usable nuclear materials. These efforts result in permanent threat reduction by minimizing and, to the extent possible, eliminating the use of HEU in civilian applications. This includes working with global Mo-99 producers to convert their existing operations to use LEU targets and accelerating the development of new non-HEU-based Mo-99 production capabilities in the United States. Additionally, the Convert subprogram continues to support the use of LEU fuels over HEU fuels by supporting DP's Domestic Uranium Enrichment program. This will allow the United States to continue to supply LEU fuel for those who have converted to the use of LEU fuel.

On January 2, 2020, in accordance with the American Medical Isotopes Production Act of 2012 (AMIPA), the Secretary of Energy certified to Congress that there is an insufficient global supply of Mo-99 produced without the use of HEU available to satisfy the domestic U.S. market. This certification will be effective for no more than two years from the effective date of January 2, 2020, resulting in an extension to the period that the Nuclear Regulatory Commission (NRC) may issue HEU export licenses for medical isotope production. DOE maintains its commitment to HEU minimization, and it is DOE's priority to meet the letter and spirit of the law as soon as achievable, while also ensuring a reliable supply of Mo-99 to U.S. patients. Accordingly, DOE will conduct reviews of the market every six months and will make a new certification regarding the sufficiency of supply as soon as the statutory conditions are satisfied.

Currently, the Convert subprogram has converted or verified the shutdown of 106 HEU research reactors and isotope production facilities worldwide. In support of this effort, the program will continue its work to qualify a high-density LEU fuel and to demonstrate the fabrication capability necessary to convert six U.S. high performance research reactors (USHPRR) from HEU to LEU fuel. These high performance research reactors cannot convert with existing LEU fuels. Therefore, the Convert program will be procuring Major Items of Equipment (MIE) to support making U-Mo monolithic fuel to convert the USHPRRs to an LEU fuel. Funding will also support the continued development of the Proliferation Resistance Optimized Core (PRO-Core) project. The Convert subprogram will identify and work with international partners on the design of new-build research reactors to explore technical options to reduce the likelihood that the reactor could be misused for proliferation objectives.

FY 2021 funding will allow the Convert subprogram to continue to provide funding for cooperative agreements and laboratory expertise to support the establishment of new, non-HEU-based Mo-99 production facilities in the United States. Building on prior-year support, the Convert subprogram's cooperative agreement partners continue to make progress toward commercially producing Mo-99 in the United States without the use of HEU. In August 2019, NNSA awarded $60 million in new cooperative agreements to four commercial companies: Northstar Medical Radioisotopes, SHINE Medical Technologies, Northwest Medical Isotopes, and Niowave, Inc.

The Convert subprogram will continue to support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium threat reduction.

In FY 2021, the LAPS activities, which are the activities that include support for the Mo-99 cooperative agreements, are being re-aligned back into the Conversion subprogram. This program was previously a part of the Convert subprogram until FY 2018. The Convert subprogram manages all Mo-99 related activities

Highlights of the FY 2021 Budget Request

- The Convert subprogram will continue the pursuit of research reactor and isotope production facility conversions and/or verification of shutdowns. Two facilities will be converted or verified as shutdown in FY 2021.
- The Convert subprogram will continue its support of domestic Mo-99 commercial partners to establish a reliable commercial supply of Mo-99 produced without HEU.
- The Convert subprogram will support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium threat reduction and furthering deployment of peaceful uses technology.

- The Convert subprogram will support the Uranium Lease and Takeback (ULTB) program. ULTB is being re-aligned from the Material Disposition sub-program because it more closely supports the Mo-99 program. ULTB previously was a part of the Convert subprogram until FY 2016. The Convert subprogram manages all Mo-99 related activities as specified in the AMIPA. Establishment and implementation of the ULTB program is a Mo-99 related component of AMIPA.

Conversion

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Request
Conversion $99,000,000	**Conversion $170,000,000**	**Conversion +$71,000,000**
• Continue activities to support converting and/or verifying the shutdown of facilities for outyears. • Provide technical and financial support to the U.S. private sector to support establishment of a reliable domestic production capability for Mo-99 without the use of HEU and to existing global Mo-99 producers to convert from the use of HEU to LEU targets. • Continue irradiation of mini-plate experiment in the Advanced Test Reactor in support of qualifying a new high-density LEU fuel that can convert the U.S. High Performance Research Reactors (USHPRRs). • Continue fabrication of key full-size irradiation test plates for the new, high-density LEU fuel, and continue LEU fuel plate and assembly fabrication demonstration activities in support of converting USHPRRs.	• Continue activities to support converting and/or verifying the shutdown of two facilities. • Complete post-irradiation examination (PIE) of the MiniPlate-1 (MP-1) experiment. • Continue fabrication of key full-size irradiation test plates for the new, high-density LEU fuel for irradiation in early 2022. • Continue LEU fuel plate and assembly fabrication demonstration activities in support of converting USHPRRs. • Support DP's domestic uranium enrichment program which includes a high-assay LEU requirement to support DNN programs. • Provide technical and financial support to the U.S. private sector to support establishment of a reliable domestic production capability for Mo-99 without the use of HEU. • Continue to implement the ULTB program. (This sub-program is being re-aligned from the Material Disposition program. Previously, it was part of the Convert program until FY 2016 and more closely tied to the Mo-99 program.)	• The increase in funding supports DNN's contribution to DP's domestic uranium enrichment program, procurement and installation of additional equipment at BWXT to establish a commercial fabrication capability for UMo LEU fuel, and the re-alignment of the LAPS program.

Material Management and Minimization
Nuclear Material Removal

Description

The Nuclear Material Removal subprogram, referred to as the Remove subprogram, supports the removal, consolidation, and disposal of the world's most vulnerable weapons-usable nuclear material. Each kilogram of excess nuclear material from civilian sites worldwide that is removed reduces the risk of a terrorist acquiring the material for use in a nuclear weapon.

This subprogram supports the removal, consolidation, and disposal of HEU and plutonium from civilian facilities around the world. This material includes Russian-origin HEU and plutonium and "Gap" material which includes U.S.-origin HEU, HEU of non-U.S. and non-Russian-origin, and separated plutonium. On a case-by-case basis in support of nonproliferation objectives, some U.S.-origin HEU and LEU spent fuel that previously fell under the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (also known as the U.S.-origin program), may be returned.

The Remove subprogram continues to evaluate all excess nuclear material to identify and prioritize candidate material for removal or disposition. The subprogram evaluates material attractiveness, site and country level threats, and other factors to determine materials that are most at-risk and prioritizes them for removal or disposal. Furthermore, the subprogram works with foreign partners to obtain regulatory permits; characterize, stabilize, package, and transport material; and provide replacement LEU, or other incentives, for other-than-high-income-economy-countries, to encourage elimination of these materials. The subprogram coordinates all future U.S. return projects with relevant DOE stakeholders, including the Office of Environmental Management (EM), to enable long-term planning and appropriate resource allocation.

In addition, as part of its mission to address emerging threats, the Remove subprogram will continue to develop the capability to promptly respond, if asked, to support the removal of nuclear material from countries of concern (e.g., Libya 2004). This includes in-country stabilization, packaging, and removal of nuclear materials (focusing on HEU and plutonium) through the deployment of self-sufficient, trained teams and mobile facilities. The subprogram is planning to conduct a mock deployment of the emerging threats capabilities in late FY 2020. This mock deployment will test equipment capabilities and increase personnel proficiency while working alongside other DOE/NNSA and interagency partners.

Highlights of the FY 2021 Budget Request

- The Nuclear Material Removal subprogram will continue to identify and eliminate excess HEU and plutonium, including removing and/or disposing of 90 kilograms of material.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Request
Nuclear Material Removal $32,925,000	**Nuclear Material Removal $40,000,000**	**Nuclear Material Removal +$7,075,000**
• Remove and/or confirm the disposition of an additional 40 kilograms of HEU and/or plutonium for a cumulative total of 7,140 kilograms. • Conduct an emerging threats mock deployment exercise to ensure a short-term readiness posture to respond to an urgent nuclear material removal mission.	• Remove and/or confirm the disposition of an additional 90 kilograms of HEU and/or plutonium. • Sustain the Mobile Plutonium Facility (MPF) and the Mobile Uranium Facility (MUF) equipment, and perform off-site readiness exercises that practice a subset of MPF and MUF capabilities. • Complete construction of the Mobile Melt-Consolidate (MMC) system; conduct testing of the completed system; carry out operational process R&D and optimization activities; complete development of all safety and operational documentation and procedures; and ensure the system is ready for deployment by the end of FY 2021.	• Increase supports scaling up development of mobile capability to address problematic fuels (MMC), replaces end-of-life equipment for MPF and MUF, and funds a deployable communications system and related support for the MPF and MUF.

Material Management and Minimization
Material Disposition

Description

The Material Disposition subprogram, referred to as the Dispose subprogram, is responsible for disposing of excess nuclear material in the United States and managing the provision of nuclear material for peaceful uses. The Dispose subprogram includes activities that are necessary to support the overall program to dispose of 34 metric tons of surplus weapon-grade plutonium including surveillance, monitoring, and packaging of surplus pits at Pantex and surplus nuclear weapon pit disassembly and conversion of resultant metal to oxide, which is being conducted in the Advanced Recovery and Integrated Extraction System (ARIES) at LANL.

In FY 2021, the Dispose subprogram includes approximately $45 million to continue activities to expedite the removal of plutonium from the state of South Carolina by expanding current downblending operations which will require hiring, training, and ensuring the appropriate clearance and qualifications of additional employees. In support of expedited plutonium removal activities and increased staffing in K-Area, NNSA is planning for a new entry control facility (ECF) in the K-Area perimeter fence with capacity for additional staffing forecast to support the additional shifts for downblend operations in the K-Area Interim Storage (KIS) glovebox, K-Area infrastructure improvements, startup and operations of the K-Area Characterization and Storage Pad Project, and construction of the Surplus Plutonium Disposition (SPD) Project. The K-Area perimeter fence ECF will likely result in a new minor construction project that could start in FY 2020 as planning continues. Separately, NNSA will continue the planned minor construction project (previously reported in FY 2020) to enhance the K-Area Material Access Area (MAA) ECF, which will also support the increased staffing in K-Area.

The Dispose subprogram will continue ongoing plutonium oxide production operations at LANL in preparation for downblend and procurement and installation of several MIE at LANL to improve material movement efficiency, reduce worker dose, and address risk of single point failures in the Advanced Recovery and Integrated Extraction System (ARIES). Furthermore, the Dispose subprogram will continue activities to improve PF-4 vault storage including the disposition of legacy Mixed Oxide (MOX) Fuel materials that have been in storage in PF-4 at LANL in order to make that space available for higher priority materials. This subprogram will continue to evaluate system-level engineering and technical improvements to improve the efficiency of the dilute and dispose process flowsheet and material handling activities, including the potential use of robotic and virtual reality technology.

The Dispose subprogram is also responsible for preparation of the Japan Fast Critical Assembly (FCA) plutonium fuel for disposition. In FY 2019, an independent Business Case Analysis validated the alternatives evaluation approach and results and based on the BCA, DOE/NNSA selected electrolytic dissolution using H Canyon, and conceptual design was initiated. Design and research & development continue in FY 2020. Physical modifications, including installation of the spare electrolytic dissolver will begin in FY 2021. The Japan Atomic Energy Agency (JAEA) is providing the funding for disposition of the FCA fuel.

NNSA has eliminated more than 163 metric tons of weapons-usable HEU by downblending it (or shipping it for downblending) to LEU for use in power and research reactors in the United States and abroad. The subprogram has substantially reduced excess holdings of HEU throughout the DOE/NNSA complex, an amount sufficient to produce 6,400 weapons. The subprogram is supporting the Down-blending Offering for Tritium (DBOT) contract, which will run from FY 2019 through FY 2025. Although DBOT primarily is a DP contract, the Dispose subprogram is responsible for managing and funding a portion of the DBOT contract to support excess HEU disposition. In addition, the Dispose subprogram manages enriched uranium supply and demand needs in support of DNN statutory obligations, international commitments or assurances, and to advance nonproliferation mission goals. This includes management oversight of contractors to downblend HEU into high assay LEU (HALEU) or LEU, and provide HALEU fuel for research reactors that have been converted to use LEU, and HALEU targets for medical isotope production.

The Dispose subprogram will continue disposition of legacy material and low equity discards stored at Y-12 in order to reduce risk due to the deteriorating infrastructure and to support the transition to the Uranium Processing Facility (UPF). The HEU Thorium discards will be completed in FY 2021, Building 9206 discards will be complete by the end of FY 2022, and the Area 5 De-inventory (A5D) and Building 9212 discards will be accelerated to be complete by the end of FY 2024.

Furthermore, the Dispose subprogram will focus on the development of international plutonium management strategies by developing bi-lateral and multi-lateral working arrangements. Participating countries will work together at a technical level to support efforts to manage plutonium inventories in a way that minimizes the stockpiles of excess plutonium and maximizes the security and protection of the material.

Highlights of the FY 2021 Budget Request

- The Material Disposition subprogram will continue efforts to expedite the removal of plutonium from the state of South Carolina and continue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of surplus plutonium.
- The Material Disposition subprogram will continue to eliminate surplus HEU by downblending to LEU, or through direct disposal with a priority on legacy material to reduce operating risk in deteriorating infrastructure.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Request
Material Disposition $186,608,000	**Material Disposition $190,711,000**	**Material Disposition +$4,103,0000**
U.S. Plutonium Disposition $138,449,000	**U.S. Plutonium Disposition $155,946,000**	**U.S. Plutonium Disposition +$17,497,000**
• Continue to provide surveillance and packaging capabilities for surplus pits and plutonium. • Continue pit disassembly and oxide conversion activities to prepare plutonium for disposition. • Continue expediting the removal of plutonium from the state of South Carolina. • Continue transition to the dilute and dispose strategy, including technical development and analysis. • Continue the National Environmental Policy Act (NEPA) process for the dilute and dispose program. • Maintain the Waste Solidification Building (WSB) facility in a lay-up configuration while the Department determines options for future use. • Support the ongoing maintenance of critical programmatic documents including the Program Execution Plan, integrated schedules, performance measures, memoranda of agreement, analysis for plutonium disposition, and interface control documents; and minimal required infrastructure and erosion control maintenance required to comply with safety and environmental standards.	• Continue to provide surveillance and packaging capabilities for surplus pits and plutonium. • Continue pit disassembly and oxide conversion activities to prepare plutonium for disposition. • Continue expediting the removal of plutonium from the state of South Carolina. • Continue transition to the dilute and dispose strategy, including technical development and analysis. • Maintain the WSB facility in a lay-up configuration while the Department determines options for future use. • Support the ongoing maintenance of critical programmatic documents including the Program Execution Plan, integrated schedules, performance measures, memoranda of agreement, analysis for plutonium disposition, and interface control documents; and required infrastructure and erosion control maintenance to comply with safety and environmental standards.	• The increase supports the ramping up to hire and train new personnel at LANL in support of the dilute and dispose strategy and activities associated with expediting removal of plutonium from the state of South Carolina.
U.S. Uranium Disposition $47,159,000	**U.S. Uranium Disposition $32,886,000**	**U.S. Uranium Disposition -$14,273,000**
• Downblend or ship for downblending HEU to produce LEU consistent with specifications. • Continue to downblend HEU into high assay LEU metal for research reactor fuel and for Mo-99 targets, in support of replacing current HEU	• Downblend or ship for downblending HEU to produce LEU consistent with specifications. • Continue to downblend HEU into high assay LEU metal for research reactor fuel and for Mo-99 targets, in support of replacing current HEU	• The decrease reflects the completion of the Repurposed Excess Uranium (REU) campaign.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Request
demand for research reactor fuel and medical isotope production with LEU-based solutions. • Continue implementing the ULTB program. • Accelerate cleanup of legacy material in Y-12's Building 9206, Building 9212 and the A5D to reduce risk. • Support tracking and analyzing enriched uranium supply and demand needs and commitments of DNN mission goals. • Support development of a material disposition capability.	demand for research reactor fuel and medical isotope production with LEU-based solutions. • Accelerate cleanup of legacy material in Y-12's Building 9206, Building 9212 and the A5D to reduce risk. • Support tracking and analyzing enriched uranium supply and demand needs and commitments of DNN mission goals. • Complete HEU Thorium discards.	
International Plutonium Disposition $1,000,000	**International Plutonium Disposition $1,879,000**	**International Plutonium Disposition +$879,000**
• Continue to implement plutonium management strategies with international partners.	• Continue to implement plutonium management strategies with international partners.	• The increase supports two Plutonium Management Experts Group (PMEG) workshops to collaborate on technical areas of mutual interest.

Material Management and Minimization
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	9,140	9,140	12,319	18,398	+6,079
Minor Construction	N/A	N/A	49,897	49,897	58,110	45,872	-12,238
Total, Capital Operating Expenses	N/A	N/A	**59,037**	**59,037**	**70,429**	**64,270**	**-6,159**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	9,140	9,140	9,341	9,547	+206
Material Intro Hood #1, LANL	5,000	0	0	0	1,715	1,242	-473
Material Intro Hood #2, LANL	5,000	0	0	0	0	2,200	+2,200
Replace DMO-2 Capability, LANL	5,728	0	0	0	1,263	1,782	+519
Install Second Calorimeter, LANL	5,000	0	0	0	0	2,377	+2,377
Install In-Line NDA Capability, LANL	2,250	0	0	0	0	750	+750
Install Second Can Opener, LANL	500	0	0	0	0	500	+500
Inline Storage Glovebox #2, LANL	18,273	0	0	0	0	0	0
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**9,140**	**9,140**	**12,319**	**18,398**	**+6,079**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	30,897	30,897	31,577	32,272	+695
K-Area Protected Area Perimeter Entry Control Facility (ECF), SR	8,000	0	0	0	0	8,000	+8,000
Down Blend Process Optimization, SR	10,000	1,000	7,000	7,000	2,000	0	-2,000
Characterizaton and Storage Pad, SR	19,500	1,000	12,000	12,000	6,500	0	-6,500
Mobile Melt-Consolidate System, SR	10,633	0	0	0	5,033	5,600	+567
105-K Entry Control Facility Expansion, SR	13,000	0	0	0	13,000	0	-13,000
Total, Minor Construction Projects	**N/A**	**N/A**	**49,897**	**49,897**	**58,110**	**45,872**	**-12,238**
Total, Capital Summary	**N/A**	**N/A**	**59,037**	**59,037**	**70,429**	**64,270**	**-6,159**

Outyears for Material Management and Minimization
Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	22,062	20,463	17,317	10,415	N/A
Minor Construction	32,982	33,708	34,450	35,208	N/A
Total, Capital Operating Expenses	**55,044**	**54,171**	**51,767**	**45,623**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	9,757	9,972	10,191	10,415	N/A
Material Intro Hood #1, LANL	1,094	949	0	0	0
Material Intro Hood #2, LANL	2,200	600	0	0	0
Replace DMO-2 Capability, LANL	1,414	1,184	85	0	0
Install Second Calorimeter, LANL	2,300	323	0	0	0
Install In-Line NDA Capability, LANL	750	750	0	0	0
Inline Storage Glovebox #2, LANL	4,547	6,685	7,041	0	0
Total, Capital Equipment (including MIE)	**22,062**	**20,463**	**17,317**	**10,415**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	32,982	33,708	34,450	35,208	N/A
Total, Minor Construction Projects	**32,982**	**33,708**	**34,450**	**35,208**	**0**
Total, Capital Summary	**55,044**	**54,171**	**51,767**	**45,623**	**0**

Global Material Security

Overview

Global Material Security (GMS) directly contributes to national security efforts to reduce global nuclear security threats. The GMS Program focuses on preventing terrorists and other actors from obtaining nuclear and radioactive material to use in an improvised nuclear device (IND) or a radiological dispersal device (RDD). GMS works with partner countries to improve the security of vulnerable materials and facilities and to improve partners' capacity to detect, disrupt, and investigate illicit trafficking of these materials. GMS promotes long-term sustainability of its capacity-building support by working with partners to develop their own regulations and inspections processes, training infrastructure, maintenance approaches, exercise and performance testing programs, life-cycle planning, and nuclear security culture. To enhance its reach and effectiveness, GMS provides technical and policy support to multilateral organizations, including the International Atomic Energy Agency (IAEA) and International Criminal Police Organization (INTERPOL). As part of an ongoing strategic analysis process, GMS is also exploring innovative approaches, technologies, and tools to adapt to emerging threats.

GMS consists of three subprograms: International Nuclear Security (INS), Radiological Security (RS), and Nuclear Smuggling Detection and Deterrence (NSDD).

Global Material Security
Funding[a]

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Request	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Global Material Security				
International Nuclear Security	46,339	58,000	66,391	+8,391
Radiological Security				
Domestic Radiological Security	127,433	147,002	101,000	-46,002
International Radiological Security	78,907	78,907	73,340	-5,567
Nuclear Smuggling Detection and Deterrence	154,429	159,000	159,749	+749
International Contributions (non-add)[a]	5,399	0	0	0
Total, Global Material Security	**407,108**	**442,909**	**400,480**	**-42,429**

Outyears for Global Material Security Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Global Material Security				
International Nuclear Security	67,785	68,598	69,558	72,688
Radiological Security				
Domestic Radiological Security	103,121	104,358	105,819	110,581
International Radiological Security	74,880	75,779	76,840	80,298
Nuclear Smuggling Detection and Deterrence	163,104	165,061	167,372	174,904
Total, Global Material Security	**408,890**	**413,796**	**419,589**	**438,471**

[a] The international contributions received by the GMS program shown in the FY 2019 Enacted column are a non-add to the FY 2019 Appropriation. The amount received in FY 2019 totaled $5,398,655 including $1,759,390 from Canada, $3,294,559 from the United Kingdom, and $344,706 from Finland.

Global Material Security
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Global Material Security:	
International Nuclear Security: This increase supports new initiatives, bilateral engagements with new partners, and additional activities for countering unmanned aerial systems.	**+8,391**
Domestic Radiological Security: The decrease reflects the acceleration of FY 2021 Cesium Irradiator Replacement Program activities using funding provided in FY 2020 above the budget request, the one-time FY 2020 increase to address the cesium irradiator container breach in Seattle, Washington, and an initial effort to establish a training program with state and local governments to train first responders.	**- 46,002**
International Radiological Security: The decrease reflects the acceleration of FY 2021 international activities using funding provided in FY 2020 above the budget request.	**- 5,567**
Nuclear Smuggling Detection and Deterrence: No major change to the budget.	**+749**
Total, Global Material Security	**- 42,429**

Global Material Security
International Nuclear Security

Description

The mission of the International Nuclear Security (INS) subprogram is to lead U.S. international nuclear security efforts by working with partner countries, international organizations, and non-governmental organizations to prevent theft and sabotage of nuclear material and nuclear facilities worldwide.

For more than 20 years, NNSA has leveraged the expertise of the U.S. National Laboratories to mitigate the risks of terrorists acquiring nuclear material. While these efforts have dramatically improved nuclear security around the world, gaps remain. Global expansion of the civilian nuclear fuel cycle, evolving adversary capabilities and tactics, and the availability of technologies to execute attacks presents a significant concern for global nuclear security.

INS is evolving along with these threats and risks. While highly enriched uranium and weapons-grade plutonium remain a top priority, INS is also concerned with other high-risk materials and the impacts of attacks on facilities that could adversely impact U.S. national security. INS is also examining emerging issues and technologies that could raise concerns or benefits for nuclear security in the future, and is developing innovative approaches to integrate these findings into partner country engagements.

Accordingly, INS works across the globe to secure weapons-usable nuclear materials, nuclear power plants and nuclear fuel cycle facilities, research and non-power reactors, and materials in transit.

Across all of these areas, INS employs a risk-informed approach to prioritize engagements with partner countries to identify and reduce threats and risks by enhancing or building effective and comprehensive nuclear security regimes with its partners. Effective and comprehensive nuclear security regimes must include laws, regulations, procedures, people, organizations, training, and technologies, all of which must be integrated with operations, safety, the public, and the international community.

Based on a careful assessment of threats and vulnerabilities, INS implements nuclear security upgrades in select partner countries. INS also assists partner countries with developing and implementing effective nuclear security regulations, training and educational programs, secure transportation, protective force capabilities, material control and accounting capabilities, cyber security programs for nuclear facilities, and insider threat mitigation programs, including strong nuclear security culture, and drills and exercises. INS also partners with the International Atomic Energy Agency (IAEA) to develop nuclear security support centers (NSSCs) that help maintain expertise and serve as resources for nuclear security capacity building.

INS leverages a variety of partnerships in pursuit of its mission, including partnerships with the IAEA, the World Institute for Nuclear Security, the Global Partnership against the Spread of Weapons and Materials of Mass Destruction, and several non-government organizations. Partnering with the IAEA is of key importance to ensure that global norms and standards are strong and to reinforce the nuclear security risk-reduction work done bilaterally. INS works with the IAEA on the development of nuclear security guidance documents, advanced training, advisory missions, and technical meetings.

Highlights of the FY 2021 Budget Request

- Lead international efforts to promote White House initiatives on cyber security related to nuclear facilities, insider threat mitigation, and transport security.
- Partner with up to 50 countries to improve nuclear security through specialized training, regulations development, and performance testing.
- Strengthen global nuclear security with continued partnership with the IAEA to enhance partner capabilities to mitigate threats.
- Develop and expand partnerships, including with nuclear newcomers to inform nuclear security regulations and best practices.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
International Nuclear Security $58,000,000	**International Nuclear Security $66,391,000**	**International Nuclear Security +$8,391,000**
• Lead high priority nuclear security initiatives to improve cyber security for nuclear facilities, mitigate insider threats, and improve transportation security practices with over 40 countries. • Provide upgrades to nuclear security facilities in five priority partner countries, based on thorough assessments of threats and vulnerabilities. • Engage with 40 countries to develop effective and comprehensive nuclear security regimes. Continue partnership with IAEA to support implementation of three international training courses and revision of IAEA technical documents and guidelines. • Continue partnering with the IAEA to strengthen and support the NSSCs, advisory missions, educational programs, and subject matter expert assistance to build sustainable, effective global nuclear security. • Organize activities to promote awareness of the available technologies and associated capabilities that enable an effective nuclear security regime. • Examine nuclear security-related emerging threats and technologies.	• Collaborate with international partners to conduct six regional workshops related to cyber security for nuclear facilities, transport security, and insider threat mitigation. • Expand and deepen bilateral engagement with up to 50 total countries, including nuclear newcomers. • Continue partnership with IAEA to support the implementation of three international training courses, the revision of IAEA technical documents and guidelines, and the capabilities of five NSSCs. • Secure nuclear material in five partner countries. • Lead U.S. international engagement with 10 or more partners on solutions to counter the threat that unmanned aerial systems may pose to nuclear facilities. • Develop innovative solutions to address nuclear security concerns and create risk reduction opportunities, including consideration of security impacts of emerging technologies such as advanced reactors.	• This increase supports bilateral engagements with new partners and additional activities for countering unmanned aerial systems.

Global Material Security
Radiological Security

Description

The Radiological Security (RS) subprogram supports U.S. national security and plays an important role in preventing radiological terrorism at home and abroad by working with partners to secure high risk radioactive materials that could be used in act of terrorism. Radioactive materials are used worldwide to diagnose and treat diseases such as cancer, sterilize medical instruments, and monitor the structural integrity of materials. These same radioactive materials, if not adequately protected, pose a risk to the safety and security of our Nation.

RS reduces the risk of radioactive materials falling into the wrong hands and being used in a radiological dispersal device (RDD)—better known as a "dirty bomb." An RDD could have devastating economic and psychological consequences for our country and create panic. To mitigate that risk, RS applies a "cradle-to-grave" approach to radioactive source security by addressing vulnerabilities during all phases of the lifecycle of radioactive sources including production, transportation, use, and end-of-life management. RS leverages the unique technical capabilities of the Department of Energy National Laboratories to develop and implement sustainable security solutions that take into consideration the needs of radioactive source users. RS has developed an integrated and comprehensive approach to security by working closely with government partners, the response community, and the private sector.

To mitigate the risk of radiological terrorism, RS employs a three-pronged strategy, which includes **protecting** high-activity sources, **removing** disused or orphaned sources, and **reducing** the reliance on radioactive sources to achieve permanent risk reduction.

RS protects high-activity radioactive materials located at vulnerable locations (e.g. hospitals, universities, etc.) in the United States and in other high priority countries worldwide. RS works in close cooperation with national, regional, and local partners and the IAEA. RS implements state-of-the art security solutions to protect radioactive material at volunteer sites. Additionally, RS deploys mobile source transit systems for sources used in the well-logging and radiography industries.

Where appropriate, RS addresses the vulnerabilities of disused or orphaned radioactive sources by removing, consolidating into secure storage and, if possible, disposing of those sources. On a case-by-case limited basis, RS also repatriates high-risk U.S.-origin sources from international locations.

RS reduces the reliance on radioactive sources by encouraging the transition away from radioactive sources to more secure alternatives. This permanently reduces risk either by eliminating high-activity sources or by obviating the need to introduce sources in the first place. Technologies for alternatives are maturing, and new technologies are entering the market. RS works to disseminate information on these alternative technologies and provides cost-sharing incentives to volunteer organizations willing to transition away from cesium irradiators to non-radioisotopic technologies through its domestic-focused Cesium Irradiator Replacement Project (CIRP). RS is on track to achieve its goal of supporting voluntary elimination of cesium-137 blood irradiators in the United States by December 31, 2027, as outlined in the FY 2019 National Defense Authorization Act. As CIRP is voluntary, RS continues to conduct outreach and provide cost-sharing incentives to encourage participation.

Two current initiatives highlight how these strategies are integrated. The Global Cesium Security Initiative (GCSI) prioritizes international efforts to ensure effective security for cesium-based devices worldwide, including replacing cesium-137 irradiators with x-ray technology, enhancing physical protection of cesium-137 with In-Device Delay, and enhancing the national infrastructure within a country to effectively respond to an event involving the attempted theft of a cesium-137 source. The RadSecure 100 effort expands what was accomplished under the 2020 Cities Initiative including strategies for permanent risk reduction, security enhancements, and enhanced local law enforcement response activities to the top 100 major metropolitan areas in the United States. Additionally, RadSecure 100 incorporates security enhancements for mobile sources, transportation security, cybersecurity, and insider threat awareness activities.

Highlights of the FY 2021 Budget Request

- Enhance capabilities to manage disused sources safely and securely, both domestically as well as internationally.
- Continue to support the transition to alternative technologies globally by replacing high-activity radioactive sources with non-radioisotopic alternative technologies and expanding education and outreach to encourage broader adoption of technologies that do not use high-activity radioactive sources.
- Continue and expand partnerships with industry to identify new security solutions to address risks and increase security of radioactive materials.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Radiological Security $225,909,000	**Radiological Security $174,340,000**	**Radiological Security -$51,569,000**
Domestic Radiological Security $147,002,000 **International Radiological Security $78,907,000**	**Domestic Radiological Security $101,000,000** **International Radiological Security $73,340,000**	**Domestic Radiological Security -$46,002,000** **International Radiological Security -$5,567,000**
• Complete the remediation of, reconstruction of, and return to full operation the building affected by the breached cesium-137 source in Seattle, Washington. • Under GCSI, focus on securing and eliminating cesium-based devices in priority countries worldwide through tailored protect, remove, or reduce strategies. • Replace 85 devices that use high-activity radioactive sources with non-radioisotopic alternative technologies (75 replacements domestically and 15 internationally). • Expand education and outreach to encourage a broader adoption of technologies that do not use high-activity radioactive sources. • Under the 2020 Cities Initiative, secure the remaining buildings with high risk quantities of cesium-137 and cobalt-60 in major metropolitan areas of the United States. • Deploy the mobile source tracking systems for use on field-deployed sources. • Secure an additional 60 buildings with high-priority radioactive sources (30 domestic sites and 30 international sites). • Continue to collaborate with industry on "security by design" to make source-based devices and facilities inherently more secure in the manufacturing process. • Work with appropriate authorities and sites to sustain previously installed security upgrades domestically and internationally.	• Replace 85 devices that use high-activity radioactive sources with non-radioisotopic alternative technologies (70 replacements domestically and 15 internationally). • Remove an additional 600 excess and unwanted sealed sources from locations throughout the United States. • Secure an additional 60 buildings with high-priority radioactive sources (30 domestic sites and 30 international sites). • Expand deployment of security and tracking solutions for mobile sources and work with new industry partners to develop security solutions for other make and models of mobile sources. • Lead cybersecurity initiatives at high-priority radioactive material sites in the United States and around the world, providing partners with best practices, training, and other technical assistance. • Work with industry and regulators to enhance security of high-activity radioactive sources during transportation across the United States and internationally. • Continue expanding the security by design cooperation with industry to make source based devices and facilities inherently more secure. • Provide local law enforcement with the capability to train their officers locally on the threat of radioactive materials and how to respond to the potential theft of radioactive materials.	• The decrease reflects the acceleration of FY 2021 Cesium Irradiator Replacement Program activities using funding provided in FY 2020 above the budget request, the one-time FY 2020 increase to address the cesium irradiator container breach in Seattle, Washington, and an initial effort to establish a training program with state and local governments to train first responders. • The decrease for International Radiological Security reflects the acceleration of FY 2021 irradiator replacements and critical security enhancements into FY 2020.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Continue the removal of an additional 750 excess and unwanted sealed sources from locations throughout the United States. • Recover and dispose or securely store disused or orphaned radioactive sources in other countries. • Domestically, in the top 20 highest priority areas, increase coordination between sites that have high-priority radioactive material and local law enforcement agencies responsible for protecting those sites.		

Global Material Security
Nuclear Smuggling Detection and Deterrence

Description

The Nuclear Smuggling Detection and Deterrence (NSDD) subprogram works to build capacity of partner countries to detect, disrupt, and investigate smuggling of nuclear and radiological materials that could be used in acts of terrorism. NSDD provides partners with tailored radiation detection systems based on assessments of high risk smuggling pathways and operational environments. NSDD partners include international law enforcement, intelligence, and border security organizations. To facilitate long term systems operability, NSDD works with partners to develop their capabilities in operation and management, training, and maintenance. NSDD coordinates closely with other U.S. Government agencies (e.g. Departments of Homeland Security, State, Defense, and Justice) to maximize the impact of U.S. Government resources, and collaborates with international organizations such as INTERPOL, IAEA, the Border Monitoring Working Group, the World Customs Organization, and the Global Initiative to Combat Nuclear Terrorism (GICNT) to promote consistency in global efforts to counter nuclear smuggling.

NSDD continues to address remaining gaps in global counter-nuclear smuggling capabilities by expanding program initiatives and partnerships, in consideration of the evolving nature and emergence of new global threats. NSDD cooperates with partners to establish and sustain a defense-in-depth detection strategy at:

- High priority points of entry, including land border crossings, rail crossings, airports, and sea ports.
- In frontier areas, working with border and maritime security agencies at green and blue borders.
- Within the interior of states, partnering with police and security services.

NSDD works with partners to build necessary capabilities, in a manner commensurate with partners' existing security practices, by conducting trainings, workshops, drills, exercises, and related events designed to test, evaluate, and improve system performance and effectiveness.

NSDD will continue work to expand and deepen existing relationships with partner country agencies that enhance policies and procedures, operations, training, maintenance, and assessment of deployed systems. These collaborations are also designed to enhance the partner's investigative capabilities to include capacity building focused on analysis of detected material. Together, these tools are integral to a practical, comprehensive, and effective counter nuclear smuggling operability.

Highlights of the FY 2021 Budget Request

- Equip priority points of entry with radiation detection systems and provide associated training and maintenance support to help counter the threat of illicit trafficking of special nuclear material; Eastern Europe and Central Asia are priority regions.
- Strengthen radiation detection and interdiction capabilities in high-risk frontier areas, through Green Border Security Initiative and Maritime Vector Partnership projects.
- Strengthen interdiction and inspection capabilities of Internal Security and Law Enforcement (ISLE) units making intelligence-driven decisions to patrol and protect internal checkpoints, major public events, and possible adversary targets of interest such as critical infrastructure.
- Continue to build and evaluate partners' capabilities in five performance areas critical to a baseline counter nuclear smuggling operability: policies and procedures, operations, training, maintenance, and assessment.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nuclear Smuggling Detection and Deterrence ($159,000,000)	**Nuclear Smuggling Detection and Deterrence ($159,749,000)**	**Nuclear Smuggling Detection and Deterrence (+ $749,000)**
• Provide 28 additional mobile and man-portable systems for use at internal checkpoints in countries along known smuggling routes. • Strengthen radiation detection and interdiction capabilities of green border security teams and improve surveillance capabilities near sensitive and high risk areas on green borders. • Provide enhanced capabilities to interior law enforcement and intelligence agencies responding to counter smuggling information alerts and investigations. • Provide radiation detection capabilities for targeted screening at high-risk airports in the Middle East, the Caucasus, and Southeast Asia. • Provide identification, inspection, and radiation detection tools for interdiction of small maritime vessels in the Indian Ocean and the Arabian Sea. • Establish five new bilateral partner country engagements to strengthen nuclear forensics capabilities, bringing total nuclear forensics engagement count to 44 partner countries. • Equip an additional 27 official crossing points to close key gaps in the global nuclear detection architecture in eight countries and continue connecting radiation detection sites to national communications systems in three countries. • Continue to support capacity building activities in prioritized countries where systems have been installed, but are not indigenously sustained. • Transition 65 radiation detection systems to indigenous sustainment and maintain engagements to encourage continued	• Complete a total of 30 projects along points of entry, enhancing radiation detection capabilities at: 25 large-scale border crossing points, four man-portable Passenger Rail Initiative deployments, and one pilot Strategic Airport Initiative deployment. • Enhance frontier area interdiction and inspection capabilities by completing 10 projects providing radiation localization and identification equipment, along with ancillary interdiction equipment, to enforcement units by completing: five Green Border Security Initiative projects and five Maritime Vector Partnership projects. • Strengthen interdiction, inspection, and investigation capabilities of internal security and law enforcement units by completing one pilot project providing radiation detection equipment, ancillary equipment, and human resource development. • Conduct approximately 60 drills, workshops, or exercises, and complete over 100 training courses, to advance partner country capabilities in operating, maintaining, and managing radiation detection measures, to include investigations. • Continue to support capacity building activities in prioritized partner countries to promote and evaluate system operability. The number of partner agencies maintaining a baseline counter nuclear smuggling operability will be reported as a performance metric.	• No major change to the budget.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
commitment, maintain visibility, and share best practices. • Conduct approximately 60 events, workshops, or exercises to advance partner country capabilities in radiation detection, equipment maintenance, and forensics.		

Global Material Security
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	0	0	0	0	0
Minor Construction	N/A	N/A	10,000	10,000	8,000	0	-8,000
Total, Capital Operating Expenses	N/A	N/A	**10,000**	**10,000**	**8,000**	**0**	**-8,000**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	0
Enhanced Training Center (ETC), Y-12	18,000	0	10,000	10,000	8,000	0	-8,000
Total, Minor Construction Projects	**N/A**	**N/A**	**10,000**	**10,000**	**8,000**	**0**	**-8,000**
Total, Capital Summary	**N/A**	**N/A**	**10,000**	**10,000**	**8,000**	**0**	**-8,000**

Outyears for Global Material Security

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	0	0	0	0	N/A
Minor Construction	0	0	0	0	N/A
Total, Capital Operating Expenses	**0**	**0**	**0**	**0**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	0	0	0	0	N/A
Total, Capital Equipment (including MIE)	**0**	**0**	**0**	**0**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	N/A
Total, Minor Construction Projects	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**0**	**0**	**0**	**0**	**0**

Nonproliferation and Arms Control

Overview

The Nonproliferation and Arms Control (NPAC) program enhances U.S. national security and facilitates legitimate civil nuclear cooperation by reducing global nuclear proliferation threats. NPAC applies the unique technical and policy expertise that resides in NNSA to support U.S. nonproliferation and arms control objectives to prevent proliferation, ensure peaceful nuclear uses, and enable verifiable nuclear reductions. The NPAC program pursues these objectives through four subprograms: (1) International Nuclear Safeguards; (2) Nuclear Export Controls; (3) Nuclear Verification; and (4) Nonproliferation Policy, that respectively: strengthen international nuclear safeguards; control the proliferation of nuclear material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and develop programs and strategies to anticipate and address nuclear nonproliferation and arms control challenges and opportunities. Across these programmatic functions, NPAC continues to play a leading role in addressing current threats while also drawing upon its expertise to anticipate emerging nonproliferation challenges and develop technical approaches and potential policy solutions.

Nonproliferation and Arms Control
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Nonproliferation and Arms Control				
International Nuclear Safeguards	52,429	57,000	56,200	-800
Nuclear Export Controls	34,134	36,000	35,500	-500
Nuclear Verification	32,273	34,000	33,500	-500
Nonproliferation Policy	10,867	13,000	13,508	+508
Total, Nonproliferation and Arms Control	**129,703**	**140,000**	**138,708**	**-1,292**

Outyears for Nonproliferation and Arms Control
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Nonproliferation and Arms Control				
International Nuclear Safeguards	57,742	58,435	59,255	61,921
Nuclear Export Controls	36,623	37,065	37,582	39,274
Nuclear Verification	34,256	34,663	35,148	36,730
Nonproliferation Policy	13,000	13,157	13,341	13,941
Total, Nonproliferation and Arms Control	**141,621**	**143,320**	**145,326**	**151,866**

Nonproliferation and Arms Control
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Nonproliferation and Arms Control	
International Nuclear Safeguards: Additional funding provided in FY 2020 enabled completion of Phase I of the enrichment testing and training platform. The FY 2021 request returns the project to its baseline; the slight reduction will have no effect on NPAC's ability to provide critical support to the International Atomic Energy Agency (IAEA).	**-800**
Nuclear Export Controls: No major change to the budget.	**-500**
Nuclear Verification: No major change to the budget.	**-500**
Nonproliferation Policy: No major change to the budget.	**+508**
Total, Nonproliferation and Arms Control	**-1,292**

Nonproliferation and Arms Control
International Nuclear Safeguards

Description

The International Nuclear Safeguards (NS) subprogram strengthens the international nuclear safeguards regime and the IAEA's ability to verify peaceful uses of nuclear materials and facilities and detect non-compliance. NS manages programs to strengthen the technology and human capital base to support safeguards, oversees activities of the U.S. Support Program (USSP) to IAEA Safeguards, collaborates with the IAEA and other partners to enhance the implementation of safeguards norms and best practices, oversees implementation of U.S. Additional Protocol (AP) and Voluntary Offer Agreement (VOA) safeguards requirements and activities at DOE sites and facilities, and assesses the physical protection of U.S.-obligated nuclear materials overseas. NS also provides support to the IAEA to monitor Iran's compliance with applicable United Nations Security Council resolutions.

Highlights of the FY 2021 Budget Request

- Implement ongoing DOE/NNSA statutory and treaty/agreement obligations and authorities, including: a) physical security assessment visits for U.S.-obligated materials at foreign facilities; b) implementing U.S. safeguards obligations under the U.S. Voluntary Offer Agreement/Additional Protocol; and c) international safeguards training.
- Support effective IAEA safeguards of Iran's nuclear program in accordance with applicable United Nations Security Council resolutions.
- Refine development of a nonproliferation enrichment testing and training platform to develop and test technologies and approaches for transfer to the IAEA and in collaboration with select foreign partners.
- Strengthen the U.S. safeguards technology and human capital base to meet projected U.S. and IAEA resource requirements.
- Promote universal adherence to the highest standard of IAEA Safeguards Agreements: a Comprehensive Safeguards Agreement with an Additional Protocol, and a modified Small Quantities Protocol (where applicable).
- Provide customized training and outreach to more than 45 foreign partners to enable effective and efficient IAEA safeguards implementation around the world.
- Field test and finalize advanced safeguards approaches for the IAEA for Gas Centrifuge Enrichment Plants (GCEPs).
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through capacity building in nuclear safeguards.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
International Nuclear Safeguards ($57,000,000)	**International Nuclear Safeguards ($56,200,000)**	**International Nuclear Safeguards (-$800,000)**
• Continue developing safeguards technologies and approaches to: (1) address electrochemical processing based on R&D conducted with international partners; (2) improve efficiencies of safeguards; and (3) enhance inspector capabilities in high-priority areas such as enhanced in-field collection analysis and detection of undeclared activities. • Transfer five safeguards tools to foreign partners or international organizations to meet identified safeguards deficiencies. • Initiate development of a nonproliferation enrichment testing and training platform for the development and testing of technologies approaches for transfer to the IAEA. • Improve safeguards concepts and approaches for new facilities and fuel cycles; strengthen Safeguards by Design approaches directly with designers and nuclear industry; and analyze the implications of emerging technology to international safeguards applications. • Enhance partnerships with the IAEA and advanced nuclear partners to field test advanced safeguards technologies to enhance state declarations and optimize safeguards resource allocations. • Expand and enhance efforts to promote universal adherence to IAEA safeguards agreements and good practices in safeguards implementation by providing customized training and outreach to more than 50 countries.	• Continue developing safeguards technologies and approaches to: (1) address electrochemical processing based on R&D conducted with international partners; (2) improve efficiencies of safeguards; and (3) enhance inspector capabilities in high-priority areas such as enhanced in-field collection analysis and detection of undeclared activities. • Transfer five safeguards tools to foreign partners or international organizations to meet identified safeguards deficiencies. • Continue developing a nonproliferation enrichment testing and training platform for the development and testing of technologies approaches for transfer to the IAEA. • Improve safeguards concepts and approaches for new facilities and fuel cycles; strengthen Safeguards by Design approaches directly with designers and nuclear industry, especially for advanced reactor designs; and analyze the implications of emerging technology to international safeguards applications. • Enhance partnerships with the IAEA and advanced nuclear partners to field test advanced safeguards technologies to enhance state declarations and optimize safeguards resource allocations. • Expand and enhance efforts to promote universal adherence to IAEA safeguards agreements and good practices in safeguards implementation by providing customized training and outreach to more than 50 countries.	• Additional funding provided in FY 2020 enabled completion of Phase I of the enrichment testing and training platform. FY 2021 funding returns the project to its baseline; the slight reduction will have no effect on NPAC's ability to provide critical support to the IAEA.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories. • Maintain qualified and knowledgeable safeguards staff at the U.S. National Laboratories and IAEA through maintenance of early and mid-career safeguards positions at U.S. National Laboratories and safeguards training courses. • Cooperate with Department of State, Department of Defense, the Nuclear Regulatory Commission, and the IAEA to develop guidelines and policies to help prioritize the allocation of safeguards resources in ways that will strengthen the IAEA's ability to detect, deter, and investigate undeclared nuclear activities. • Continue to provide, on an as-requested basis, technical and technology assistance to the IAEA to monitor Iran's nuclear program, and to prepare for possible involvement in denuclearization activities in the Democratic People's Republic of Korea (DPRK). • Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations. • Lead six to eight U.S. Government assessments of the physical protection of U.S.-obligated nuclear materials at foreign facilities.	• Support non-power peaceful uses activities in the developing world as a means to further enhance safeguards implementation and regulatory effectiveness. • Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories. • Maintain qualified and knowledgeable safeguards staff at the U.S. National Laboratories and IAEA through maintenance of early and mid-career safeguards positions at U.S. National Laboratories and safeguards training courses. • Cooperate with Department of State, Department of Defense, the Nuclear Regulatory Commission, and the IAEA to develop guidelines and policies to help prioritize the allocation of safeguards resources in ways that will strengthen the IAEA's ability to detect, deter, and investigate undeclared nuclear activities. • Continue to provide, on an as-requested basis, technical and technology assistance to the IAEA to monitor Iran's nuclear program, and to prepare for possible involvement in denuclearization activities in DPRK. • Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations. • Lead four U.S. Government assessments of the physical protection of U.S.-obligated nuclear materials at foreign facilities.	

Nonproliferation and Arms Control
Nuclear Export Controls

Description

The Nuclear Export Controls (NC) subprogram facilitates peaceful nuclear cooperation by strengthening domestic and global capacity to detect and prevent the illicit transfer of nuclear and dual-use materials, equipment, and technology. NC implements and oversees programs that: provide technical and end-user evaluations of U.S. export license applications; provide technical support that enhances the U.S. Government's capacity to detect and interdict illicit nuclear and dual-use commodity technology transfers to foreign programs of concern; provide technical support to the multilateral nonproliferation export control regimes; and strengthen foreign partner national systems of export control consistent with U.S. policy and the multilateral supplier regimes.

Highlights of the FY 2021 Budget Request

- Implement ongoing DOE/NNSA statutory obligations and authorities, including U.S. nonproliferation and export control activities (export license reviews and interdiction case technical reviews).
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through international capacity-building and engagement in export controls.
- Provide nonproliferation assessments of emerging nuclear technologies and other emerging strategic risks and challenges to anticipate and prevent nuclear technological surprises.
- Continue the Export Compliance Assistance Program (ECAP) to strengthen export control awareness training across DOE and NNSA facilities.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nuclear Export Controls $36,000,000	**Nuclear Export Controls $35,500,000**	**Nuclear Export Controls -$500,000**
• Train U.S. export enforcement officials in partnership with the Export Enforcement Coordination Center (E2C2) to familiarize them with controlled nuclear and dual-use material, equipment, and technology, which could be used for Weapons of Mass Destruction (WMD) purposes, and collaborate with the Custom and Border Protection's (CBP) National Targeting Center. E2C2 coordinates and deconflicts enforcement activities among federal agencies. • Perform approximately 6,000 technical reviews of U.S. export licenses for nuclear and dual-use commodities, continue to provide state-of-the-art technology assessments to the multilateral control regimes, and provide training courses for DOE and other U.S. Government officials regarding evolving export controlled technologies and proliferation concerns. • Support the U.S. Government enforcement community by providing approximately 3,000 technical analyses for interdiction cases per year and unique analytical products regarding proliferation trends. • Maintain and support information technology systems to support export control licensing, interdiction analysis, and the multilateral nonproliferation export control regimes. • In coordination with Department of State, provide technical reviews of proposed transfers of items, materials, goods, and technology to Iran in accordance with applicable United Nations Security Council resolutions.	• Engage approximately 35 foreign partners on a bilateral and regional basis to strengthen their national export control systems to help prevent illicit trafficking in nuclear and WMD-related materials, commodities, and technology. This is accomplished through training and technical cooperation to exchange export control best practices and build the capacity of key countries to serve as trainers for their region. • Train U.S. export enforcement officials to familiarize them with controlled nuclear and dual-use material, equipment, and technology, which could be used for WMD purposes, and collaborate with the CBP's National Targeting Center. Provide technical reach back to U.S. export enforcement agencies • Perform approximately 6,000 technical reviews of U.S. export licenses for nuclear and dual-use commodities, continue to provide state-of-the-art technology assessments to the multilateral control regimes, and provide training courses for DOE and other U.S. Government officials regarding evolving export controlled technologies and proliferation concerns. • Support the U.S. Government enforcement community by providing approximately 3,000 technical analyses for interdiction cases per year and unique analytical products regarding proliferation trends. • Maintain and support information technology systems to support export control licensing,	• No major change to the budget.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Complete development of the new ECAP to deploy export control awareness training across DOE and NNSA facilities targeted at the Federal workforce, and coordinated with the local Export Control Compliance Officers at each National Laboratory.	interdiction analysis, and the multilateral nonproliferation export control regimes. • In coordination with Department of State, provide technical reviews of proposed transfers of items, materials, goods, and technology to Iran in accordance with applicable United Nations Security Council resolutions. • Continue to support ECAP which deploys export control awareness training across DOE and NNSA facilities targeted at the Federal workforce, and coordinated with the local Export Control Compliance Officers at each National Laboratory.	

Nonproliferation and Arms Control
Nuclear Verification

Description

The Nuclear Verification (NV) subprogram reduces proliferation concerns by enabling verifiable arms reductions, including through support for negotiation and implementation of U.S. nonproliferation and arms control treaties and agreements. The NV subprogram conducts applied technology development, testing, evaluation, maintenance, and deployment of monitoring technologies and develops monitoring and verification approaches that are informed through analysis of the potential impacts of initiatives on DOE and NNSA National Laboratories, Plants, and Sites. Additionally, the NV subprogram maintains technical readiness to negotiate and implement future nuclear fuel cycle transparency agreements and conducts U.S.-led missions to monitor, verify, disable, and dismantle proliferant nuclear fuel cycle programs around the world. The subprogram performs monitoring activities under existing agreements and supports U.S. Government review of other countries' compliance with their treaty and agreement obligations. The subprogram also contributes to U.S. policy development for treaty and agreement implementation while ensuring U.S. requirements for maintaining a safe, secure, and reliable nuclear weapons stockpile are met.

Highlights of the FY 2021 Budget Request

- Implement ongoing DOE/NNSA treaty/agreement obligations and authorities, including implementing DOE obligations under the Plutonium Production Reactor Agreement (PPRA), Chemical Weapons Convention, and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).
- Support compliance analysis and implementation of the New Strategic Arms Reduction Treaty (START) and the Open Skies Treaty.
- Maintain technical and manpower readiness through regular exercises and trainings for future U.S.-led monitoring and verification of denuclearization activities.
- Continue development of a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so to determine and assess key event parameters.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nuclear Verification $34,000,000	**Nuclear Verification $33,500,000**	**Nuclear Verification -$500,000**
• Support U.S. implementation, compliance analyses, and policy development for the New START Treaty and the Open Skies Treaty, and ensure DOE/NNSA equities and interests are protected. • Under the terms of the PPRA, conduct three monitoring visits in Russia to ensure that Russian plutonium oxide is stored securely and that shutdown Russian plutonium production reactors remain in a non-operational status, and host Russian monitors on annual PPRA monitoring visit to shutdown U.S. plutonium production reactors at the Savannah River and Hanford Sites. • Continue national security and nuclear nonproliferation activities related to nuclear testing limitations, including those that support monitoring and verification capabilities under the Comprehensive Nuclear-Test-Ban Treaty (CTBT) International Monitoring System to complement and strengthen U.S. nuclear explosion monitoring and verification capabilities. • Provide seismic monitoring capacity-building training under the Seismic Cooperation Program to foreign partner institutions to enhance their abilities to detect and analyze possible nuclear explosions, as well as mitigate geophysical hazards. • Develop, test, and evaluate verification procedures and technologies; train and exercise specialized U.S. verification teams; and conduct operations planning to maintain short-notice readiness for U.S.-led monitoring and verification	• Support U.S. implementation and compliance analyses and policy development for the New START Treaty and the Open Skies Treaty, and ensure DOE/NNSA equities and interests are protected. • Under the terms of the PPRA, conduct up to three monitoring visits in Russia to ensure that Russian plutonium oxide is stored securely and that shutdown Russian plutonium production reactors remain in a non-operational status, and host Russian monitors on annual PPRA monitoring visit to shutdown U.S. plutonium production reactors at the Savannah Site. • Continue national security and nuclear nonproliferation activities related to nuclear testing limitations, including those that support monitoring and verification capabilities under the CTBT International Monitoring System and International Data Centre that complement and strengthen U.S. nuclear explosion monitoring and verification capabilities. • Provide seismic monitoring capacity-building under the Seismic Cooperation Program to foreign partner institutions to enhance their abilities to detect and analyze possible nuclear explosions, as well as mitigate geophysical hazards. • Develop, test, and evaluate verification procedures and technologies; train and exercise specialized U.S. verification teams; and conduct operations planning to maintain short-notice readiness for U.S.-led monitoring and verification	• No major change to the budget.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
of nuclear weapons material production programs and associated denuclearization efforts around the world. • Develop, test, and evaluate warhead and weapons material monitoring and verification procedures and technologies, and support international technical engagements to address long-term verification challenges. • Collaborate with the United Kingdom under the 1958 Mutual Defense Agreement and with other partner countries to develop potential common approaches to nuclear verification issues. • Implement U.S. and DOE legal obligations under the Chemical Weapons Convention, including maintaining accreditation of the Organization for the Prohibition of Chemical Weapons (OPCW) laboratory at Lawrence Livermore National Laboratory (LLNL). • Develop a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so, to determine and assess key event parameters.	of nuclear weapons material production programs and associated denuclearization efforts around the world. • Develop, test, and evaluate warhead and weapons material monitoring and verification procedures and technologies, and support international technical engagements to address long-term verification challenges. • Collaborate with the United Kingdom under the 1958 Mutual Defense Agreement and with other partner countries to develop potential common approaches to nuclear verification issues. • Implement U.S. and DOE legal obligations under the Chemical Weapons Convention, including maintaining accreditation of the Organization for the Prohibition of Chemical Weapons (OPCW) laboratory at LLNL.	

Description

The Nonproliferation Policy (NP) subprogram continues its longstanding role in developing and implementing programmatic efforts that anticipate and address enduring and emerging nuclear nonproliferation challenges and opportunities. NP continues to serve as the DOE/NNSA lead in supporting the negotiation and implementation of nonproliferation agreements and requirements set forth in the Atomic Energy Act of 1954, as amended, and stemming from national nonproliferation initiatives, agreements, and treaties, including the Nuclear Non-Proliferation Treaty. In addition, the NP subprogram continues to lead efforts to develop DOE/NNSA nonproliferation policy guidance on nuclear technology transfer and nuclear fuel cycle issues, undertakes activities to improve and update multilateral nuclear supplier arrangements, and identifies supplier vulnerabilities and potential gaps in supplier arrangements. The NP subprogram also implements the regulations at 10 CFR Part 810 (Part 810), which control the export of unclassified nuclear technology and assistance, pursuant to Section 57b(2) of the Atomic Energy Act of 1954, as amended. Additionally, the NP subprogram supports activities focused on reducing the danger of nuclear war and preventing the proliferation of nuclear weapons in critical regions, and undertakes studies and analyses focused on enduring and evolving proliferation challenges, supporting DOE/NNSA efforts to anticipate nuclear surprises on the horizon and to evolve programmatic responses accordingly.

Highlights of the FY 2021 Budget Request

- Implement ongoing DOE/NNSA statutory obligations and authorities, including: U.S. nonproliferation and export control activities (123 Agreements, and Part 810 authorizations).
- Provide technical leadership as part of the U.S. delegation in the Nuclear Suppliers Group (NSG) through the provision of expertise to ensure NSG controls keep pace with technological, industry, and proliferation developments.
- Develop technical and policy solutions that support the implementation of high-level Administration initiatives to address pressing proliferation concerns, including the effective implementation of the Nuclear Non-Proliferation Treaty and related elements of the nonproliferation regime.
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through international outreach.
- Provide nonproliferation assessments of emerging nuclear technologies and other emerging strategic risks and challenges.
- Continue implementation of legal authority to impose monetary civil penalties for violations of the Part 810 regulation.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nonproliferation Policy $13,000,000	**Nonproliferation Policy $13,508,000**	**Nonproliferation Policy +$508,000**
• Process 40-50 Part 810 specific authorization applications and requests for amendments, including end-use and technical reviews. Review specific authorization reports and notifications for compliance with Part 810 and the scope of the existing license. • Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination. • Continue Part 810 Process Improvement procedures, focusing on expanding external outreach and reducing processing times. • Conduct Track 1.5 engagements with India, Pakistan, Saudi Arabia, Egypt, Burma, and China, to reduce the danger of nuclear war and discourage the spread of nuclear weapons in critical regions. • Grow South Asia-focused social media and web-based projects to promote U.S. interests in the region. • Continue work with NSG to strengthen controls on nuclear exports, including amendments of the NSG Guidelines and control lists, consistent with advancements in the technology, commercial, and proliferation domains. • Launch a U.S.-led advanced nuclear technology review of the NSG control lists. • Expand NSG industry outreach activities to establish a consistent dialog with industry on the impacts of technological and commercial developments on the NSG Guidelines.	• Process 40-50 Part 810 specific authorization applications and requests for amendments, including end-use and technical reviews. Review specific authorization reports and notifications for compliance with Part 810 and the scope of the existing license. • Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination. • Continue Part 810 Process Improvement procedures, focusing on expanding external outreach and reducing processing times. Conduct • Conduct Track 1.5 engagements with India, Pakistan, Saudi Arabia, Egypt, Burma, and China, to reduce the danger of nuclear war and discourage the spread of nuclear weapons in critical regions. • Continue to grow South Asia-focused social media and web-based projects to promote U.S. interests in the region. • Continue work with NSG to strengthen controls on nuclear exports, including amendments of the NSG Guidelines and control lists, consistent with advancements in the technology, commercial, and proliferation domains. • Execute a U.S.-led advanced nuclear technology review of the NSG control lists. • Continue NSG industry outreach activities to establish a consistent dialog with industry on the impacts of technological and commercial developments on the NSG Guidelines.	• No major change to the budget.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Conclude work on the NSG Information Sharing System (NISS) Web and Mobile Applications, versions 1.1 and 1.0. • Conduct analyses of the impact of NPT-related developments on U.S. nonproliferation interests. • Support U.S. deliverables for the 2020 NPT Review Conference and 50th Anniversary of the NPT entry into force, including a peaceful use package and a "Creating the Conditions Working Group" to examine conditions for nuclear disarmament. • Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding Administrative Arrangements. • Lead the preparations for the U.S.-Republic of Korea 123 Agreement under the High Level Bilateral Commission. • Conduct analyses of accountancy information in support of the implementation of 23 bilateral 123 Agreements. • Implement the new 10 CFR Part 810 civil penalty authority.	• Continue upgrading the NISS Web and Mobile Applications. • Conduct analyses of the impact of NPT-related developments on U.S. nonproliferation interests. • Support implementation of U.S. deliverables for the 2025 NPT Review Cycle. • Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding Administrative Arrangements. • Lead the preparations for the U.S.-Republic of Korea 123 Agreement under the High Level Bilateral Commission. • Conduct analyses of accountancy information in support of the implementation of 23 bilateral 123 Agreements.	

Defense Nuclear Nonproliferation
National Technical Nuclear Forensics R&D

Overview

Technical nuclear forensics is the examination and evaluation of discovered or seized nuclear materials and devices or, in cases of nuclear explosions or radiological dispersals, of detonation signals and post-detonation debris. The National Technical Nuclear Forensics R&D (NTNF R&D) program supports R&D that develops and maintains advanced technical nuclear forensics analysis capabilities at the National Laboratories that can support time-critical decisions in the event of a nuclear or radiological incident and assist in determining the origin of interdicted materials or nuclear devices. NNSA leverages this expertise at the National Laboratories to maintain a field response capability in the event of an incident requiring nuclear forensics analysis capabilities in which the responders are integrated with their interagency partners to provide a whole of government response.

NNSA has established this new program in FY 2021 to take on a more active leadership role in NTNF. NTNF R&D will support requirements emerging from interagency activities such as the National Science and Technology Council's *Nuclear Defense R&D Strategic Plan for Fiscal Years 2020-2024* and the 2019-2020 National Academies' study on technical nuclear forensics.

Highlights of the FY 2021 Budget Request

- Consolidate support for developing NTNF technical capability and expertise at the DOE National Laboratories due to changing interagency priorities.
- Develop advanced technical nuclear forensics analysis capabilities that support U.S. Government response to a nuclear event.

National Technical Nuclear Forensics R&D
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
National Technical Nuclear Forensics R&D	**0** [a]	**0** [a]	**40,000**	**+40,000**

Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR):

- FY 2019 Transferred: SBIR: $0; STTR: $0
- FY 2020 Projected: SBIR: $0; STTR: $0
- FY 2021 Request: SBIR: $1,460; STTR: $0

Outyears for National Technical Nuclear Forensics R&D
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
National Technical Nuclear Forensics R&D	**40,840**	**41,330**	**41,909**	**43,795**

[a] Prior to FY 2021, funding for the National Technical Nuclear Forensics R&D was funded under the Defense Nuclear Nonproliferation Research and Development, Nuclear Detonation Detection subprogram.

National Technical Nuclear Forensics R&D
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Nonproliferation	
National Technical Nuclear Forensics R&D: The increase reflects the reallocation of funding from Defense Nuclear Nonproliferation Research and Development's Nuclear Detonation Detection subprogram and plan for NNSA to take on a more active leadership role in NTNF.	**+40,000**
Total, National Technical Nuclear Forensics R&D	**+40,000**

Defense Nuclear Nonproliferation
National Technical Nuclear Forensics R&D

Description

The NTNF R&D program develops and maintains advanced technical nuclear forensics analysis capabilities at the National Laboratories that can support time-critical decisions in the event of a nuclear or radiological incident and assist in determining the origin of interdicted materials or nuclear devices. NNSA leverages this expertise at the National Laboratories to maintain a field response capability where nuclear forensics analysis capabilities and responders are integrated with their interagency partners to provide a whole of government response.

NNSA has established this new program in FY 2021 to take on a more active leadership role in NTNF. NTNF R&D will support requirements emerging from interagency activities, including the National Science and Technology Council's *Nuclear Defense R&D Strategic Plan for Fiscal Years 2020-2024* and the 2019-2020 National Academies' study on technical nuclear forensics. NTNF R&D will also sustain subject matter expertise to support exercises, mentoring, training, expert reach-back, and real-world contingency operations.

The program will support research designed to significantly decrease the time required for nuclear forensics to provide technical information on the design characteristics and material origins of a detonated device. This will require sustained investment over multiple years, with the goal of a transformational impact to decision and policy makers. Research activities will seek to develop and apply advanced, rapid, and novel non-destructive analysis methods to fallout debris evidence; enhance weapons codes or develop novel codes to expedite computational efficiency; and develop an accelerated and adaptive data evaluation framework.

NTNF R&D will also support efforts into intentional forensics, which includes the introduction of benign and persistent tracer materials in fuel fabrication and other process steps of the weapons cycle. These materials could serve as diagnostic markers to help identify the origins of future special nuclear material samples recovered outside of institutional control.

Highlights of the FY 2021 Budget Request

- Establish a consolidated program to advance capabilities that can significantly improve time-critical decision support, improving analytical solutions timelines.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
National Technical Nuclear Forensics R&D **$0**	**National Technical Nuclear Forensics R&D** **$40,000,000**	**National Technical Nuclear Forensics R&D** **+$40,000,000**
• Technical nuclear forensics activities were previously supported within the DNN R&D Nuclear Detonation Detection subprogram in FY 2020 [$12,000,000]	• Continue to improve technical nuclear forensic capabilities, including the technical means to assess bulk samples of Special Nuclear Material (SNM) and the technical preparedness for scenarios of surface-interacting nuclear detonations. • Address research priorities that support the technical capability of operational assets and verification and validation activities. • Improve the process to generate actionable information from laboratory measurements, modeling efforts, and expert evaluations in the analysis of fallout debris samples following a nuclear detonation. • Reduce timelines and uncertainties in priority measurements. • Inform future capability requirements by assessing the benefits of incorporating emerging technical methods during operational exercises, baseline assessments, and other targets of opportunity. • Expand understanding of the complex dynamic processes that form fallout debris particles within the nuclear fireball and apply this knowledge to improve measurable chemical and physical signatures. • Conduct precision nuclear data measurements on relevant actinide cross sections, and SNM target irradiation experiments, and transition these results into modeling codes in support of the nuclear forensics, nuclear science, and stockpile stewardship communities. • Identify specific persistent markers or taggants that do not impact material performance, and develop feasible approaches, including advanced manufacturing	• Increase reflects reallocation of funding from the DNN R&D Nuclear Detonation Detection subprogram, as well as increased overall funding to address the loss of technical capability and expertise at the DOE national laboratories due to changing interagency priorities, and to develop advanced technical nuclear forensics analysis capabilities that support U.S. Government response to a nuclear event.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
	techniques, for injecting markers into fabrication process steps. • Discover signatures related to origin, provenance, and design intent of interdicted nuclear material and weapons material components. • Design and implement technical methods that reveal a material's prior processing steps, surface treatments, contacts with other surfaces, and storage conditions. • Explore analytical techniques to characterize recent changes to environmental conditions or exposure to contaminants. • Develop methods for age-dating, characterization of changes to morphological features or trace element compositions due to environmental conditions, and extracting and identifying environmental contaminants in uranium and plutonium oxides and metals.	

Defense Nuclear Nonproliferation Research and Development

Overview

The Defense Nuclear Nonproliferation Research and Development (DNN R&D) program directly contributes to nuclear security by developing U.S. capabilities to detect and characterize global nuclear security threats in full coordination with the goals and priorities of U.S. Government mission stakeholders. Specifically, the DNN R&D program makes these strategic contributions through the innovation of U.S. technical capabilities to detect, identify, locate, and characterize: (1) foreign nuclear material production and weapons development activities; (2) movement and illicit diversion of special nuclear materials; and (3) global nuclear detonations. These foundational capabilities are either advanced to higher maturities, transitioned to stakeholders for further development for mission-specific applications, or transferred to operational performers. The DNN R&D program also supports foundational capabilities that can be leveraged across nonproliferation, counterterrorism, and emergency response mission areas.

To meet national and Departmental nuclear security requirements, DNN R&D leverages the unique facilities and scientific skills of DOE, academia, and industry to perform research and demonstrate advances in capabilities, develop prototypes, and produce sensors for integration into operational systems.

The FY 2021 Budget Request transfers funding for R&D in technical nuclear forensics from the DNN R&D Nuclear Detonation Detection subprogram to the new DNN National Nuclear Technical Forensics R&D program.

Defense Nuclear Nonproliferation Research and Development (DNN R&D)

Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Request
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	281,521	299,046	235,220	-63,826
Nuclear Detonation Detection	195,749	196,617	236,531	+39,914
Nonproliferation Fuels Development	98,300	15,000	0	-15,000
Nonproliferation Stewardship Program	0	22,500	59,900	+37,400
Total, Defense Nuclear Nonproliferation R&D	**575,570**	**533,163**	**531,651**	**-1,512**

Outyears for Defense Nuclear Nonproliferation Research and Development (DNN R&D)

Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	240,160	243,042	246,445	269,246
Nuclear Detonation Detection	241,498	244,396	247,818	258,970
Nonproliferation Fuels Development	0	0	0	0
Nonproliferation Stewardship Program	61,158	61,892	62,758	65,582
Total, Defense Nuclear Nonproliferation R&D	**542,816**	**549,330**	**557,021**	**593,798**

Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR):

- FY 2019 Transferred: SBIR: $10,491; STTR: $0
- FY 2020 Projected: SBIR: $11,214; STTR: $0
- FY 2021 Request: SBIR: $11,535; STTR: $0

Defense Nuclear Nonproliferation Research and Development
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Defense Nuclear Nonproliferation Research and Development	
Proliferation Detection (PD): The decrease reflects the transfer of funds for nuclear test detection activities to the Nuclear Detonation Detection subprogram.	-63,826
Nuclear Detonation Detection (NDD): The increase reflects the transfer of funds for nuclear test detection activities from the Proliferation Detection subprogram to the Nuclear Detonation Detection subprogram to consolidate research focused on the detection of nuclear detonations, offset by the transfer of funds for nuclear technical forensics to the new DNN National Technical Nuclear Forensics R&D program.	+39,914
Nonproliferation Fuels Development (NFD): No funding is requested to continue this activity in FY 2021.	-15,000
Nonproliferation Stewardship Program: The increase reflects support for additional targeted, long-term activities to ensure the Nation is technically prepared to meet future nonproliferation goals and unanticipated threats through relevant science and technology, testbeds and research environments for high-priority nonproliferation applications.	+37,400
Total, Defense Nuclear Nonproliferation Research and Development	**-1,512**

Description

The Proliferation Detection (PD) R&D subprogram develops technologies to: detect foreign nuclear weapons programs; support nuclear arms control treaty verification by improving compliance monitoring capabilities; and support national nuclear security and interdiction of nuclear materials outside of regulatory control. PD efforts are aligned along these major functional areas: (1) Nuclear Weapons Development and Material Production Detection efforts targeted toward the detection, identification, location, and characterization of foreign nuclear weapons program activities; (2) Nuclear Weapons and Material Security efforts targeted toward nuclear security and nuclear arms control treaty monitoring and verification tools and applications, operational interdiction, radiological source replacement, and nuclear security efforts across NNSA; and (3) Nonproliferation Enabling Capabilities efforts supporting a broad R&D base to bring new, cross-cutting technologies to multi-use applications across NNSA and the interagency community, including a field experiment and demonstration program and university research program. The field demonstration program integrates research and experimental testbed activities to advance technology in support of the Nation's treaty verification and monitoring needs.

PD's university program is comprised of three consortia which link universities and DOE National Laboratories to address basic research shortfalls in nuclear nonproliferation and security and treaty compliance monitoring.

Highlights of the FY 2021 Budget Request

- Advance U.S. detection and characterization capabilities of foreign nuclear weapons production activities through 2026.
- Achieve improvements in U.S. capabilities in nuclear weapons and material security applications, including detecting special nuclear material (SNM) and its movement, incident response, and nuclear safeguards.
- Continue programmatic activities for nonproliferation and foreign weapons program activity monitoring through continued execution and development of national testbeds for validation of new sensors, equipment, and capabilities.
- Provide a broad, underlying set of technical capabilities that support nuclear nonproliferation and nuclear security.
- Continue to align with the developing interagency requirements for early detection of nuclear proliferation, including SNM production and cross-cutting artificial intelligence and other data science applications.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Proliferation Detection $299,046,000	**Proliferation Detection $235,220,000**	**Proliferation Detection -$63,826,000**
• Develop and demonstrate advances in U.S. capabilities to detect and characterize foreign nuclear programs, especially in denied areas as follows: advance sensor and algorithm development and demonstrate technologies and methods in operational testbed environments for SNM production detection, including the continued development of a new reactor monitoring testbed; understand the impact of alternative manufacturing techniques and advance stand-off detection methods for weaponization activities to monitor the potential technical breakout of foreign weapons programs; innovate new analytic approaches to move proliferation detection to earlier timelines and close information gaps in denied areas. • Develop and demonstrate advances in U.S. capabilities to strengthen nuclear security across the threat spectrum as follows: advance detection and imaging for SNM detection, and incident response, including device diagnostics and stabilization tools with improved understanding of improvised nuclear device performance, focusing on both high explosives and nuclear materials; and address nuclear data gaps in support of nuclear security. • Begin development of a new testbed to support field experiments associated with the Low Yield Nuclear Monitoring effort, designed to improve U.S. capabilities to detect and characterize low yield, and evasively conducted underground nuclear explosions.	• Continue to develop and demonstrate advances in U.S. capabilities to detect and characterize foreign nuclear programs, especially in denied areas as follows: advance sensor and algorithm development and demonstrate technologies and methods in operational testbed environments for SNM production detection, including the continued development of a new reactor monitoring testbed; understand the impact of alternative manufacturing techniques and advance stand-off detection methods for weaponization activities to monitor the potential technical breakout of foreign weapons programs; and innovate new analytic approaches to move proliferation detection to earlier timelines and close information gaps in denied areas. • Continue to develop and demonstrate advances in U.S. capabilities to strengthen nuclear security across the threat spectrum as follows: advance detection and imaging for SNM detection, develop and advance safeguards technology, and address nuclear data gaps in support of nuclear security. • Continue to support the Integrated University Program to address basic gaps in nuclear nonproliferation and treaty compliance monitoring.	• The decrease reflects the transfer of funds for nuclear test detection activities to the Nuclear Detonation Detection subprogram.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
• Support the Integrated University Program to address basic gaps in nuclear nonproliferation and treaty compliance monitoring.		

Description

The Nuclear Detonation Detection (NDD) subprogram develops and builds space sensors for the nation's operational nuclear test treaty monitoring and related capabilities; produces and updates the regional geophysical datasets and analytical understanding of waveform and radionuclide signatures to enable operation of the nation's ground-based nuclear detonation monitoring networks; and supports activities to improve U.S. capabilities to detect and characterize low yield and evasively conducted underground nuclear explosions.

Highlights of the FY 2021 Budget Request

- Produce nuclear detonation detection satellite payloads in accordance with the negotiated schedule with the United States Air Force (USAF).
- Support the payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads in accordance with host satellite schedules.
- Conduct research in seismic and radionuclide detection to support national capability in terrestrial and airborne monitoring and analysis methods.
- Continue to align with developing interagency requirements for early detection of nuclear proliferation through low-yield nuclear explosion monitoring.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nuclear Detonation Detection $196,617,000	**Nuclear Detonation Detection $236,531,000**	**Nuclear Detonation Detection +$39,914,000**
• Fabricate Global Burst Detector (GBD) nuclear detonation detection payloads and test assets for Global Positioning System (GPS) block IIIF satellites in accordance with the negotiated schedule with the USAF. Support payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads. Continue development and production of sensor-laden payloads for launch into geosynchronous orbit. Continue required engineering development work and satellite interface coordination to support payload design updates for future satellite blocks for GBDs and other U.S. Nuclear Detonation Detection System payloads. • Improve pre- and post-detonation technical nuclear forensic capabilities, including the technical means to assess bulk samples of SNM, and the technical preparedness for scenarios of surface-interacting nuclear detonations. Address research priorities that undergird the technical capability of operational assets and that support verification and validation activities. • Improve capabilities of geophysical models, datasets, and analyses of seismic signals from underground detonations and improve technologies to detect radionuclide releases, including integrating products of field and laboratory test campaigns into methods to improve event discrimination and yield estimation.	• Continue to fabricate GBD nuclear detonation detection payloads and test assets for GPS block IIIF satellites in accordance with the negotiated schedule with the USAF. Support payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads. Continue development and production of sensor-laden payloads for launch into geosynchronous orbit. Continue required engineering development work and satellite interface coordination to support payload design updates for future satellite blocks for GBDs and other U.S. Nuclear Detonation Detection System payloads. • Continue to improve capabilities of geophysical models, datasets, and analyses of seismic signals from underground detonations and improve technologies to detect radionuclide releases, including integrating research products of field and laboratory test campaigns into methods to improve event discrimination and yield estimation. • Continue development of a new testbed to support field experiments associated with the Low Yield Nuclear Monitoring effort, designed to improve U.S. capabilities to detect and characterize low yield and evasively conducted underground nuclear explosions.	• The increase reflects the transfer of funds for nuclear test detection activities from the Proliferation Detection subprogram to the Nuclear Detonation Detection subprogram, to consolidate activities focused on the detection of nuclear detonations. • The increase is partially offset by a reduction in the Space Nuclear Detonation Detection subprogram due to completion of one-time long-lead procurements and integration costs. • The increase is also partially offset by the transfer of funding for technical nuclear forensics from the DNN R&D Nuclear Detonation Detection subprogram to the new National Nuclear Technical Forensics R&D program.

Description

DNN R&D efforts to design and develop new high-density, high-assay LEU fuels are concluded with FY 2020 funding.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nonproliferation Fuels Development $15,000,000	**Nonproliferation Fuels Development $0**	**Nonproliferation Fuels Development -$15,000,000**
• Continue research and development into high-density, high-assay LEU fuels.	• No funding requested.	• No funding is requested to continue this activity in FY 2021.

Defense Nuclear Nonproliferation Research and Development
Nonproliferation Stewardship Program

Description

The NNSA bears principal responsibility for the mission to prevent would-be proliferant states and terrorists from obtaining nuclear weapons, nuclear or radioactive materials, and related technology and expertise. NNSA's Office of Defense Nuclear Nonproliferation (DNN) accomplishes this mission in partnership with other U.S. Government and international agencies. Mission partners executing these missions within NNSA and across the government deploy operational technologies, conduct early-stage R&D, and develop deployable technologies based on prior R&D, existing expertise, and operating facilities resident in the federal enterprise. All of these actions rely on foundational nonproliferation technical competencies held at DOE/NNSA's laboratories, sites, and plants.

The U.S. nuclear weapons program and domestic nuclear fuel cycle infrastructure have significantly narrowed or declined since the Cold War era, leaving the Nation without the large cadre of DOE/NNSA laboratory personnel with hands-on experience in sensitive fuel-cycle processes and nuclear weapons development and testing. At the same time, advances in manufacturing, computing, and other key areas, combined with easier access to nuclear-related information, are creating more diverse pathways to developing a nuclear weapon and have reduced and evolved the footprint and associated signatures of those activities. The convergence of these trends coupled with the continued threat of covert proliferation is making the task of nuclear nonproliferation more difficult.

The Nonproliferation Stewardship Program (NSP) subprogram employs a focused and prioritized strategy, deliberate planning, and dedicated resources to ensure foundational technical competencies at DOE/NNSA are sustained and available to support the Nation's nonproliferation missions. The NSP takes inventory of expertise, technologies, and facilities at DOE, and identifies current and future gaps in capabilities. To ensure the technical agility needed to support nonproliferation missions and anticipated threats, the NSP sustains and develops foundational nonproliferation technical competencies by providing targeted, long-term support for enabling infrastructure, science and technology, and an expert workforce.

Highlights of the FY 2021 Budget Request

- Continue testbed development needed to address immediate capability shortfalls in support of nonproliferation missions.
- Support additional targeted, long-term activities to ensure the Nation is prepared to meet future nonproliferation goals and unanticipated threats through relevant science and technology, testbeds and research environments, and modern expertise needed for high-priority nonproliferation applications, including competencies in uranium and plutonium sciences and engineering.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nonproliferation Stewardship Program $22,500,000	**Nonproliferation Stewardship Program $59,900,000**	**Nonproliferation Stewardship Program +$37,400,000**
• Establish the nonproliferation stewardship program to build and sustain foundational technical competencies, based on enabling infrastructure, science and technology, and workforce expertise, that are needed to support future nonproliferation missions and anticipate threats. • Conduct initial program planning, a strategic review of current capabilities, and establishment of an implementation plan to build and sustain foundational nonproliferation technical competencies. • Begin initial testbed development needed to address immediate capability shortfalls in support of nonproliferation missions.	• Continue testbed development needed to address immediate capability shortfalls in support of nonproliferation missions. • Support additional targeted, long-term activities, including relevant science and technology, testbeds and research environments, and modern expertise needed for high-priority nonproliferation applications, which includes competencies in uranium and plutonium sciences and engineering.	• The increase reflects additional targeted funding for enabling infrastructure, science and technology, and an expert workforce to ensure the Nation is prepared to meet future nonproliferation goals and unanticipated threats.

Defense Nuclear Nonproliferation Research and Development
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	44,170	44,170	45,142	46,135	+993
Minor Construction	N/A	N/A	1,139	1,139	25,841	1,190	-24,651
Total, Capital Operating Expenses	N/A	N/A	**45,309**	**45,309**	**70,983**	**47,325**	**-23,658**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	44,170	44,170	45,142	46,135	+993
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**44,170**	**44,170**	**45,142**	**46,135**	**+993**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	1,139	1,139	1,164	1,190	+26
LYNM PE-1 - Infrastructure Upgrades, NNSS	6,777	0	0	0	6,777	0	-6,777
Nonproliferation Testbed Tunnel Excavation, NNSS	17,900	0	0	0	17,900	0	-17,900
Total, Minor Construction Projects	**N/A**	**N/A**	**1,139**	**1,139**	**25,841**	**1,190**	**-24,651**
Total, Capital Summary	**N/A**	**N/A**	**45,309**	**45,309**	**70,983**	**47,325**	**-23,658**

Outyears for Defense Nuclear Nonproliferation Research and Development

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	47,150	48,187	49,247	50,330	N/A
Minor Construction	1,216	1,243	1,270	1,298	N/A
Total, Capital Operating Expenses	**48,366**	**49,430**	**50,517**	**51,628**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	47,150	48,187	49,247	50,330	N/A
Total, Capital Equipment (including MIE)	**47,150**	**48,187**	**49,247**	**50,330**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	1,216	1,243	1,270	1,298	N/A
Total, Minor Construction Projects	**1,216**	**1,243**	**1,270**	**1,298**	**0**
Total, Capital Summary	**48,366**	**49,430**	**50,517**	**51,628**	**0**

Nonproliferation Construction

Overview

The Nonproliferation Construction Program consolidates construction projects that directly contribute to reducing global nuclear security threats and is a key component of the Department of Energy (DOE), National Nuclear Security Administration (DOE/NNSA) integrated nonproliferation, counterterrorism, and emergency response strategy.

Highlights of the FY 2021 Budget Request

In FY 2021, the Administration is continuing termination activities with prior year funding for the Mixed Oxide Fuel Fabrication (MFFF) project and continuing to pursue a dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy consists of blending plutonium with an inert mixture, packaging it for safe storage and transport, and disposing of it in a geologic repository. The Surplus Plutonium Disposition (SPD) project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the State of South Carolina.

Nonproliferation Construction
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Request	FY 2021 Request	FY 2021 Request vs FY 2020 Request
Nonproliferation Construction				
U.S. Construction				
18-D-150, Surplus Plutonium Disposition Project (SPD), SRS				
SPD Total Estimated Cost (TEC)	0	54,000	118,000	+64,000
SPD Other Project Costs (OPC)	0	25,000	30,589	+5,589
Subtotal, 18-D-150, Surplus Plutonium Disposition Project (SPD), SRS	**0**	**79,000**	**148,589**	**+69,589**
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS				
MFFF Total Estimated Cost (TEC)	70,000	0	0	0
MFFF Other Project Costs (OPC)	150,000	220,000	0	-220,000
Subtotal, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	**150,000**	**220,000**	**0**	**-220,000**
Subtotal, U.S. Construction	**220,000**	**299,000**	**148,589**	**-150,411**
Total, Nonproliferation Construction	**220,000**	**299,000**	**148,589**	**-150,411**

Outyears for Nonproliferation Construction
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Nonproliferation Construction				
U.S. Construction				
18-D-150, Surplus Plutonium Disposition Project (SPD), SRS				
SPD Total Estimated Cost (TEC)	101,234	91,858	89,262	0
SPD Other Project Costs (OPC)	14,471	9,921	11,930	36,345
Subtotal, 18-D-150, Surplus Plutonium Disposition Project (SPD), SRS	**115,705**	**101,779**	**101,192**	**36,345**
21-D-xxx, LANL Project	**16,657**	**50,781**	**67,069**	**84,368**
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS				
MFFF Total Estimated Cost (TEC)	0	0	0	0
MFFF Other Project Costs (OPC)	0	0	0	0
Subtotal, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	**0**	**0**	**0**	**0**
Subtotal, U.S. Construction	**132,362**	**152,560**	**168,261**	**120,713**
Total, Nonproliferation Construction	**132,362**	**152,560**	**168,261**	**120,713**

Nonproliferation Construction Projects
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Nonproliferation Construction Projects	
U.S. Construction:	
18-D-150, Surplus Plutonium Disposition (SPD) Project: The increase reflects the continuation of early site preparation and long-lead procurement activities, as well as continued development of the design in support of Critical Decision (CD)-2 and CD-3 for all major systems supporting the plutonium processing gloveboxes.	**+69,589**
99-D-143, Mixed Oxide (MOX) Fuel Fabrication Facility: Contractual termination settlement is complete. Termination activities will continue with available prior year balances. No new funds are requested.	**-220,000**
Total, Nonproliferation Construction Projects	**-150,411**

Nonproliferation Construction
U.S. Construction

Description

The Nonproliferation Construction program will continue termination activities of the Mixed Oxide Fuel Fabrication (MFFF) facility with available prior year funding and continue to pursue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy consists of blending plutonium with an inert mixture, packaging it for safe storage and transport, and disposing of it in a geologic repository. The Surplus Plutonium Disposition (SPD) project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the State of South Carolina.

On May 10, 2018, in accordance with Section 3121 of the National Defense Authorization Act for Fiscal Year 2018 (FY 2018 NDAA) and Section 309 of the Consolidated Appropriations Act, 2018, the Department of Energy (DOE) notified Congress that the Secretary of Energy exercised his authority to waive the requirement to use funds to construct the Mixed Oxide (MOX) facility. On June 7, 2018, the U.S. District Court granted the State of South Carolina's motion for a Preliminary Injunction and required the DOE to continue construction. On October 9, 2018, the U.S. Court of Appeals lifted the Preliminary Injunction, allowing the Department to move forward with termination of construction of the MOX facility. On October 10, 2018, NNSA notified the MOX prime contractor that its contract was terminated. On January 8, 2019, the U.S. Court of Appeals issued its decision to stay the preliminary injunction on termination issued earlier by the Federal Court in Aiken County, SC. This final ruling held the State of South Carolina lacks standing to challenge the decision to terminate the MOX Project.

NNSA continues termination of the MOX prime contract and transition of the stewardship and disposition of the project's property, plant, equipment and records by the Management and Operating (M&O) contractor. The Department has reached a global settlement agreement with MOX Services to resolve all outstanding issues before the United States Court of Federal Claims (COFC), the Court of Appeals for the Federal Circuit and final termination of the MOX contract. The settlement amount is $186 million and this agreement represents a resolution that provides the best value to the American taxpayer and completes closeout nearly two years ahead of projections. The comprehensive settlement agreement resolves all legal issues with the exception of potential claims under the False Claims Act, or for any civil or criminal fraud. Final project termination and asset disposition will be completed by FY 2021.

The SPD project obtained CD-1 on December 19, 2019 following completion of the Independent Cost Estimate (ICE) in November 2019 by the NNSA Office of Cost Estimating and Performance Evaluation (CEPE). In FY 2020, the project will obtain CD-3A approval to initiate early site preparation including, but not limited to, concrete cuts and new openings in walls, security modification, and demolition and removal activities.

In FY 2021, the SPD project will continue to execute early site preparation and long-lead procurements activities, will complete the final design and project documentation required to support a third phase of CD-3A, and initiate final site preparation activities. In addition, this will allow for the installation of a second-floor mezzanine within the 105-K Final Storage Area (FSA). All partial critical decisions will include the final design documents and all required project management documentation to include safety document maturity, safeguards and security, operations, and a baseline estimate and schedule for the early construction activities. Furthermore, FY 2021 scope continues the development of the preliminary design for the major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, security, etc.), structural analysis, design safety analysis, and security vulnerability assessment. The project will also continue supporting National Environmental Policy Act (NEPA) requirements, technology maturation, risk management, project management, and baseline development.

Other Project Cost (OPC)

This activity supports all other costs related to a project that are not included in the total estimated cost (TEC). OPCs include, but are not limited to: research and development, conceptual design and conceptual design report, cold start-up and commissioning costs, NEPA documentation, project data sheet preparation, siting, and permitting requirements. These costs are part of the approved baseline and the total project cost (TPC) of the project.

Total Estimated Costs (TEC)

This activity supports the design, long-lead equipment procurement, site preparation, and construction of the project.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
U.S. Construction $299,000,000	**U.S. Construction $148,589,000**	**U.S. Construction -$150,411,000**
18-D-150, Surplus Plutonium Disposition (SPD) Project $79,000,000	**18-D-150, Surplus Plutonium Disposition (SPD) Project $148,589,000**	**18-D-150, Surplus Plutonium Disposition (SPD) Project +$69,589,000**
SPD OPC $25,000,000	**SPD OPC $30,589,000**	**SPD OPC +$5,589,000**
• Support activities such as project management and project controls support, procurement support, design authority activities, operations and security support, and start-up planning.	• Support activities such as project management and project controls support, procurement support, design authority activities, operations and security support, and start-up planning.	• The increase supports the continuation of other project costs for the SPD project.
SPD TEC $54,000,000	**SPD TEC $118,000,000**	**SPD TEC +$64,000,000**
• Support Preliminary Design. • Continue design of gloveboxes and specialized engineered electrical equipment. • Initiate early site preparations and long-lead procurements of gloveboxes and specialized engineered electrical equipment upon CD-3A approval.	• Support Preliminary Design. • Continue design of gloveboxes and specialized engineered electrical equipment. • Complete the final design and project documentation required to support a third phase of CD-3A.	• The increase reflects the scheduled execution of early site preparation and long lead procurements activities, as well as continuing the maturation of the design in support of CD-2/3 for all major systems supporting the plutonium processing gloveboxes.
MOX Fuel Fabrication Facility (MFFF) $220,000,000	**MOX Fuel Fabrication Facility (MFFF) $220,000,000**	**MOX Fuel Fabrication Facility (MFFF) $0**
MFFF OPC $220,000,000	**MFFF OPC $0**	**MFFF OPC -$220,000,000**
• Continue termination activities such as continued demolition and disposition of facilities/equipment/materials/records, transition of the MFFF into a layup condition, and activities to maintain and preserve facilities and assets in a safe state in support of a future mission, litigation and financial audits. Project closeout documents will also be developed.	• Complete termination activities such as continued demolition and disposition of facilities/equipment/materials/records, transition of the MFFF into a layup condition, and activities to maintain and preserve facilities and assets in a safe state in support of a future mission, litigation and financial audits. Project closeout documents will be finalized.	• Decrease reflects the completion of the contractual termination settlement. Termination activities will continue with available prior year balances.
MFFF TEC $0	**MFFF TEC $0**	**MFFF TEC $0**
• Not Applicable.	• Not Applicable.	• No change

Nonproliferation Construction
Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
18-D-150 Surplus Plutonium Disposition Project, SRS							
Total Estimated Cost (TEC)	454,354	0	0	0	54,000	118,000	64,000
Other Project Cost (OPC)	128,256	0	0	0	25,000	30,589	+5,589
Total Project Cost, 18-D-150 Surplus Plutonium Disposition Project, SRS	**582,610**	**0**	**0**	**0**	**79,000**	**148,589**	**+69,589**
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS							
Total Estimated Cost (TEC)	5,503,520	5,503,520	0	0	0	0	0
Other Project Cost (OPC)	796,333	356,333	220,000	220,000	220,000	0	-220,000
Total Project Cost, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	**6,299,853**	**5,859,853**	**220,000**	**220,000**	**220,000**	**0**	**-220,000**
Total All Construction Projects							
Total Estimated Cost (TEC)	5,957,874	5,503,520	0	0	54,000	118,000	64,000
Other Project Cost (OPC)	924,589	356,333	220,000	220,000	245,000	30,589	+5,589
Total Project Cost (TPC) All Construction Projects	**6,882,463**	**5,859,853**	**220,000**	**220,000**	**299,000**	**148,589**	**-150,411**

Outyears to Completion for Nonproliferation Construction

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
18-D-150 Surplus Plutonium Disposition Project, SRS					
Total Estimated Cost (TEC)	101,234	91,858	89,262	0	0
Other Project Cost (OPC)	14,471	9,921	11,930	36,345	0
Total Project Cost, 18-D-150 Surplus Plutonium Disposition Project, SRS	**115,705**	**101,779**	**101,192**	**36,345**	**0**
22-D-XXX, LANL Project	**16,657**	**50,781**	**67,069**	**84,368**	**0**
Total All Construction Projects					
Total Estimated Cost (TEC)	117,891	142,639	156,331	84,368	0
Other Project Cost (OPC)	14,471	9,921	11,930	36,345	0
Total Project Cost (TPC) All Construction Projects	**132,362**	**152,560**	**168,261**	**120,713**	**0**

18-D-150, Surplus Plutonium Disposition (SPD)
Savannah River Site, Aiken, South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2021 Request for the Surplus Plutonium Disposition project is $148,589K. The preliminary cost range for this project is $448 million - $620 million, with Critical Decision 4 (CD-4) projected for FY 2026 to FY 2028, based on the conceptual design cost and schedule range. The most recent Department of Energy (DOE) approved CD for the project is CD-1, Approve Alternative Selection and Cost Range, which was approved on December 19, 2019. The SPD Program mission need was to be implemented utilizing the Mixed Oxide (MOX) Fuel approach. In FY 2019, the MOX project was terminated and the Department will pursue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy will support the expedited removal of plutonium from the State of South Carolina, and is therefore a key objective of the program.

The dilute and dispose strategy employs mature plutonium processing technologies currently in use at DOE facilities. However, to disposition 34 metric tons of plutonium in a timely manner and expedite the removal of plutonium from the State of South Carolina, additional throughput capacity to dilute the plutonium oxide with an inhibitor material is required. This project will install new gloveboxes, associated process and process support equipment and security upgrades.

Funding for this project is controlled at the Total Project Cost (TPC) level. All appropriations may be used for either design, construction, or other project costs.

Significant Changes[a]
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2020 CPDS and is not a new start.

In order to achieve plutonium disposition mission needs and remove plutonium from South Carolina as quickly as possible, the project must capitalize on opportunities to reduce the project schedule. As such, the previously planned CD-3A has been subdivided into phases: 1.) early site preparation activities, 2.) long lead procurements, and 3) final site preparation activities in the existing facility which could not be completed earlier due to conflicts with facility operations or insufficient design completion.

In preparation for CD-1, the NNSA Office of Cost Estimating and Performance Evaluation (CEPE) completed an Independent Cost Estimate (ICE). As a result of the ICE reconciliation, the upper end of the TPC range is 5% higher than the original estimate. This ICE forms the basis for the cost and schedule in this data sheet.

A Federal Project Director (FPD) level II has been assigned to this project.

As required by DOE Order 413.3B, an independent Analysis of Alternatives (AoA) was completed. Based on the results, the Department Project Management Executive, with concurrence from the SPD AoA Steering Committee, selected the K-Area Reactor Facility at the Savannah River Site (SRS), Aiken, South Carolina as the preferred location. CD-1 was approved in December 2019.

In FY 2020, the project will obtain CD-3A approval and initiate early site preparation including but not limited to concrete cuts and new openings in walls, security modification, and demolition and removal activities. These activities will provide construction work force access and enable construction activities to start immediately after CD-3 and progress as planned. The CD-3A documentation includes the final design documents, all required project management and nuclear safety documentation, and a baseline estimate and schedule for the early site preparation activities. At 60% design, the project will complete a Technical Independent Project Review.

[a] Funding and schedules shown throughout the CPDS are estimates and consistent with the high end of the cost range

The project will also complete the final design activities required to support a second phase of CD-3A for long lead procurements which will allow the project to initiate procurements for the three Safety Significant gloveboxes for downblending of plutonium, a diesel generator, and HEPA filter housings. Based on information obtained from prospective manufacturers/suppliers during the development of the conceptual design, it is estimated that 33 months are required for the procurement, manufacturing and delivery of the shielded gloveboxes. The final design documents, equipment specifications, all required project management documentation and a baseline estimate and schedule will be completed prior to proceeding.

Phasing of CD-3A will allow the project to execute the procurements in parallel with the completion of the design. Without partial critical decisions to execute early site preparations and long lead procurements, CD-4 will be delayed at least 16 months. The FY 2020 work scope also continues the maturation of the design for the major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, security, etc.), structural analysis, design safety analysis, and security vulnerability assessment. The project will also continue risk management, project management, and baseline development.

In FY 2021, the project will continue to execute early site preparation and long lead procurements activities, will complete the final design and project documentation required to support a third phase of CD-3A, and initiate final site preparation activities. In addition, this will allow for the installation of a second-floor mezzanine within the 105-K Final Storage Area (FSA). All partial critical decisions will include the final design documents and all required project management documentation to include safety document maturity, safeguards and security, operations, and a baseline estimate and schedule for the early construction activities.

The FY 2021 work scope also includes continuing the maturation of the design in support of CD-2/3 for all major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, fire detection/suppression, security, etc.). In addition, completion of the 60% formal design review, development of the Preliminary Design Safety Analysis, and initiation of the 90% formal design review are all scheduled for FY 2021. The project will continue risk management, project management, and baseline development.

The funding profile for future years will be updated when the estimates are validated and a baseline has been approved as part of the critical decision process.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	10/31/1997	2/2/2017	3QFY2018	1QFY2022	4QFY2021	1QFY2022	N/A	4QFY2027
FY 2019	10/31/1997	2/2/2017	4QFY2018	4QFY2022	4QFY2021	4QFY2022	N/A	4QFY2027
FY 2020	10/31/1997	2/2/2017	1QFY2020	4QFY2022	4QFY2021	4QFY2022	N/A	4QFY2028
FY 2021	10/31/1997	9/30/2019	12/19/2019	4QFY2022	4QFY2021	4QFY2022	N/A	2QFY2028

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A		
FY 2018	1QFY2022	1QFY2020		
FY 2019	4QFY2022	4QFY2019		
FY 2020	4QFY2022	2QFY2020		
FY 2021	4QFY2022	2QFY2020		

CD-3A – Early site preparations and long lead procurement for glovebox and specialized engineered equipment.

Project Cost History

Fiscal Quarter or Date

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	165,000	255,000	420,000	80,000	N/A	80,000	500,000
FY 2019	154,820	261,780	416,600	83,400	N/A	83,400	500,000
FY 2020	71,044	365,440	436,484	152,319	N/A	152,319	588,803
FY 2021	89,189	385,521	474,710	145,382	N/A	145,382	620,092

2. Project Scope and Justification

Scope

Approximately 15,000 ft^2 of processing space in the existing Hazard Category 2 K-Area Facility will be utilized for the project which will expand the dilution capability. In addition, a 10,000 ft^2 support building will be located adjacent to the existing structure. To increase dilution throughput capacity, gloveboxes, equipment, and support systems (i.e., glovebox ventilation, fire suppression, glovebox rooms with airlocks, material control and accountability equipment, monitoring equipment, lag storage, etc.) will be installed in the K-Area Facility.

Justification

The mission of the dilute and dispose strategy is to expedite removal of plutonium from the State of South Carolina by providing processing, characterization, and storage capabilities to efficiently and permanently dispose of 34 metric tons of plutonium, thereby eliminating excess nuclear weapons materials.

It is a Departmental priority to remove certain inventories of plutonium from the State of South Carolina. Therefore, expediting removal of plutonium from SRS for final disposition is a key objective of the program. Although the dilute and dispose strategy utilizes mature technologies currently in use at DOE facilities, additional capacity is required to increase throughput in order to expedite removal of plutonium from SRS and disposition the full 34 metric tons of plutonium in a timely manner. The additional capacity will be provided by the SPD Project. The project will include new gloveboxes and associated process and process support equipment and security features for the diluted plutonium product until eventual characterization, packaging, and shipment for disposal.

A quantitative risk analysis was completed to confirm a bounding cost range based on 10% conceptual design. A Risk Management Plan (RMP) and a Risk and Opportunity Assessment Report (ROAR) have been prepared for the project. Updates to these documents were prepared based upon 30% design in support of CD-1. The contingency included in this data sheet is consistent with the criteria found in the Association for Advancement of Cost Engineering International (AACEI) recommended practices and DOE G 413.3-21 for a Class 3 estimate.

In accordance with DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, an appropriate National Environment Policy Act (NEPA) review is required to support the Project. DOE Order 413.3B requires final NEPA documentation prior to CD-2 for the project with a Record of Decision after CD-2 approval but prior to CD-3. In April 2015, DOE issued the *Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (SPD SEIS, DOE/EIS-0283-S2). Although the SPD SEIS ROD does not contain a reference to installation of any specific number of

gloveboxes for the purpose of implementing the Dilute and Dispose approach for the 6 metric tons (MT) of non-pit plutonium, the information contained in the *Savannah River Site and Los Alamos National Laboratory Timing and Throughput Assumptions Used for the Surplus Plutonium Disposition Supplemental EIS* (April 2015) clearly indicates that installation and operation of three (3) additional glovebox lines were analyzed as part of the development of the SPD Supplemental EIS. Because the installation of three (3) additional glovebox lines for implementing the Dilute and Dispose strategy for the 6 MT of non-pit plutonium was previously analyzed and is consistent with the conceptual design for the SPD Project, no additional NEPA analyses or decisions are required to design, procure, and construct the SPD Project.

The SPD project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements have been met.

Key Performance Parameters (KPPs)

Performance Measure[a]	Threshold	Objective
Dilution throughput capacity	1.5 metric tons per year	N/A

3, Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	29,000	29,000	27,795
FY 2021	39,000	39,000	25,109
FY 2022	21,189	21,189	36,285
Total Design	**89,189**	**89,189**	**89,189**
Construction			
FY 2020	25,000	25,000	24,708
FY 2021	79,000	79,000	67,288
FY 2022	90,045	90,045	57,998
FY 2023	91,858	91,858	93,672
FY 2024	99,618	99,618	110,864
FY 2025	0	0	29,071
FY 2026	0	0	1,920
Total, Construction	**385,521**	**385,521**	**385,521**
Total Estimated Costs (TEC)			
FY 2020	54,000	54,000	52,503
FY 2021	118,000	118,000	92,397
FY 2022	111,234	111,234	94,283
FY 2023	91,858	91,858	93,672
FY 2024	99,618	99,618	110,864
FY 2025	0	0	29,071
FY 2026	0	0	1,920

[a] Key Performance Parameters will be finalized upon approval of the project baseline.

	Budget Authority (Appropriations)	Obligations	Costs
Total TEC	**474,710**	**474,710**	**474,710**
Other Project Costs[a]			
FY 2017[b]	5,750	5,750	4,413
FY 2018[b]	6,732	6,732	7,416
FY 2019	25,000	25,000	20,267
FY 2020	25,000	25,000	26,770
FY 2021	30,589	30,589	13,080
FY 2022	4,471	4,471	13,543
FY 2023	9,921	9,921	16,574
FY 2024	1,574	1,574	6,974
FY 2025	36,345	36,345	12,207
FY 2026	0	0	13,389
FY 2027	0	0	9,578
FY 2028	0	0	1,171
Total OPC	**145,382**	**145,382**	**145,382**
Total Project Costs (TPC)			
FY 2017	5,750	5,750	4,413
FY 2018	6,732	6,732	7,416
FY 2019	25,000	25,000	20,267
FY 2020[b]	79,000	79,000	79,273
FY 2021	148,589	148,589	105,477
FY 2022	115,705	115,705	107,826
FY 2023	101,779	101,779	110,246
FY 2024	101,192	101,192	117,838
FY 2025	36,345	36,345	41,278
FY 2026	0	0	15,309
FY 2027	0	0	9,578
FY 2028	0	0	1,171
Grand Total	**620,092**	**620,092**	**620,092**

[a] Appropriated funds shown for FY 2017 through FY 2019 for other project costs were appropriated in the Material Management and Minimization program to support planning and design activities for the dilute and dispose strategy.

[b] Includes funds for early procurement of engineered equipment.

[b] FY 2017 and 2018 actual costs corrected from the FY 2020 PDS

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	80,314	46,234	N/A
Contingency	8,875	24,810	N/A
Total, Design	**89,189**	**71,044**	**N/A**
Construction			
Site Work	61,255	35,299	N/A
Long Lead Equipment	21,329	23,530	N/A
Equipment	21,737	22,753	N/A
Other Construction	209,150	149,640	N/A
Contingency	72,050	134,218	N/A
Total, Construction	**385,521**	**365,440**	**N/A**
Total Estimated Cost	**474,710**	**436,484**	**N/A**
Contingency, TEC	**80,925**	**159,028**	**N/A**
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	2,340	2,340	N/A
Conceptual Design	25,905	34,927	N/A
Other OPC Costs	N/A	76,175	
NNSA Other Direct Costs	19,600	N/A	N/A
Execution/Start-up Phase	11,139	N/A	N/A
Startup and Training	18,111	N/A	N/A
CD-3A Phase - Support	7,430	N/A	N/A
CD-3A Phase Design OPC Support	6,452	N/A	N/A
Preliminary / Final Design Phase OPC Support	43,659	N/A	N/A
Contingency	10,746	38,877	N/A
Total, OPC	**145,382**	**152,319**	**N/A**
Contingency, OPC	10,746	38,877	N/A
Total Project Cost	**620,092**	**588,803**	**N/A**
Total Contingency (TEC+OPC)	**91,671**	**197,905**	**N/A**

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	15,000	47,000	46,000	56,000	85,000	62,000	62,000	500,000
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	14,750	59,000	59,000	59,000	74,750	62,000	62,000	500,000
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	37,482	79,000	65,000	74,750	62,000	62,000	62,000	588,803
FY 2021	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	37,482	79,000	148,589	115,705	101,779	101,192	36,345	620,092

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4Q FY 2028
Expected Useful Life (number of years)	20 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	4Q FY 2048

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	58.3	58.3	1,166.3	1,166.3

7. D&D Information

Approximately 15,000 ft^2 of processing space in the existing Hazard Category 2 K-Area Facility will be required for the project. In addition, a 10,000 ft^{-2} new support building will be located adjacent to the existing structure. The new square footage is reported below.

	Square Feet
New area being constructed by this project at Savannah River Site (K-Area).	10,000
Area of D&D in this project at Savannah River Site (K-Area).	N/A
Area at Savannah River Site (K-Area) to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Area of D&D in this project at other sites	N/A
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Total area eliminated	N/A

8. Acquisition Approach

The Acquisition Strategy, which was developed as part of the CD-1 package, is with the Management and Operating (M&O) contractor for the design and construction of the SPD Project.

Nuclear Counterterrorism and Incident Response Program

Overview

Among the National Nuclear Security Administration (NNSA) enduring missions is to protect our nation and its citizens from nuclear terrorism and incidents or accidents involving the release of radiological material. The NNSA Nuclear Counterterrorism and Incident Response (NCTIR) Program evaluates and assesses nuclear or radiological threats, uses the knowledge generated through this process to inform domestic and international policies and regulations, contingency planning, training, and international capacity building. These activities in turn strengthen national and international counterterrorism, counterproliferation, and emergency preparedness and response capabilities.

The NCTIR Program includes the following subprograms:

- The **Emergency Operations (EO) subprogram** ensures a comprehensive and integrated approach to emergency management, including planning, mitigation, preparedness, response, and recovery. The EO subprogram ensures NNSA will be ready to respond promptly, efficiently, and effectively to any worldwide emergency involving or affecting national equities by applying the necessary resources to manage the consequences of a nuclear or radiological incident or accident and protect workers, the public, the environment, and national security. EO develops all-hazards emergency management policy and programs, provides incident management training and exercise planning, staffs and executes the 24/7/365 alert, provides warning and notification , and manages the Emergency Communications Network (ECN) capability for the Department of Energy (DOE). EO assists NNSA and DOE sites and deployable teams with implementation of emergency management policies, practices, and technical support. EO also manages the Department's Continuity of Operations and Continuity of Government Programs.

- The **Counterterrorism and Counterproliferation (CTCP) subprogram** reduces the threat of nuclear proliferation and nuclear and radiological terrorism through innovative science, technology, and policy solutions. Further, CTCP maintains the capability to respond to, avert, and mitigate the consequences of nuclear and radiological incidents in the United States and abroad and provides a technical nuclear forensics capability to support attribution of nuclear materials and devices. The following subprograms support CTCP:

    - The Nuclear Incident Response (NIR)/ Nuclear Emergency Support Team (NEST) subprogram provides flexible and effective response capabilities for any nuclear/radiological incident in the United States or abroad by applying the unique technical expertise in NNSA's nuclear security enterprise. This is accomplished by ensuring that highly trained response personnel and specialized technical equipment are ready to deploy to provide an integrated response for nuclear weapon accidents, counter-WMD operations, radiological/nuclear public health emergencies, national exercises, and security operations for National Special Security Events and other national significant events.

    - The National Technical Nuclear Forensics (NTNF) subprogram supports the larger interagency NTNF mission with operational, technical, and analytical capabilities. NNSA will continue to maintain its NTNF capability to assess and determine the origin of interdicted nuclear materials and nuclear devices, and in the case of a nuclear detonation, the device design and origin of the nuclear materials used. This program leverages expertise at the National Laboratories to maintain a laboratory and field response capability in the event of an incident requiring nuclear forensics analysis capabilities in which responders integrate with interagency partners to provide a whole of government response.

    - The Counterterrorism Response and Capacity Building subprogram leverages NNSA's technical expertise to strengthen preparedness and capabilities to respond to all radiological or nuclear incidents, accidents, and terror threats posing a potential risk to the United States, its citizens, or its interests. These activities exercise and expand state and local radiological and nuclear incident response capabilities and enable key international partners to effectively address radiological or nuclear incidents in their region with or without U.S. involvement as far from U.S. territory as possible.

- The Nuclear Counterterrorism (NCT) Assessment subprogram provides the Nation's technical capability to understand and defeat nuclear threat devices, including improvised nuclear devices (IND) and lost or stolen foreign nuclear weapons, and to develop foundational technologies supporting nuclear counterproliferation efforts. NCT maintains this technical capability by 1) assessing nuclear threat device concepts; 2) assessing protection requirements for nuclear materials; 3) conducting classified Nuclear Threat Reduction (NTR) exchanges with the United Kingdom and France; and 4) improving predictive render safe capabilities. Technical work on device assessment also supports the Department of Defense (DoD), Federal Bureau of Investigation (FBI), and Intelligence Community in policy, planning, and operational capabilities.

Nuclear Counterterrorism and Incident Response Program
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Nuclear Counterterrorism & Incident Response Program				
Emergency Operations	35,574	35,545	36,000	+455
Counterterrorism and Counterproliferation				
Nuclear Incident Response	162,570	202,149	206,558	+4,409
National Technical Nuclear Forensics	15,181	19,110	40,000	+20,890
Counterterrorism Response & Capacity Building	8,210	9,105	9,655	+550
Nuclear Counterterrorism Assessment	65,150	70,686	85,300	+14,614
AMS Recapitalization	32,500	35,500	0	-35,500
Subtotal, Counterterrorism and Counterproliferation	283,611	336,550	341,513	+4,963
Total, Nuclear Counterterrorism & Incident Response Program	**319,185**	**372,095**	**377,513**	**+5,418**

Outyears for Nuclear Counterterrorism and Incident Response Program
Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Nuclear Counterterrorism & Incident Response Program				
Emergency Operations	36,756	37,197	37,718	39,415
Counterterrorism and Counterproliferation				
Nuclear Incident Response	208,000	208,937	213,372	214,866
National Technical Nuclear Forensics	40,840	41,330	41,909	43,795
Counterterrorism Response & Capacity Building	9,900	10,700	10,850	11,338
Nuclear Counterterrorism Assessment	89,945	91,902	91,678	92,200
AMS Recapitalization	0	0	0	0
Subtotal, Counterterrorism and Counterproliferation	348,685	352,869	357,809	362,199
Total, Nuclear Counterterrorism & Incident Response Program	**385,441**	**390,066**	**395,527**	**401,614**

Nuclear Counterterrorism and Incident Response Program
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Nuclear Counterterrorism and Incident Response Program	
Emergency Operations: No significant change.	**+455**
Counterterrorism and Counterproliferation: The increase primarily reflects additional funding for the Capability Forward initiative to provide enhanced training and equipment to support the Federal Bureau of Investigation; additional interagency responsibility for coordination of technical nuclear forensics, increased support for the National Nuclear Materials Archive, and improvements for post-detonation forensics; and the transfer of high explosives and nuclear materials research to Nuclear Counterterrorism Assessment from Defense Nuclear Nonproliferation Research and Development (DNN R&D). These increases are largely offset by the completion of funding for the recapitalization of the Aerial Measuring System.	**+4,963**
Total, Nuclear Counterterrorism and Incident Response Program	**+$5,418**

Nuclear Counterterrorism and Incident Response Program
Emergency Operations

Description

The Emergency Operations subprogram manages emergency preparedness, emergency management policy, and incident response to sustain the DOE/NNSA mission, maintain readiness, and ensure a fully implemented and integrated comprehensive emergency management enterprise system throughout the Department. The FY 2021 Budget Request will continue to focus on complex wide integration and enhancement of Emergency Operations activities.

To strengthen emergency preparedness across DOE/NNSA, this subprogram develops and implements specific programs, processes, and concepts to minimize the impacts of emergencies on worker and public health and safety, the environment, and national security. This is accomplished by promulgating appropriate departmental policies and implementing requirements and guidance; developing and conducting training and other emergency preparedness activities; supporting DOE/NNSA readiness assurance activities and participating in interagency emergency planning and coordination activities. EO will also develop standards for exercises and provide training to support an all hazards emergency management capability.

This subprogram operates the DOE/NNSA Consolidated Emergency Operations Center (CEOC) and manages the Emergency Communications Network (ECN). The DOE/NNSA CEOC provides the core functions of supporting department command, control, communications, Geographic Information System (GIS) data, and situational intelligence requirements for all categories of DOE emergency response situations at all times. The DOE/NNSA CEOC will broaden and strengthen all its hazards incident support effectiveness through training, exercises, improvements and efficiencies.

The ECN is the Department's high-reliability communication system that supports collecting, processing, and disseminating emergency related information from multiple sources. The ECN ensures DOE/NNSA decision-makers have a common operating picture for real-time situation awareness during the management and support of operational emergencies, energy emergencies, and emergency assistance including national and international counterterrorism and COOP related events. The network supports classified and unclassified voice, video, and data transmissions. The system is expected to grow from 91 nodes to over 110 nodes by the end of FY 2021. ECN provides continuous effective and secure network services for DOE/NNSA response components to include COOP, Response/Render Safe, Forensics, and Counterterrorism missions. The expansion has included the installation of nodes to other government agencies and other countries.

The Continuity of Operations Program (COOP), supports all aspects identified in: Presidential Policy Directive 40 (PPD-40), *National Continuity Policy;* Federal Continuity Directive (FCD) 1, Federal Executive Branch National Continuity Program Requirements; FCD 2 Federal Executive Branch Mission Essential National Continuity Program Requirements; and Office of Science and Technology Policy (OSTP)/OMB D-16-1, Minimum Requirements for Federal Executive Branch Continuity Communications Capabilities. The Emergency Operations subprogram also supports training and exercises, equipment, maintenance and upgrades to classified facilities along with a Headquarters continuity facility and a devolution facility outside of the National Capital Region.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Emergency Operations ($35,545,000)	**Emergency Operations ($36,000,000)**	**Emergency Operations (+$455,000)**
• Execute Continuity of Operations and Government Programs. • Develop a Unified Coordination Structure. • Provide ECN dedicated communications capabilities in support of the global emergency management and response mission of the DOE/NNSA and its Government partners. • Operate the CEOC which manages the 24 hours/day, 7 days/week, 365 days/year (24/7/365) single-point-of-contact for Departmental and interagency notifications regarding situations requiring unified coordination. • Ensure all DOE/NNSA Headquarters/Labs/ Plants/Sites for Emergency Management Programs will be ready to guarantee a comprehensive and integrated approach to emergency management, including planning, mitigation, preparedness, response, and recovery.	• Execute Continuity of Operations and Government Programs. • Implement a Unified Coordination Structure. • Provide ECN dedicated communications capabilities in support of the global emergency management and response mission of the DOE/NNSA and its Government partners. • Operate the CEOC which manages the 24 hours/day, 7 days/week, 365 days/year (24/7/365) single-point-of-contact for Departmental and interagency notifications regarding situations requiring unified coordination. • Ensure all DOE/NNSA Headquarters/Labs/ Plants/Sites for Emergency Management Programs will be ready to guarantee a comprehensive and integrated approach to emergency management, including planning, mitigation, preparedness, response, and recovery.	• No significant change.

Nuclear Counterterrorism and Incident Response Program
Counterterrorism and Counterproliferation

Description

The Counterterrorism and Counterproliferation (CTCP) subprogram is focused on providing expertise, practical tools, and technically informed policy recommendations required to advance U.S. nuclear counterterrorism and counterproliferation objectives. CTCP focuses on nuclear and radiological incidents and accidents, with the core mission to prepare for, respond to and successfully resolve such events.

The **Nuclear Incident Response (NIR) / Nuclear Emergency Support Team (NEST)** subprogram serves as the nation's last line of defense against a nuclear or radiological incident or accident. Its mission is to apply the unique technical expertise within NNSA's nuclear security enterprise to prepare for, prevent, mitigate, and respond to a nuclear or radiological incident domestically or abroad. The strategic approach for incident response activities is to ensure a central point of contact and an integrated response to all emergencies involving radionuclides.

This subprogram works closely with other DOE elements as well as other federal organizations, including Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), DOD, and FBI to provide technical assistance to respond domestically or abroad to nuclear and radiological incidents, including terrorist threats involving nuclear materials, and to conduct exercises and provide support to the NEST programs to ensure safe incident resolution and the protection of public safety and the environment. This is accomplished by ensuring the appropriate infrastructure is in place to provide command, control, coordination, and communications of the NNSA nuclear incident response teams. It is also essential that response personnel are properly organized, trained, and equipped to rapidly deploy and successfully resolve an incident.

Specialized NEST response teams are trained and equipped to execute a variety of national security and public health and safety missions, to include searching for, identifying, characterizing, defeating, and taking possession of a nuclear device; supporting efforts to recover nuclear material outside of regulatory control; and providing preventive radiological and nuclear detection support to federal, state, and local public safety organizations for major public events. NEST provides technical support to the FBI to respond to nuclear threat devices, including specialized technology and training for regional teams to locate and identify radiological/nuclear devices and prevent these devices from detonating. The funding in this budget request supports comprehensive program activities needed to support the Capability Forward initiative which is transitioning regional FBI teams to be able to take decisive action against a WMD device while increasing the number of U.S. cities covered by this capability. Accordingly, this budget Request supports scheduled implementation of the Capability Forward initiative to remain on the proposed schedule for completion of the expansion and enhancement of the Stabilization program to fourteen cities with decisive WMD defeat capability, including continued training facility upgrades to be completed in FY 2021, and equipment and personnel costs associated. Funding in the FY 2021 Request will address NEST public health and safety capability mission shortfalls reflected in the NNSA Incident Response Readiness Index performance measures.

NEST is also trained and equipped to support federal, state, and local entities' response to accidents and incidents involving the release of nuclear or radiological materials. These teams provide technical analysis to support protective action guidance – such as evacuation, shelter-in place, and medical treatment – during a radiological response. NEST analysis is based on predictive modeling of atmospheric dispersal, real-time radiological measurements, and the latest medical science.

The **National Technical Nuclear Forensics (NTNF)** subprogram maintains capabilities in three distinct areas: 1) to analyze and determine the provenance of interdicted nuclear material (known as the Pre-detonation Materials Program), 2) to safely disassemble and analyze nuclear devices to determine their design lineage and technical attributes (known as the Pre-detonation Device Program), and 3) to analyze debris from a nuclear detonation to determine the origin of the attack (known as the Post-detonation Program). These programs leverage operational and scientific expertise at the National Laboratories to support whole of government nuclear forensics response capability and the associated attribution of an attack. Credible nuclear forensics capabilities serve as a powerful deterrent for malicious actors and states that would

support them, both wittingly and unwittingly. National level requirements to support TNF are outlined in nuclear forensics Presidential policies which specify interagency roles and responsibilities to maintain mission readiness and provide operational capability for response, analysis and assessment in support of attribution. NNSA work in this area includes training and exercises for responders and equipment procurement and maintenance to ensure the capability to activate laboratory teams and deploy response teams. This nuclear forensics funding also allows for continued development of the National Nuclear Materials Archive (NNMA) so that valuable historic samples of nuclear materials may be identified, analyzed, and stored. Comparative analysis of these materials may significantly aid the evaluation of interdicted pre-detonation materials or post-detonation samples and thus enhance technical nuclear forensics capabilities for attribution. The NNMA will be funded to allow for increased throughput of analysis of historically valuable nuclear samples and ensure a baseline capacity to respond in an emergency. In FY 2021, NNSA will take on a more active leadership role in NTNF. For CTCP, this scope includes leading the National Nuclear Forensics Center (NNFC) and improving the ability to analyze interdicted nuclear materials. These changes, along with associated R&D investments by DNN, will allow for a more robust TNF capability for the nation, which will ensure a capability for an unattributed nuclear attack and inform the appropriate response.

The **Counterterrorism Response and Capacity Building** subprogram mission is to strengthen preparedness for all radiological or nuclear incidents, accidents, and terror threats posing a potential risk to the United States territory, citizens, or its interests. This subprogram works domestically with federal, state, and local officials to expand their capabilities to respond to a radiological or nuclear threat or incident. As part of a robust strategy to protect America from potential radiological or nuclear threats, this program also cooperates with key international partners to strengthen their ability to effectively address radiological or nuclear incidents in their region—with or without U.S. involvement—as far from U.S. territory as possible.

The Counterterrorism Response and Capacity Building subprogram activities include technical exchanges, joint technical experiments, workshops, exercises, technical assistance and support, policy development, and training with partners. These activities address the full range of potential radiological or nuclear threats. This subprogram assesses global security trends, risks, and requirements annually to plan, prioritize, and implement radiological/nuclear counterterrorism and incident response joint activities.

The **Nuclear Counterterrorism (NCT) Assessment** subprogram provides the nation's technical capability to understand and defeat nuclear threat devices including improvised nuclear devices (INDs) and lost or stolen foreign nuclear weapons. NCT maintains and advances this technical capability through partnerships with NNSA's nuclear weapons design laboratories and production facilities and through technically informed exchanges with the United Kingdom and France. NCT conducts focused science on explosive and nuclear material behaviors, applying research concluded under DNN. In particular, NCT performs integrated experiments as part of risk assessments of nuclear materials and nuclear threat devices in support of interagency and international partner. Collectively, this work shapes our understanding of nuclear terrorism threats. This understanding is used to support policies and procedures to improve nuclear material protection and the technical capabilities available for crisis operations. The NCT Assessment subprogram informs policies and procedures across multiple departments and agencies and is coordinated across NNSA and within the U.S. interagency process, to ensure maximum alignment with agreed-upon joint goals and ongoing programs.

This FY 2021 Budget Request enhances NNSA's laboratory capabilities (modeling/simulation, tools, expertise) for highly specialized nuclear threat science assessments, while incrementally improving predictive capabilities in support of crisis operations. NCT Assessment will conduct scientific studies, including integrated experiments with Defense Programs, to ensure that material security and risk management policies and missions are informed by defensible and relevant assessments of potential threats. NCT Assessment will support the requirement to perform technical assessments in support of the Design Basis Threat (DBT) that governs DOE's nuclear material security posture. Similar technical expertise will continue to support DNN international nuclear security engagements by providing technical inputs for risk prioritization. This Request also enables implementation of the technical work plans under the bilateral and trilateral classified channels that enable the sharing of best practices with foreign partners to reduce nuclear terrorism risks; and will provide funding to use current capabilities to develop innovative technologies to address emerging nuclear threats. The Request also reflects the transfer of scope of high explosives and nuclear materials activities from DNN to NCT. DNN began

high explosives and nuclear materials research on behalf of Nuclear Counterterrorism Assessment in FY 2015 and will conclude the research in FY 2020. Transferring the scope to Nuclear Counterterrorism in FY 2021 will enable integrated experiments and increased focused science, applying the research concluded under DNN to support risk assessments of nuclear materials and nuclear threat devices in support of operational partners and the intelligence and security communities.

CTCP Highlights of the FY 2021 Budget Request

- Conduct Stabilization operations activities and continue implementation of the Capability Forward initiative to provide technical assistance to the FBI to respond to nuclear threat devices by providing specialized technology and training for regional teams. The increased funding in this budget request will transition existing Stabilization teams to incorporate initial WMD defeat capabilities through enhance training and equipment procurement, as well as increasing the number of total teams. This includes training facility upgrades, applied science, and technical bench depth building;
- Provide expertise and equipment to 1) detect and identify nuclear or radiological materials during high-profile events or in response to a threat; 2) rapidly respond to and disable a potentially yield producing nuclear device; and 3) lead the federal government's monitoring and technical assessment efforts after a nuclear or radiological incident or accident, saving lives;
- Enables procurement of mission critical equipment to recapitalize equipment that has exceeded its useful life;
- Lead coordination of the government agencies supporting response and assessment for technical nuclear forensics;
- Identify, consolidate and analyze historical nuclear material samples of value to the technical nuclear forensics program and establish the National Nuclear Materials Archive (NNMA) within NNSA;
- Advance the nation's technical capability to: understand and defeat nuclear threat devices, including Improvised Nuclear Devices (INDs), and lost or stolen nuclear weapons; advise on protection requirements for nuclear materials; and, prevent nuclear terrorism through Nuclear Threat Reduction channels with the United Kingdom and France;
- Commence focused science on explosive and nuclear material behaviors, applying research concluded under DNN;
- Conduct integrated experiments and increase focused science to support risk assessments of nuclear materials and nuclear threat devices in support of operational partners and the intelligence and security communities;
- Strengthen U.S. national security by increasing partner capabilities to counter and respond to radiological and nuclear incidents and accidents worldwide through: policy, training, exercises, technical exchanges, and equipment provisioning.

Activities and Explanation of Changes

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Counterterrorism and Counterproliferation ($336,550,000)	**Counterterrorism and Counterproliferation ($341,513,000)**	**Counterterrorism and Counterproliferation (+$4,963,000)**
Nuclear Incident Response/Nuclear Emergency Support Team ($202,149,000)	***Nuclear Incident Response/Nuclear Emergency Support Team ($206,558,000)***	***Nuclear Incident Response/Nuclear Emergency Support Team (+4,409,000)***
• Provide technical assistance to federal, state, tribal, local, and international government agencies to deal with incidents, including terrorist threats that involve potential use of nuclear materials. • Provide technical assistance to a Lead Federal Agency to search for or detect illicit radiological or nuclear material. • Continue collection and expert analysis of radiological material signatures through DOE Radiological Triage Program. • Support lead federal agencies to address threats posed by domestic and foreign terrorists likely to have both the will and means to employ nuclear devices and weapons-usable nuclear materials. • Sustain WMD defeat capabilities for an identified critical mission area. This effort includes predictive capability. • Provide DOE/NNSA technical assistance for the planning, execution, and evaluation of national level exercises, including but not limited to: Marble Challenge, Nuclear Weapons Accident/Incident Exercises (NUWAIX), and other DOD-led exercises in which DOE/NNSA is not the lead. • Implement advanced training for consequence management response teams and home teams	• Provide technical assistance to federal, state, tribal, local, and international government agencies to deal with incidents, including terrorist threats that involve potential use of nuclear materials. • Provide technical assistance to a Lead Federal Agency to search for or detect illicit radiological or nuclear material. • Continue collection and expert analysis of radiological material signatures through DOE Radiological Triage Program. • Support lead federal agencies to address threats posed by domestic and foreign terrorists likely to have both the will and means to employ nuclear devices and weapons-usable nuclear materials. • Sustain WMD defeat capabilities for an identified critical mission area. This effort includes predictive capability. • Provide DOE/NNSA technical assistance for the planning, execution, and evaluation of national level exercises, including but not limited to: Marble Challenge, NUWAIX, and other DOD-led exercises in which DOE/NNSA is not the lead. • Implement advanced training for consequence management response teams and home teams based on requirements of updated mission analyses that reflect lessons from responses and exercises. Sustain data communications systems	• Increase supports continued implementation of the Capability Forward initiative for 14 teams with enhanced directed WMD disablement capability to respond to a nuclear terrorism threat: o The initiative requires: 1) procurement of new, specialized equipment to enable directed WMD defeat capability; 2) directed WMD defeat training and associated consumable equipment; 3) training, applied science and technical bench depth across the national laboratory enterprise to advise on directed WMD defeat during a crisis; and, 4) use of applied science to develop and characterize new directed WMD defeat technologies to expand the applicability of the technical tool set. o Improves readiness for public health and safety missions, the key issue in NNSA's Incident Response Readiness Index performance metric shortfall.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
based on requirements of updated mission analyses that reflect lessons from responses and exercises. Sustain data communications systems for communications between the field teams and home teams. • Provide continued decision support tools to radiological response efforts, in the event of the intentional or accidental release of radiological or nuclear material, as well as, informing recovery planning efforts. • Improve clarity of guidance provided to public health officials on evacuation recommendations and health effects from the accidental or intentional release of radiological materials based on the latest science. • Work jointly with the federal coordinating agency, which is usually DHS/FEMA, during any radiological accident or incident. • Coordinate with the EPA/NRC and other elements within DOE, to provide support to safeguard the public and environment and mitigate the effects of a nuclear or radiological accident or incident. • Continue recapitalization efforts for critical incident response equipment that is beyond its planned life cycle. • Sustain capability for existing and increased number of Stabilization cities, including training and equipment maintenance. • Provide training and equipment to additional Stabilization cities and upgrade NNSA infrastructure and specialized technical equipment, as needed.	for communications between the field teams and home teams. • Provide continued decision support tools to radiological response efforts, in the event of the intentional or accidental release of radiological or nuclear material, as well as, informing recovery planning efforts. • Improve clarity of guidance provided to public health officials on evacuation recommendations and health effects from the accidental or intentional release of radiological materials based on the latest science. • Work jointly with the federal coordinating agency, which is usually DHS/FEMA, during any radiological accident or incident. • Coordinate with the EPA/NRC and other elements within DOE, to provide support to safeguard the public and environment and mitigate the effects of a nuclear or radiological accident or incident. • Continue recapitalization efforts for critical incident response equipment that is beyond its planned life cycle. • Sustain capability for existing and increased number of stabilization cities including training and equipment maintenance. • Deploy to additional cities and upgrade infrastructure and specialized technical equipment, as needed.	

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
National Technical Nuclear Forensics ($19,110,000)	***National Technical Nuclear Forensics ($40,000,000)***	***National Technical Nuclear Forensics (+$20,890,000)***
• Provide technical and operational capabilities in support of the U.S. Government interagency NTNF program. • Maintain readiness to respond to pre- and post-detonation nuclear events. • Participate in one Ground Collection Task Force field exercise and one enhanced training event. • Fully support two Post-Detonation device assessment training and exercise events. • Conduct two DFEAT exercises. • Continue preventative and corrective facility maintenance at P-Tunnel, NNSS for support to the Pre-Detonation Device Program. Continue to address broader infrastructure improvements at the NNSS. • Continue LANL PF-4/TA-55 plans and procedure development in support of Pre-Detonation Device Program requirements. • Enhance operational capability for Bulk Special Nuclear Materials Analysis Program and begin identification and analysis of nuclear materials for the National Nuclear Materials Archives. • Lead U.S. nuclear forensics technical collaboration efforts with the UK under the Nuclear Threat Reduction channel.	• Provide technical and operational capabilities in support of the U.S. Government interagency NTNF program. • Lead and coordinate the interagency nuclear forensics mission. • Advance analysis methodologies for interdicted materials. • Maintain readiness to respond to pre- and post-detonation nuclear events. • Participate in one Ground Collection Task Force field exercise and one enhanced training event. • Fully support two Post-Detonation device assessment training and exercise events. • Conduct two DFEAT exercises. • Continue preventative and corrective facility maintenance at P-Tunnel, NNSS for support to the Pre-Detonation Device Program. Continue to address broader infrastructure improvements at the NNSS. • Continue LANL PF-4/TA-55 plans and procedure development in support of Pre-Detonation Device Program requirements. • Continue operational capability enhancements for BSAP. • Identify, consolidate, and analyze historical nuclear material samples for the NNMA. • Lead U.S. nuclear forensics technical collaboration efforts with the UK under the Nuclear Threat Reduction channel.	• Increase funds an expanded NTNF Program that provides interagency coordination and leadership for the nuclear forensics community. New scope includes: ○ NNSA leadership and coordination of the interagency to conduct technical nuclear forensics operational response and material and device assessment. ○ Support for advancing analysis methodologies for interdicted materials. • Continues program to identify and analyze U.S. nuclear material samples of value to nuclear forensics and population of the National Nuclear Materials Archive.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Counterterrorism Response and Capacity Building ($9,105,000)	***Counterterrorism Response and Capacity Building ($9,655,000)***	***Counterterrorism Response and Capacity Building (+$550,000)***
• Design and conduct seven *Silent Thunder* domestic WMD counterterrorism tabletop exercises (TTXs) with additional seminars. • Design and conduct seven *Eminent Discovery* international radiological/nuclear terrorism interdiction response TTXs. • Conduct four international incident preparedness and response technical exchange workshops. • Engage key international partners bilaterally to coordinate nuclear and radiological incident preparedness and response. • Conduct four joint IAEA training courses on incident and nuclear security preparedness and response. • Support international policy development and execution with IAEA to strengthen global harmonization and coordination on nuclear and radiological incident preparedness and response, including public messaging. • Conduct operational training and support missions for foreign major public events.	• Design and conduct seven *Silent Thunder* domestic WMD counterterrorism TTXs with additional seminars. • Design new training modules to expand knowledge base for participants in *Silent Thunder* TTXs. • Design and conduct seven *Eminent Discovery* international radiological/nuclear terrorism interdiction response tabletop exercises. • Design and conduct two scenario based policy discussions with key partners. • Conduct three international incident preparedness and response technical exchange workshops. • Engage key international partners bilaterally to coordinate nuclear and radiological incident preparedness and response. • Conduct joint IAEA training courses on incident and nuclear security preparedness and response. • Support international policy development and execution with IAEA to strengthen global harmonization and coordination on nuclear and radiological incident preparedness and response, including public messaging. • Conduct operational training and support missions for foreign major public events.	• Enables base program activities to conduct outreach, including operational training and support missions for foreign major public events, additional training for medical response to radiological emergencies, work with the IAEA, including in the coordination of safety and security responses, and improving public messaging regarding nuclear or radiological incidents.

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Nuclear Counterterrorism Assessment ($70,686,000)	***Nuclear Counterterrorism Assessment ($85,300,000)***	***Nuclear Counterterrorism Assessment (+$14,614,000)***
• Perform high-precision threat device modeling and experiments. • Continue Tier Threat Modeling Archive Validation project. • Conduct technical assessment in support of USG nuclear material security efforts.	• Perform high-precision threat device modeling and experiments. • Continue Tier Threat Modeling Archive Validation project. • Conduct technical assessment in support of USG nuclear material security efforts.	• Reflects the transfer of scope from DNN to enable focused science on explosive and nuclear material behaviors. • DNN began high explosives and nuclear materials research on behalf of Nuclear Counterterrorism Assessment in FY 2015 and will conclude the research in FY 2020. • In coordination with Defense Programs, funding will enable integrated experiments and focused science, applying the research concluded under DNN, to support risk assessments of nuclear materials and nuclear threat devices in support of operational partners and the intelligence and security communities.
AMS Recapitalization ($35,500,000)	***AMS Recapitalization ($0)***	***AMS Recapitalization (-$35,500,000)***
• Continue targeted recapitalization efforts for Aerial Measuring Systems (AMS) aircraft that are near the end of their effective life cycle. • Finalize recapitalization efforts for the AMS Phase I purchase of three fixed-wing aircraft. • Initiate AMS Phase II procurement of two rotary-wing aircraft.	• No additional funding is requested for aircraft recapitalization efforts. • Continue AMS Phase II procurement activities for two rotary-wing aircraft with anticipated delivery expected late FY 2022.	• Funding to complete aircraft recapitalization efforts was requested in FY 2019 and FY 2020.

Nuclear Counterterrorism and Incident Response Program
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	36,848	36,848	37,659	38,487	+828
Minor Construction	N/A	N/A	145	145	7,548	151	-7,397
Total, Capital Operating Expenses	N/A	N/A	**36,993**	**36,993**	**45,207**	**38,638**	**-6,569**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	36,848	36,848	37,659	38,487	+828
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**36,848**	**36,848**	**37,659**	**38,487**	**+828**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	145	145	148	151	+3
New Stabilization Training Facility (9940 Site), SNL	7,400	0	0	0	7,400	0	-7,400
Total, Minor Construction Projects	**N/A**	**N/A**	**145**	**145**	**7,548**	**151**	**-7,397**
Total, Capital Summary	**N/A**	**N/A**	**36,993**	**36,993**	**45,207**	**38,638**	**-6,569**

Outyears for Nuclear Counterterrorism and Incident Response Program
Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	39,334	40,199	41,083	41,987	N/A
Minor Construction	154	157	160	164	N/A
Total, Capital Operating Expenses	**39,488**	**40,356**	**41,243**	**42,151**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	39,334	40,199	41,083	41987	N/A
Total, Capital Equipment (including MIE)	**39,334**	**40,199**	**41,083**	**41,987**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	154	157	160	164	N/A
Total, Minor Construction Projects	**154**	**157**	**160**	**164**	**0**
Total, Capital Summary	**39,488**	**40,356**	**41,243**	**42,151**	**0**

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Argonne National Laboratory			
Domestic Radiological Security	1,414	640	440
International Radiological Security	489	1,019	947
Nuclear Smuggling Detection and Deterrence	306	767	771
Global Material Security	2,209	2,426	2,158
Conversion (formerly HEU Reactor Conversion)	0	22,700	25,698
Nuclear Material Removal	1,711	1,500	1,800
Laboratory and Partnership Support	5,933	1,462	0
Material Management and Minimization	7,644	25,662	27,498
Nonproliferation & Arms Control	9,018	12,010	11,899
Proliferation Detection R&D	4,170	2,472	2,432
Nonproliferation Fuels Development	22,860	4,800	0
Defense Nuclear Nonproliferation R&D	27,030	7,272	2,432
Emergency Operations	220	225	230
Counterterrorism and Counterproliferation	3,105	3,261	3,358
Nuclear Counterterrorism & Incident Response	3,325	3,486	3,588
Total Argonne National Laboratory	**49,226**	**50,856**	**47,575**
Brookhaven National Laboratory			
International Nuclear Security	0	170	195
Domestic Radiological Security	280	0	0
International Radiological Security	75	100	93
Nuclear Smuggling Detection and Deterrence	300	1,232	1,238
Global Material Security	655	1,502	1,526
Conversion (formerly HEU Reactor Conversion)	0	254	275
Material Management and Minimization	0	254	275
Nonproliferation & Arms Control	4,681	2,920	2,893
Proliferation Detection R&D	1,120	3,680	3,621
Nonproliferation Fuels Development	429	0	0
Defense Nuclear Nonproliferation R&D	1,549	3,680	3,621
Counterterrorism and Counterproliferation	2,519	2,595	2,672
Nuclear Counterterrorism & Incident Response	2,519	2,595	2,672
Total Brookhaven National Laboratory	**9,404**	**10,951**	**10,987**
Carlsbad Area Office			
Domestic Radiological Security	545	0	0
Global Material Security	545	0	0
Total Carlsbad Area Office	**545**	**0**	**0**
Consolidated Business Center			
Nuclear Material Removal	100	0	0
Material Management and Minimization	100	0	0
Total Consolidated Business Center	**100**	**0**	**0**
Fermi National Accelerator Laboratory			
Proliferation Detection R&D	0	500	492
Defense Nuclear Nonproliferation R&D	0	500	492
Total Fermi National Accelerator Laboratory	**0**	**500**	**492**

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Idaho National Laboratory			
International Nuclear Security	3,872	3,668	4,170
Domestic Radiological Security	10,194	12,333	8,474
International Radiological Security	836	418	389
Global Material Security	14,902	16,419	13,033
Conversion (formerly HEU Reactor Conversion)	0	42,600	45,600
Nuclear Material Removal	7,745	10,000	10,700
Material Management and Minimization	7,745	52,600	56,300
Nonproliferation & Arms Control	2,603	3,781	3,746
Proliferation Detection R&D	7,102	5,034	4,954
Nonproliferation Fuels Development	38,394	5,900	0
Nonproliferation Stewardship Program	0	0	3,780
Defense Nuclear Nonproliferation R&D	45,496	10,934	8,734
Counterterrorism and Counterproliferation	4,609	4,747	4,890
Nuclear Counterterrorism & Incident Response	4,609	4,747	4,890
Total Idaho National Laboratory	**75,355**	**88,481**	**86,703**
Kansas City National Security Complex (KCNSC)			
Material Disposition	2,550	775	100
Material Management and Minimization	2,550	775	100
Nonproliferation & Arms Control	2,354	2,686	2,661
Proliferation Detection R&D	275	0	0
Defense Nuclear Nonproliferation R&D	275	0	0
Counterterrorism and Counterproliferation	25,274	52,032	62,093
Nuclear Counterterrorism & Incident Response	25,274	52,032	62,093
Total Kansas City National Security Complex (KCNSC)	**30,453**	**55,493**	**64,854**
Lawrence Berkeley National Laboratory			
Nonproliferation & Arms Control	303	0	0
Proliferation Detection R&D	7,823	5,250	5,166
Defense Nuclear Nonproliferation R&D	7,823	5,250	5,166
Counterterrorism and Counterproliferation	430	443	456
Nuclear Counterterrorism & Incident Response	430	443	456
Total Lawrence Berkeley National Laboratory	**8,556**	**5,693**	**5,622**
Lawrence Livermore National Laboratory			
International Nuclear Security	7,070	8,830	10,061
Domestic Radiological Security	1,032	0	0
International Radiological Security	3,926	4,716	4,383
Nuclear Smuggling Detection and Deterrence	4,911	4,491	4,512
Global Material Security	16,939	18,037	18,956
Nuclear Material Removal	34	0	0
Material Disposition	140	0	100
Material Management and Minimization	174	0	100
Nonproliferation & Arms Control	24,042	23,212	22,998
National Technical Nuclear Forensics R&D	0	0	10,099
Proliferation Detection R&D	45,660	47,150	35,882
Nuclear Detonation Detection	7,690	8,574	16,139
Nonproliferation Stewardship Program	0	750	1,000
Defense Nuclear Nonproliferation R&D	53,350	56,474	53,021
Emergency Operations	663	624	637
Counterterrorism and Counterproliferation	42,128	47,392	59,787
Nuclear Counterterrorism & Incident Response	42,791	48,016	60,424
Total Lawrence Livermore National Laboratory	**137,296**	**145,739**	**165,598**

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Los Alamos National Laboratory			
International Nuclear Security	3,608	4,594	5,230
Domestic Radiological Security	31,563	23,935	16,445
International Radiological Security	969	1,370	1,273
Nuclear Smuggling Detection and Deterrence	9,678	9,468	9,513
Global Material Security	45,818	39,367	32,461
Conversion (formerly HEU Reactor Conversion)	0	200	1,670
Nuclear Material Removal	320	50	250
Material Disposition	48,200	60,600	79,082
Laboratory and Partnership Support	1,145	935	0
Material Management and Minimization	49,665	61,785	81,002
Nonproliferation & Arms Control	17,106	19,250	19,073
National Technical Nuclear Forensics R&D	0	0	13,808
Proliferation Detection R&D	56,028	50,581	35,520
Nuclear Detonation Detection	57,230	66,743	76,009
Nonproliferation Fuels Development	673	0	0
Nonproliferation Stewardship Program	0	0	4,780
Defense Nuclear Nonproliferation R&D	113,931	117,324	116,309
Counterterrorism and Counterproliferation	43,062	48,354	51,804
Nuclear Counterterrorism & Incident Response	43,062	48,354	51,804
Total Los Alamos National Laboratory	**269,582**	**286,080**	**314,457**
National Energy Technology Lab			
Material Disposition	0	750	0
Material Management and Minimization	0	750	0
Total National Energy Technology Lab	**0**	**750**	**0**
Nevada National Security Site			
International Radiological Security	1,910	611	568
Global Material Security	1,910	611	568
Nonproliferation & Arms Control	359	12	12
National Technical Nuclear Forensics R&D	0	0	1,981
Proliferation Detection R&D	21,231	21,801	10,306
Nuclear Detonation Detection	620	593	11,327
Nonproliferation Stewardship Program	0	15,900	15,000
Defense Nuclear Nonproliferation R&D	21,851	38,294	36,633
Emergency Operations	19,631	21,450	21,609
Counterterrorism and Counterproliferation	36,542	37,638	39,144
Nuclear Counterterrorism & Incident Response	56,173	59,088	60,753
Total Nevada National Security Site	**80,293**	**98,005**	**99,947**
NNSA Albuquerque Complex			
International Nuclear Security	3,518	2,600	2,976
Domestic Radiological Security	5,365	17,294	11,882
International Radiological Security	6,906	5,321	4,946
Nuclear Smuggling Detection and Deterrence	59,859	75,744	76,101
Global Material Security	75,648	100,959	95,905
Conversion (formerly HEU Reactor Conversion)	0	0	500
Nuclear Material Removal	2,200	1,000	3,000
Material Disposition	200	0	0
Laboratory and Partnership Support	20,850	250	0
Material Management and Minimization	23,250	1,250	3,500
Nonproliferation & Arms Control	2,500	0	0

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Proliferation Detection R&D	15,002	34,708	34,153
Nuclear Detonation Detection	15,176	16,532	16,245
Nonproliferation Fuels Development	400	0	0
Nonproliferation Stewardship Program	0	3,600	21,000
Defense Nuclear Nonproliferation R&D	30,578	54,840	71,398
99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS	8,383	30,000	0
18-D-150, Surplus Plutonium Disposition Project, SRS	0	500	500
Nonproliferation Construction	8,383	30,500	500
Counterterrorism and Counterproliferation	289	298	307
Nuclear Counterterrorism & Incident Response	289	298	307
Total NNSA Albuquerque Complex	**140,648**	**187,847**	**171,610**
NNSA Production Office (NPO)			
Material Disposition	14,090	7,135	10,190
Material Management and Minimization	14,090	7,135	10,190
Total NNSA Production Office (NPO)	**14,090**	**7,135**	**10,190**
Oak Ridge Institute for Science & Education			
Counterterrorism and Counterproliferation	1,860	1,916	1,973
Nuclear Counterterrorism & Incident Response	1,860	1,916	1,973
Total Oak Ridge Institute for Science & Education	**1,860**	**1,916**	**1,973**
Oak Ridge National Laboratory			
International Nuclear Security	8,125	12,427	14,168
Domestic Radiological Security	3,900	4,577	3,145
International Radiological Security	6,879	6,091	5,661
Nuclear Smuggling Detection and Deterrence	14,958	10,218	10,266
Global Material Security	33,862	33,313	33,240
Conversion (formerly HEU Reactor Conversion)	0	500	3,450
Nuclear Material Removal	5,761	4,950	6,300
Material Disposition	1,150	2,100	0
Laboratory and Partnership Support	2,255	1,060	0
Material Management and Minimization	9,166	8,610	9,750
Nonproliferation & Arms Control	17,736	20,381	20,193
National Technical Nuclear Forensics R&D	0	0	1,938
Proliferation Detection R&D	30,232	24,481	24,089
Nuclear Detonation Detection	780	830	246
Nonproliferation Fuels Development	6,555	4,300	0
Nonproliferation Stewardship Program	0	750	8,560
Defense Nuclear Nonproliferation R&D	37,567	30,361	32,895
Counterterrorism and Counterproliferation	4,555	7,191	8,415
Nuclear Counterterrorism & Incident Response	4,555	7,191	8,415
Total Oak Ridge National Laboratory	**102,886**	**99,856**	**106,431**
Office of Scientific & Technical Information			
Nuclear Detonation Detection	40	40	40
Defense Nuclear Nonproliferation R&D	40	40	40
Total Office of Scientific & Technical Information	**40**	**40**	**40**

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Pacific Northwest National Laboratory			
International Nuclear Security	3,104	4,064	4,742
Domestic Radiological Security	30,926	26,463	18,182
International Radiological Security	41,620	35,200	32,717
Nuclear Smuggling Detection and Deterrence	53,763	44,458	44,667
Global Material Security	129,413	110,185	100,308
Conversion (formerly HEU Reactor Conversion)	0	22,000	27,712
Nuclear Material Removal	250	0	350
Material Disposition	5,171	100	1,400
Laboratory and Partnership Support	809	0	0
Material Management and Minimization	6,230	22,100	29,462
Nonproliferation & Arms Control	22,659	22,892	22,681
National Technical Nuclear Forensics R&D	0	0	5,509
Proliferation Detection R&D	27,504	28,451	16,302
Nuclear Detonation Detection	4,428	5,122	15,297
Nonproliferation Fuels Development	25,520	0	0
Nonproliferation Stewardship Program	0	750	4,780
Defense Nuclear Nonproliferation R&D	57,452	34,323	36,379
99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS	200	0	0
18-D-150, Surplus Plutonium Disposition Project, SRS	0	2,250	2,000
Nonproliferation Construction	200	2,250	2,000
Emergency Operations	1,080	940	960
Counterterrorism and Counterproliferation	2,784	2,867	2,954
Nuclear Counterterrorism & Incident Response	3,864	3,807	3,914
Total Pacific Northwest National Laboratory	**219,818**	**195,557**	**200,253**
Pantex Plant			
Material Disposition	5,100	3,000	6,776
Material Management and Minimization	5,100	3,000	6,776
Proliferation Detection R&D	50	0	0
Defense Nuclear Nonproliferation R&D	50	0	0
Counterterrorism and Counterproliferation	2,456	2,530	2,606
Nuclear Counterterrorism & Incident Response	2,456	2,530	2,606
Total Pantex Plant	**7,606**	**5,530**	**9,382**
Princeton Site Office			
Proliferation Detection R&D	170	300	295
Defense Nuclear Nonproliferation R&D	170	300	295
Total Princeton Site Office	**170**	**300**	**295**
Richland Operations Office			
Counterterrorism and Counterproliferation	1,804	1,858	2,914
Nuclear Counterterrorism & Incident Response	1,804	1,858	2,914
Total Richland Operations Office	**1,804**	**1,858**	**2,914**
Sandia National Laboratories			
International Nuclear Security	13,858	12,127	13,853
Domestic Radiological Security	22,553	18,287	12,564
International Radiological Security	14,858	14,646	13,613
Nuclear Smuggling Detection and Deterrence	10,128	7,519	7,554
Global Material Security	61,397	52,579	47,584
Conversion (formerly HEU Reactor Conversion)	0	600	850
Material Disposition	2,415	0	500
Material Management and Minimization	2,415	600	1,350

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Nonproliferation & Arms Control	8,111	9,900	9,808
National Technical Nuclear Forensics R&D	0	0	1,503
Proliferation Detection R&D	40,287	38,774	26,718
Nuclear Detonation Detection	105,528	80,232	90,020
Nonproliferation Fuels Development	517	0	0
Nonproliferation Stewardship Program	0	750	1,000
Defense Nuclear Nonproliferation R&D	146,332	119,756	117,738
Counterterrorism and Counterproliferation	43,182	48,476	50,415
Nuclear Counterterrorism & Incident Response	43,182	48,476	50,415
Total Sandia National Laboratories	**261,437**	**231,311**	**228,398**
Savannah River Operations Office			
Nuclear Material Removal	1,496	150	350
Material Disposition	574	100	500
Material Management and Minimization	2,070	250	850
99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS	233	0	0
Nonproliferation Construction	233	0	0
Total Savannah River Operations Office	**2,303**	**250**	**850**
Savannah River Site			
Global Material Security	0	108	124
Conversion (formerly HEU Reactor Conversion)	0	2,700	4,700
Nuclear Material Removal	9,637	8,600	14,150
Material Disposition	111,706	28,850	47,250
Laboratory and Partnership Support	1,850	600	0
Material Management and Minimization	123,193	40,750	66,100
Nonproliferation & Arms Control	6,149	6,051	5,995
National Technical Nuclear Forensics R&D	0	0	1,503
Proliferation Detection R&D	4,628	6,079	5,982
Nuclear Detonation Detection	300	450	0
Nonproliferation Fuels Development	1,704	0	0
Defense Nuclear Nonproliferation R&D	6,632	6,529	5,982
99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS	75,602	80,000	0
18-D-150, Surplus Plutonium Disposition Project, SRS	0	74,000	142,589
Nonproliferation Construction	75,602	154,000	142,589
Nuclear Counterterrorism & Incident Response	3,489	3,594	3,701
Total Savannah River Site	**215,065**	**211,032**	**225,994**
SLAC National Accelerator Laboratory			
National Technical Nuclear Forensics R&D	0	0	1,387
Proliferation Detection R&D	1,275	1,200	1,181
Nuclear Detonation Detection	487	415	0
Defense Nuclear Nonproliferation R&D	1,762	1,615	1,181
Total SLAC National Accelerator Laboratory	**1,762**	**1,615**	**2,568**
Washington Headquarters			
International Nuclear Security	1,488	6,442	7,459
Domestic Radiological Security	611	28,981	19,911
International Radiological Security	1	9,045	8,406
Nuclear Smuggling Detection and Deterrence	526	5,103	5,127
Global Material Security	2,626	49,571	40,903

DEPARTMENT OF ENERGY
Funding by Site Detail
Defense Nuclear Nonproliferation
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Conversion (formerly HEU Reactor Conversion)	0	6,646	57,500
Nuclear Material Removal	684	1,000	0
Material Disposition	2,804	72,358	17,817
Laboratory and Partnership Support	644	40,333	0
Material Management and Minimization	4,132	120,337	75,317
Nonproliferation & Arms Control	8,641	12,384	12,269
Proliferation Detection R&D	13,229	21,151	20,812
Nuclear Detonation Detection	2,660	16,406	11,208
Defense Nuclear Nonproliferation R&D	15,889	37,557	32,020
99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS	135,582	110,000	0
18-D-150, Surplus Plutonium Disposition Project, SRS	0	2,250	3,500
Nonproliferation Construction	135,582	112,250	3,500
Emergency Operations	13,980	12,306	12,564
Counterterrorism and Counterproliferation	62,548	68,293	40,867
Nuclear Counterterrorism & Incident Response	76,528	80,599	53,431
Legacy Contractor Pensions (DNN)	28,640	13,700	14,348
Total Washington Headquarters	**272,038**	**426,398**	**231,788**
Waste Isolation Pilot Plant			
Material Disposition	9,722	2,240	4,300
Material Management and Minimization	9,722	2,240	4,300
Nonproliferation & Arms Control	325	427	423
Counterterrorism and Counterproliferation	37	39	40
Nuclear Counterterrorism & Incident Response	37	39	40
Total Waste Isolation Pilot Plant	**10,084**	**2,706**	**4,763**
Y-12 National Security Complex			
International Nuclear Security	1,696	2,970	3,413
Domestic Radiological Security	19,050	14,492	9,957
International Radiological Security	438	370	344
Global Material Security	21,184	17,832	13,714
Conversion (formerly HEU Reactor Conversion)	0	800	2,045
Nuclear Material Removal	2,987	5,675	3,100
Material Disposition	22,047	8,600	22,696
Laboratory and Partnership Support	1,514	360	0
Material Management and Minimization	26,548	15,435	27,841
Nonproliferation & Arms Control	3,116	4,094	4,057
National Technical Nuclear Forensics R&D	0	0	2,272
Proliferation Detection R&D	5,735	7,434	7,315
Nuclear Detonation Detection	810	680	0
Nonproliferation Fuels Development	1,248	0	0
Defense Nuclear Nonproliferation R&D	7,793	8,114	7,315
Counterterrorism and Counterproliferation	2,938	3,026	3,117
Nuclear Counterterrorism & Incident Response	2,938	3,026	3,117
Total Y-12 National Security Complex	**61,579**	**48,501**	**58,316**

Naval Reactors

Naval Reactors

Naval Reactors

Proposed Appropriation Language

For Department of Energy expenses necessary for Naval Reactors' activities to carry out the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition (by purchase, condemnation, construction, or otherwise) of real property, plant, and capital equipment, facilities, and facility expansion, [$1,648,396,000]*$1,684,000,000* to remain available until expended[, of which, $88,500,000 shall be transferred to "Department of Energy—Energy Programs—Nuclear Energy", for the Advanced Test Reactor]: Provided, That of such amount, [$50,500,000]$*53,700,000* shall be available until September 30, [2021]*2022* for program direction.

Explanation of Changes

Changes from the FY 2020 enacted language consist of changes to the requested funding amount and the period of availability of program direction funding and the removal of language mandating a transfer of funds to Nuclear Energy for the Advanced Test Reactor (ATR). The FY 2021 Budget Request reflects a 2.2% increase from FY 2020 Enacted levels (not including the ATR transfer). Increased funding in FY 2021 relative to FY 2020 maintains support for the current fleet and focuses on advanced technology development for future fleet capabilities. Additionally, S8G-Prototype Refueling Overhaul and Spent Fuel Handling Recapitalization Project funding profiles are updated to account for schedule delays and resource requirements.

Public Law Authorizations

- P.L. 83-703, "Atomic Energy Act of 1954"
- Executive Order 12344 (42 U.S.C. 7158), "Naval Nuclear Propulsion Program"
- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-92, National Defense Authorization Act, 2020
- P.L. 116-94 Further Consolidated Appropriations Act, 2020

Naval Reactors[a]

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Naval Reactors	**1,788,618**	**1,648,396**	**1,684,000**	**+35,604**

Overview

The Naval Reactors (NR) appropriation includes funding for activities that respond directly to the National Security Strategy of the United States and the Administrator's Nuclear Posture Review (NPR), and are central to the Department of Energy's pursuit of its Strategic Vision goal of Nuclear Security. Specifically, NR is responsible for U.S. Navy nuclear propulsion work, beginning with reactor plant technology development and design, continuing through reactor plant operation and maintenance, and ending with final disposition of naval spent nuclear fuel. The program ensures the safe and reliable operation of reactor plants in nuclear-powered submarines and aircraft carriers (constituting over 40% of the Navy's major combatants[b]) and fulfills the Navy's requirements for new nuclear propulsion plants that meet current and future national defense requirements.

Naval Reactors' mission includes ensuring the safety of reactors and associated naval nuclear propulsion plants, and control of radiation and radioactivity associated with naval nuclear propulsion activities, including prescribing and enforcing standards and regulations for these areas, as they affect the environment and the safety and health of workers, operators, and the general public. Naval Reactors maintains oversight in areas such as security, nuclear safeguards and transportation, radiological controls, public information, procurement, logistics, and fiscal management.

As part of the National Nuclear Security Administration (NNSA), Naval Reactors is working to provide the U.S. Navy with nuclear propulsion plants that are capable of responding to the challenges of the 21st century security environment.

Highlights and Major Changes in the FY 2021 Budget Request

Naval Reactors' request of $1,684,000 in FY 2021 is for continued achievement of its core objective of ensuring the safe and reliable operation of the Nation's nuclear fleet.

Naval Reactors' request includes an additional $91 million above the planned amount from the FY 2020 Future Years Nuclear Security Plan (for a total of $330 million) in FY 2021 for the Spent Fuel Handling Project (SFHP) to account for unanticipated changes in labor and material market conditions.

Naval Reactors' request includes an additional $85 million (for a total of $135 million) in FY 2021 for the S8G Prototype Refueling Overhaul to fund an expected delay to project completion.

Major Outyear Priorities and Assumptions

The outyear funding (FY 2022 through FY 2025) for Naval Reactors is $7.063 billion. Outyear funding supports Naval Reactors' core mission of providing proper maintenance and safety oversight, and addressing emergent operational issues and technology obsolescence for 98 operating reactor plants. This includes 68 submarines, 11 aircraft carriers, and 4 research, development, and training platforms (including the land-based prototypes). Outyear funding also supports Naval Reactors' continued achievement of ongoing new plant design projects, as well as continued achievement of its legacy responsibilities, such as ensuring proper management of naval spent nuclear fuel, prudent recapitalization of aging facilities, and cleanup of environmental liabilities.

Department of Energy (DOE) Working Capital Fund (WCF) Support

The Naval Reactors appropriation projected contribution to the DOE WCF for FY 2021 is $2,563,000. This funding covers certain shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

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[a] Throughout this document, funding does not reflect the mandated transfer of $85.5 million in FY 2019 and $88.5 million in FY 2020 to the Office of Nuclear Energy for operation of the Advanced Test Reactor.

[b] Major combatants includes aircraft carriers, submarines, and surface combatants based on the "Active in Commission" column from Naval Vessel Register.

Rickover Fellowship Program

Naval Reactors manages the fellowship to attract and develop technical leaders in the areas of reactor technology and design as it pertains to naval nuclear propulsion. NR anticipates spending $1,426,543 in FY 2021 to support this program.

Naval Reactors

Funding by Congressional Control[a]

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Naval Reactors				
Naval Reactors Operations and Infrastructure	525,764	553,591	506,294	-47,297
Naval Reactors Development	514,951	516,205	590,306	+74,101
S8G Prototype Refueling	250,000	170,000	135,000	-35,000
Columbia-Class Reactor Systems Development	138,000	75,500	64,700	-10,800
Program Direction	48,709	50,500	53,700	+3,200
Construction	311,194	282,600	334,000	+51,400
Total, Naval Reactors	**1,788,618**	**1,648,396**	**1,684,000**	**35,604**

Outyears for Naval Reactors Funding

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Naval Reactors				
Naval Reactors Operations and Infrastructure	596,092	694,984	743,377	754,770
Naval Reactors Development	641,584	728,816	781,291	794,638
S8G Prototype Refueling	126,000	0	0	0
Columbia-Class Reactor Systems Development	55,000	53,900	52,900	45,608
Program Direction	54,300	55,900	57,332	58,188
Construction	238,024	213,400	149,100	167,796
Total, Naval Reactors	**1,711,000**	**1,747,000**	**1,784,000**	**1,821,000**

[a] Funding tables are unclassified

Naval Reactors Funding[a]

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Naval Reactors				
Naval Reactors Operations and Infrastructure				
Research Reactor Facility Operations & Maintenance	107,531	122,580	135,493	+12,913
MARF Defueling and Layup	4,982	6,954	7,098	+144
Laboratory Facility Regulation, Compliance, & Protection	135,260	132,463	138,859	+6,396
Nuclear Spent Fuel Management	127,495	136,437	130,613	-5,824
Radiological/Environmental Remediation & Demolition	94,540	103,877	68,526	-35,351
Capital Equipment	2,000	2,000	0	-2,000
General Plant Projects	53,956	49,280	25,705	-23,575
Total, Naval Reactors Operations and Infrastructure	**525,764**	**553,591**	**506,294**	**-47,297**
Naval Reactors Development				
Ship Construction & Maintenance Support	40,168	46,067	48,299	+2,232
Nuclear Reactor Technology	165,663	163,908	198,403	+34,495
Reactor Systems & Component Technology	208,120	208,750	251,929	+43,179
Advanced Test Reactor Operations	85,500	88,500	87,275	-1,225
Capital Equipment	15,500	8,980	4,400	-4,580
Total, Naval Reactors Development	**514,951**	**516,205**	**590,306**	**+74,101**
S8G Prototype Refueling	**250,000**	**170,000**	**135,000**	**-35,000**
Columbia-Class Reactor Systems Development	**138,000**	**75,500**	**64,700**	**-10,800**
Program Direction	**48,709**	**50,500**	**53,700**	**+3,200**
Construction	**311,194**	**282,600**	**334,000**	**+51,400**
Total, Naval Reactors	**1,788,618**	**1,648,396**	**1,684,000**	**+35,604**

[a] Funding tables are unclassified

Outyears for Naval Reactors Funding[a]

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Naval Reactors				
Naval Reactors Operations and Infrastructure				
Research Reactor Facility Operations & Maintenance	148,210	119,938	115,614	110,308
MARF Defueling and Layup	15,493	58,071	84,305	85,448
Laboratory Facility Regulation, Compliance, & Protection	144,513	153,677	157,077	162,886
Nuclear Spent Fuel Management	146,346	189,262	199,516	208,693
Radiological/Environmental Remediation & Demolition	101,783	109,276	125,523	126,746
Capital Equipment	0	5,000	800	0
General Plant Projects	39,747	59,760	60,542	60,689
Total, Naval Reactors Operations and Infrastructure	**596,092**	**694,984**	**743,377**	**754,770**
Naval Reactors Development				
Ship Construction & Maintenance Support	44,835	45,524	46,347	52,676
Nuclear Reactor Technology	222,175	258,257	266,223	280,641
Reactor Systems & Component Technology	272,066	323,445	357,722	352,973
Advanced Test Reactor Operations	89,108	90,890	92,799	93,448
Capital Equipment	13,400	10,700	18,200	14,900
Total, Naval Reactors Development	**641,584**	**728,816**	**781,291**	**794,638**
S8G Prototype Refueling	**126,000**	**0**	**0**	**0**
Columbia-Class Reactor Systems Development	**55,000**	**53,900**	**52,900**	**45,608**
Program Direction	**54,300**	**55,900**	**57,332**	**58,188**
Construction	**238,024**	**213,400**	**149,100**	**167,796**
Total, Naval Reactors	**1,711,000**	**1,747,000**	**1,784,000**	**1,821,000**

[a] Funding tables are unclassified

Naval Reactors
Explanation of Major Changes
(Dollars in Thousands)

	FY 2021 Request vs FY 2020 Enacted
Naval Reactors	
Naval Reactors Operations and Infrastructure: This decrease (-9%) reflects the reprioritization of funding to address cost growth in SFHP and S8G-Prototype Refueling Overhaul, primarily through deferring minor construction projects and growth in decontamination and decommissioning efforts, while maintaining support of prototype maintenance activities. This decrease also reflects the revised schedule for MARF defueling and layup.	-47,297
Naval Reactors Development: This increase (+14%) supports unique technologies that are critical to delivering improvements in reactor performance and reliability and provide continuous support to U.S. Navy fleet operations.	+74,101
S8G Prototype Refueling: This decrease (-21%) incorporates the project's revised funding profile and supports refueling overhaul execution and completion in 2022.	-35,000
***Columbia*-Class Reactor Systems Development:** This decrease (-14%) is consistent with the project's planned funding profile and supports FY 2021 production, analysis, and testing execution.	-10,800
Program Direction: This funding increase (+6%) includes general inflationary increases for personnel and pay related costs, travel requirements, and IT hardware and maintenance operations.	+3,200
Construction: This increase (+18%) reflects revised FY 2021 requirements for the Spent Fuel Handling Recapitalization Project.	+51,400
Total, Naval Reactors	**+35,604**

Description

The Naval Reactors Operations and Infrastructure resources ensure Naval Reactors maintains an integrated and effective enterprise across program sites located in Pennsylvania, New York, and Idaho, to provide safe and environmentally conscious operation of the nuclear fleet. The Naval Reactors Operations and Infrastructure program resources provide funding for work associated with the operation of two land-based nuclear prototypes at the Kesselring Site located in West Milton, NY; two dedicated, government-owned, contractor-operated laboratory facilities, Knolls and Bettis located in Schenectady, NY and West Mifflin, PA, respectively; and naval spent nuclear fuel handling facilities and operations at the Naval Reactors Facility at the Idaho National Laboratory in Idaho. These resources fund work that ensures unique Naval Reactors' infrastructure and advanced naval nuclear capabilities are maintained well into the future. These efforts include:

1. Operation and maintenance of the DOE land-based prototypes supporting technology development and nuclear operator training.

2. Planning and preparations to defuel the Modifications and Additions to Reactor Facilities (MARF) prototype and perform the necessary work to leave the plant in a benign condition for eventual disassembly.

3. Activities to ensure Naval Reactors program operations meet or exceed applicable federal, state, and local standards and requirements.

4. Disposition of naval spent nuclear fuel from the inactivation and refueling of ships.

5. Remediation, dismantlement, and disposal of inactive Naval Reactors program systems, facilities, and areas.

6. Design and procurement of capital equipment.

7. Design and construction of facilities and infrastructure to provide for capacity, security, safety, environmental, and obsolescence needs.

Research Reactor Facility Operations & Maintenance

The mission of this subprogram is to support the two land-based prototypes located at the Kesselring Site in New York through the following work efforts: (1) Test and examine reactor materials, components, systems, and new design applications under actual operating conditions. (2) Provide a ship-like operating platform to train nuclear operators. (3) Support improved design activities for the operating prototypes and perform systematic preventive maintenance, corrective maintenance, upgrades, and modifications on the prototypes and their support equipment. (4) Evaluate problems using engineering tests and other troubleshooting techniques. (5) Procure and maintain adequate spare parts, material, specialized tools and instrumentation for troubleshooting and prototype testing.

MARF Defueling and Layup

The mission of this subprogram is to support development of design documents, planning, and preparations necessary to defuel and layup the MARF prototype, in order to place the plant in a safe and benign condition, for eventual dismantlement and off-site disposal. The request funds: (1) Advance planning including long lead material ordering and facilities preparations. (2) Work integration and scheduling. (3) Preparation and placement of contracts and management of subcontracted work. (4) Procurement of required services and shipment of required equipment and materials.

Laboratory Facility Regulation, Compliance & Protection

The mission of this subprogram is to ensure that Naval Reactors operations and design activities meet or exceed applicable federal, state, and local standards and requirements, such as Radiological Controls, Environmental, Safety and Health, Quality Assurance, and Nuclear Materials Management. This is accomplished by: (1) Personnel training, instruction, supervision, independent oversight, and formal auditing. (2) Extensive personnel and environmental sampling and monitoring programs to ensure operations have no discernible impact on human health or the environment. (3) Prepare and issue numerous reports required by federal, state, and local regulations and requirements. (4) Review of new and existing nuclear plant design and the related procurement of nuclear fuel and new project equipment. Naval Reactors' radiological workforce is a highly trained group, capable of responding in the event of a radiological accident, as well as supporting routine radiological operations.

Nuclear Spent Fuel Management

The mission of this subprogram is to fulfill Naval Reactors' cradle-to-grave responsibility for aspects of naval nuclear propulsion by properly managing naval spent nuclear fuel (NSNF). Specifically, resources in this subprogram support: (1) safely receive, handle, prepare, package and temporarily store NSNF coming from the nuclear powered fleet, prototypes and the Advanced Test Reactor. This includes fuel handling operations at Department of Energy facilities; mechanically processing NSNF at the Naval Reactors Facility (NRF) in the State of Idaho; packaging the NSNF for dry storage in a geologic repository or interim storage facility, and disposing of the radiological waste by-products produced by these processes. (2) Support nuclear powered warship deployments by managing Naval Reactors NSNF shipping container capacity for aircraft carrier and submarine refueling overhauls and defueling inactivation operations. (3) Conduct destructive and non-destructive examinations of expended naval cores and irradiated test specimens from the Advanced Test Reactor located at the Idaho National Laboratory. (4) Manage the construction of projects that directly support improvements to the NSNF receiving, processing, packaging, and disposal efforts, reducing radiological risks at the NRF.

Radiological/Environmental Remediation & Demolition

The mission of this subprogram is to remediate, dismantle, and dispose of inactive Naval Reactors systems, facilities, and areas that once supported research and development, design, testing, training, and prototype operations. Requirements are prioritized based on a criteria model that ensures currently available funding is provided to projects most critical to Naval Reactors with emphasis on balancing factors such as risk reduction and inactive facility lifecycle costs.

Capital Equipment

The mission of this subprogram is to provide the critical technical tools and equipment to ensure that Naval Reactors can achieve its mission. Capital equipment is defined as non-construction related equipment, computer systems, tooling, and furniture or fixtures having useful life of two or more years and costing greater than $500,000. The tools and equipment are required to support the other work efforts within the sub-categories of Naval Reactors Operations and Infrastructure (e.g. operator training and facilities maintenance).

General Plant Projects

The mission of this subprogram is to execute minor construction projects of a general nature, the Total Estimated Cost of which may not exceed the established minor construction threshold. General Plant Projects are necessary to adapt facilities to new or improved production techniques, to effect economies of operations, and to reduce or eliminate health, fire, and security vulnerabilities. These projects provide for design and construction, additions, and improvements to land, buildings, and utility systems, and they may include construction of small new buildings, additions to roads, and general area improvements. Funding is derived from established site construction plans and may be used for emergent and unforeseen infrastructure needs.

FY 2022-FY 2025 Key Milestones

Research Reactor Facility Operations and Maintenance

- Obtain core depletion data in the land-based prototype to validate designs and methods of current operating fleet cores.
- Perform maintenance on the land-based prototype, including replacement of major reactor plant, steam plant, and safety system components.
- Conduct core test programs and evaluations on the land-based prototype to validate current and future fleet core designs/methods as well as prototype reactor core performance.

- Conduct testing of electronic power generation and conversion units now deployed in the fleet and provide test bed for software and hardware upgrades prior to fleet deployment to ensure that problems with new technologies and designs are resolved before broader application and do not affect the deployed nuclear fleet.
- Develop technology for future fleet deployment with the use of chemistry automation testing that provides improved data and reduced time and exposure requirements for future fleet application.
- Operate and maintain Engineered Safety Features System.

MARF Defueling and Layup

- Complete MARF defueling project management plan and integrated master schedule.
- Complete servicing facility modifications to support defueling.
- Commence reactor servicing safety report revision.
- Complete detailed defueling operations planning.
- Establish shipyard contract(s) for the execution of the MARF defueling and layup.

Laboratory Facility Regulation, Compliance & Protection

- Ensure that permits and reports such as monthly reports on water discharges, quarterly reports on corrective measures, and annual reports on non-radiological air emissions, radiological discharges, radiological exposure monitoring, hazardous waste management, work on asbestos containing materials, chemicals stored on site, and results of monitoring of groundwater required by regulatory agencies are updated to reflect new guidance and direction.
- Ensure operations and fleet support testing is conducted in compliance with applicable federal and state requirements.
- Provide quality assurance support for acquisition of equipment needed for ongoing fleet operations and new projects. Examples include auditing vendors for capability and quality systems (approved vendor list); providing quality and technical support for procurement of complex equipment (reactor system valve procurements, uniquely designed pressure vessels).
- Support new plant designs, such as the *Columbia*-Class, and fleet support technical processes and knowledge through implementation of quality standards and application of engineering metrics.
- Plan and participate in a biennial emergency response to a simulated accident involving naval spent nuclear fuel as part of NR's outreach program.

Nuclear Spent Fuel Management

- Package spent fuel canisters of NSNF into dry storage to support an agreement with the State of Idaho for NSNF located in water pool storage prior to January 1, 2017 to be removed from water pool storage no later than January 1, 2023.
- Mechanically process NSNF modules for placement into dry storage to support legal requirements in the agreement with the State of Idaho.
- Load sleeves of NSNF for packaging method B disposal to support legal requirements in the agreement with the State of Idaho.
- Receive, unload, and return for next use or ultimate disposal, shipping containers of NSNF to support aircraft carrier and submarine refuelings/defuelings and inactivation operations.
- Deliver processing and packaging hardware, fuel handling equipment, and fuel handling procedures in support of S3G, A1G, S8G, D1G, A1W, Advanced Submarine Nuclear Propulsion Plant, Packaging Method B dry storage campaigns.
- Train personnel and checkout equipment/procedures for commencement of operations in the Naval Spent Fuel Handling Facility (NSFHF).

Radiological/Environmental Remediation & Demolition

All sites:

- Conduct remediation of inactive NR Program contaminated systems, facilities, and areas to reduce potential environmental liabilities.
- Continue execution of NNL, NR, and DOE-Environmental Management (EM) collaborative tasks that support facility turnover to DOE-EM, including but not limited to Integrated Project Team formation, Memorandum of Agreement development, site walkdowns, project scoping, and project schedules.

Bettis Laboratory:

- Complete multiple waste load-out campaigns in the Materials Evaluation Laboratory.

Naval Reactors Facility:

- Continue remediation of Off-Hull systems associated with the S1W and A1W prototypes, respectively.
- Commence remediation of the Hot Cell Loading Area (HCLA) and High Bay trenches.
- Commence characterization of the A1W raw water tank.
- Commence the deactivation and fill activities of the ECF water pool void spaces.
- Complete asbestos abatement in S1W.
- Commence dismantlement of the S1W Prototype Complex.
- Complete demolition of miscellaneous small-scale buildings.

Knolls Laboratory:

- Continue environmental remediation to support United States EPA and New York State Department of Environmental Conservation (NYSDEC) initiatives for Solid Waste Management Units (SWMUs) and Area of Concerns (AOCs) identified. Environmental remediation projects are in accordance with NYSDEC approved Corrective Action work schedules.
- Execute abatement of asbestos in numerous radiologically controlled spaces throughout the site.
- Complete capping of the Knolls Laboratory Land Disposal Area and prepare required regulatory reports.
- Commence F Complex demolition.
- Continue ceramics development source term reduction.
- Complete demolition of Q-Complex, including subsequent soil remediation and underground pier removal.
- Commence removing support systems from the former laboratory critical facilities (Flexible Plastic Reactor (FPR), the Pressurized Test Reactor (PTR), the Full Core Physics Experiment (FCPE) and the Thermal Test Reactor (TTComplete remediation of D1G ditch and establish separate entrance and roadway access for DOE-EM.

Capital Equipment

- Laboratory Network Upgrades; replaces network infrastructure which provides basic connectivity for every IT system used in the NR Program. Nearly every enterprise application, database, file repository, website, etc. is connected through this network infrastructure.

General Plant Projects

- BL A7 Building
- BL AMTL Upgrade EMTF Infrastructure
- KL Radio Upgrade
- KL RML HVAC Upgrade
- KS CAS Relocation
- KS Radio Upgrade
- S High Yard 30 Upgrade
- NRF Site Access Entry Point

Description

The Naval Reactors Development resources fund work that ensures the current and future fleet is the most advanced, well-maintained, and capable nuclear fleet in the world. This funding supports unique technologies used only in naval reactors that are crucial to delivering superior navy fleet operations. These efforts include:

1. Supporting the fleet and ensuring safe reactor operations by engineering solutions to emergent reactor issues, supporting equipment replacement and maintenance, and tracking reactor performance over time.

2. Developing and enhancing the fundamental methods, modeling, and materials used in reactor cores and plants, which lowers operating costs and improves performance.

3. Designing and maintaining the major reactor plant components and plant systems required for naval nuclear propulsion.

4. Operation of the Advanced Test Reactor (performed by DOE Office of Nuclear Energy) and performance of irradiation testing for ongoing evaluation of new material applications and core designs.

5. Design and procurement of capital equipment.

Ship Construction & Maintenance Support

The mission of this subcategory is to support both the operation and new construction of the nuclear powered fleet. Operating reactors require continuous mechanical, thermal, hydraulic, materials, and chemistry analyses to fully evaluate the impact of existing design features, core materials, and system modifications on reactor performance and to ensure safe operation throughout the life of the core. Maintenance of the reactor plants involves designing equipment and systems to handle new fuel, highly radioactive spent fuel, and components safely.

Nuclear Reactor Technology

The mission of this subcategory is to develop and apply core material systems that will improve nuclear safety, stealth capability, tactical ability, and reactor plant performance; to support the qualification of the manufacture of those systems at the core vendor; and to deploy these systems in Prototype reactors. The materials testing covered under Nuclear Reactor Technology forms the bedrock of naval nuclear propulsion, providing Naval Reactors with the research and development capacity to fully understand and respond to issues in the operating fleet at the elemental level and enabling Naval Reactors to remain at the forefront of nuclear reactor operations. This subcategory supports the Rickover Fellowship program as well as fuel and poison development efforts, including the examination of expended fuel modules and irradiated core components at the ECF located at the Naval Reactors Facility, which is part of the Idaho National Laboratory (INL).

Reactor Systems & Component Technology

The mission of this subcategory is to provide Naval Reactors with the technology for major reactor plant components (e.g., steam generators) as well as plant systems (e.g., instrumentation and control). This subcategory provides the support and expertise necessary to ensure the satisfactory operation of steam generators in the naval nuclear fleet and prototypes and for design and implementation of the *Virginia*-Class and *Ford*-Class steam generators as well as the heat exchanger applications for the *Columbia*-Class. The major objective of instrumentation and control component and system development is to deliver the next generation of instrumentation, control, and electrical equipment for naval nuclear applications.

Advanced Test Reactor Operations

The mission of this subprogram is to test and qualify reactor materials and fuels to be incorporated into nuclear fleet applications. Funding in this subprogram provides for operation, engineering, maintenance and other support activities associated with the Advanced Test Reactor (ATR) at the Idaho National Laboratory (INL). While ATR is a facility owned by the DOE Office of Nuclear Energy and operated by their contractor, Naval Reactors funds a portion of the cost of base operations, as well as Naval Reactors-specific testing.

Capital Equipment

The mission of this subprogram is to provide the critical technical tools and equipment to ensure that Naval Reactors can achieve its mission. Capital equipment is defined as non-construction related equipment, computer systems, tooling, and furniture or fixtures having a useful life of two or more years and costing greater than $500,000. The tools and equipment are required to support other work efforts within the subcategories of Naval Reactors Development (e.g., designing and testing of reactor plant systems, and development of new technologies).

FY 2022-FY 2025 Key Milestones

Ship Construction & Maintenance Support

- Perform material testing to establish new products and technologies.
- Core design and analysis support for continued safe and reliable operation of *Los Angeles*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Ohio*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Virginia*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Seawolf*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Nimitz*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Ford*-Class ships.
- Support resolution of fabrication or shipyard issues for reactor equipment in production.

Nuclear Reactor Technology

- Utilize key corrosion testing data to support core design needs and improved understanding of the corrosion process.
- Implement Electro-Discharge Machining equipment as a replacement for ECF underwater milling equipment.
- Perform materials examinations of components removed from operating rector plants to obtain material performance data.
- Operate, upgrade, and maintain material testing and examination capabilities and facilities.
- Fabricate model fuel elements and support irradiation testing and manufacturing studies.
- Complete D2W core physics exams.
- Complete conceptual planning for a new examination facility to provide long-term capabilities to perform testing of naval spent fuel, plant components, and test specimens.

Reactor Systems & Component Technology

- Provide test data to qualify analysis tools used to design steam generators.
- Develop Predictive Methodologies and Data Analytics for evaluation of in-service components.
- Research, develop, and test new technologies and sensors for integration into existing and future propulsion plants.
- Implement advanced controls in fleet applications as necessary.
- Perform a Reactor Systems Performance Analysis for new plant designs.
- Develop and improve design and analysis for new plant designs.
- Develop radiation shield methods for each new plant design and radioactive material handling facility and verify their effectiveness through shield surveys during initial operation.
- Maintain and enhance legacy reactor design software as required.
- Provide structural analyses and assessments for new designs and existing fleet.
- Develop, deploy, and continue enhancement and support of integrated reactor design Advanced Simulation tools.
- Perform testing and analysis of noise sources in components and develop tests to improve propulsion plant acoustics.
- Provide shielding analysis to support defueling of MARF.

Advanced Test Reactor Operations

- Perform operations, maintenance, and engineering support work for the ATR including four 50-day irradiation test cycles per year and two transient tests.
- Safely handle, ship, and receive 18 Naval Reactors program irradiation test trains per year.
- Procurement of nuclear fuel and spare parts to support ATR operations.
- Operate fifty drop-in experiment positions per year.
- Perform core internals change-outs including engineering and design work to ensure temporary deactivations and reactivations of the ATR occur without any adverse effects on the environment and human health.
- Decontaminate and refurbish flowing water loops.

Capital Equipment

- High Performance Computing; enables existing and planned design workload to be completed at a much lower cost than physical tests.
- Analytical Electrical Microscope (AEM); for microanalysis in support of NR program materials characterization and research.
- Radiological Materials Laboratory (RML) High Radiation SEM Replacement; to safely analyze radioactive materials.
- Gas Tungsten Arc Welding; for protecting areas from contamination during welding.

Naval Reactors
S8G Prototype Refueling

Description

The land-based prototype located at the Kesselring Site in West Milton, New York serves as a critical operating reactor to demonstrate technology advancements for fleet application. The land-based prototype requires a refueling overhaul, beginning in FY 2018. Originally built as a prototype for the *Ohio*-Class submarine propulsion plant, this testing platform has been integral to the development of technologies used for the *Virginia*-Class and *Seawolf*-Class, which have resulted in improved performance and reliability while reducing lifecycle costs. Continued operation of this land-based prototype and development of advanced core technology will enable extended core lifetimes, more efficient use of nuclear fuel, greater compactness, and cross-platform adaptability. By constructing the replacement Technology Demonstration Core (TDC) for the prototype with technologies planned for the *Columbia*-Class, technical, cost, and schedule risks to the ship construction program will be mitigated. The manufacturing development, technology demonstration, and new core technologies development began in FY 2010.

Overhaul of reactor and steam plant systems will be performed in conjunction with the land-based prototype refueling overhaul. System overhaul includes the required preventative and corrective maintenance to support subsequent plant operations. In addition, establishing critical site infrastructure to support the Land-based Prototype Refueling Overhaul is required to enable safe and efficient execution of the overhaul.

The land-based prototype reactor plant provides a cost-effective test and evaluation platform, for new technologies, materials, and components before they are introduced to the fleet, and a vital training platform for reactor plant operators. To preserve this critical research and development asset for the long-term and to achieve a life-of-ship core for the *Columbia*-Class, the refueling overhaul execution effort must continue in FY 2021 and complete in FY 2022 to support operator training and proof-of-concept for the *Columbia*-Class core. Naval Reactors requests $135,000,000 for this effort in FY 2021.

FY 2022-FY 2025 Key Milestones

S8G Prototype Refueling

- Complete the S8G Prototype test program.
- Complete the land-based prototype Safety Analysis Report (SAR) update.
- Complete turn-over of the prototype for critical operation and student training.
- Completion of the S8G Prototype Refueling Overhaul Project.

Naval Reactors
***Columbia*-Class Reactor Systems Development**

Description
Ohio-Class ballistic missile submarines (SSBNs) have been the backbone of the Nation's sea-based strategic deterrent since the early-1980s. Recapitalization of this strategic asset is required as *Ohio*-Class retires. With the *Columbia*-Class, the Navy plans to maintain its sea-based strategic deterrent force with a class of 12 ships, two fewer than today's *Ohio*-Class due in part to a life-of-ship-core. This new life-of-ship core will eliminate the need for mid-life reactor refuelings (mid-life refueling overhauls are an over three-year evolution during which the ship is unavailable for service). By increasing the operational availability of the class, development of a new reactor plant for the *Columbia*-Class will permit 12 *Columbia*-Class submarines to do the work of 14 *Ohio*-Class submarines– an operational and sustainment savings of over $40 billion over the life of the class.

Research, development, and design for the *Columbia*-Class SSBN began in FY 2010. The new design will leverage *Virginia*-Class technology, as well as manufacturing development and demonstration efforts being performed as part of the land-based S8G Prototype Refueling Overhaul program. NR must design a new reactor plant to meet the Navy's required capabilities, maximize operational availability, and reduce acquisition and lifecycle costs. The DOE reactor plant design and development work for the *Columbia*-Class will continue in FY 2021 and beyond to mature the design for initial fabrication and procurement of long-lead nuclear components.

Work to support the *Columbia*-Class SSBN is tightly synchronized with Navy-funded propulsion plant work. The DOE-funded design work includes reactor plant component design and development, core design analysis and manufacturing development, reactor plant instrumentation and control design and development, reactor plant configuration, reactor systems development and integration, and reactor performance, analysis, and validation. Lead submarine construction starts in FY 2021. NR requests $64,700,000 for this effort in FY 2021.

Naval Reactors
Program Direction

Description

Due to the essential nature of nuclear reactor work, Naval Reactors provides centrally controlled, technical management of program operations. Federal employees directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories. In addition, these employees interface with other DOE offices and local, state, and Federal regulatory agencies.

Naval Reactors' Federal employees are typically recruited from a community of highly trained military engineers who have completed a rigorous five-year on-the-job training program unique to Naval Reactors. This training program has groomed engineers with skill sets far beyond that of nuclear engineers found in the commercial and Federal sectors.

Travel funds are used to perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety. Additionally, Naval Reactors Representative positions at the field sites (to include locations in the United Kingdom, Japan, Hawaii, and the continental United States) rotate periodically due to retirements, attrition, and succession planning.

Other Related Expenses includes the maintenance of Naval Reactors' IT hardware, engineering software, working capital funding, and related licenses supporting mission-essential technical work. Additionally, these funds will support planned upgrades and maintenance of video teleconferencing equipment, security investigations of Federal personnel, and training requirements.

Highlights and Major Changes in the FY 2021 Budget Request

The increase for the Naval Reactors Program Direction budget includes general inflationary increases for personnel and pay related costs and IT hardware and maintenance. Additionally, NR will continue to reshape the workforce to manage knowledge transfer to ensure the accomplishment of the NR mission.

FY 2022-FY 2025 Key Milestones

NR plans to continue developing its highly technical workforce to ensure the NR mission is preserved well into the future.

Naval Reactors
Program Direction

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Naval Reactors				
Headquarters				
Salaries and Benefits	23,500	26,550	27,540	+990
Travel	1,000	1,150	1,175	+25
Other Related Expenses	3,043	2,560	3,606	+1,046
Total, Headquarters	**27,543**	**30,260**	**32,321**	**+2,061**
Naval Reactors Laboratory Field Office				
Salaries and Benefits	18,200	17,700	18,360	+660
Travel	937	600	625	+25
Other Related Expenses	2,029	1,940	2,394	+454
Total, Naval Reactors Laboratory Field Office	**21,166**	**20,240**	**21,379**	**+1,139**
Total Program Direction				
Salaries and Benefits	41,700	44,250	45,900	+1,650
Travel	1,937	1,750	1,800	+50
Other Related Expenses	5,072	4,500	6,000	+1,500
Total, Program Direction	**48,709**	**50,500**	**53,700**	**+3,200**
Federal FTEs	**246**	**246**	**246**	**+0**

Naval Reactors
Outyears Program Direction

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Naval Reactors				
Headquarters				
Salaries and Benefits	27,367	28,174	28,895	29,295
Travel	1,629	1,677	1,720	1,744
Other Related Expenses	3,584	3,689	3,784	3,868
Total, Headquarters	**32,580**	**33,540**	**34,399**	**34,907**
Naval Reactors Laboratory Field Office				
Salaries and Benefits	18,245	18,782	19,264	19,531
Travel	1,086	1,118	1,146	1,162
Other Related Expenses	2,389	2,460	2,523	2,588
Total, Naval Reactors Laboratory Field Office	**21,720**	**22,360**	**22,933**	**23,281**
Total Program Direction				
Salaries and Benefits	45,612	46,956	48,159	48,826
Travel	2,715	2,795	2,866	2,906
Other Related Expenses	5,973	6,149	6,307	6,456
Total, Program Direction	**54,300**	**55,900**	**57,332**	**58,188**
Federal FTEs	**246**	**246**	**246**	**246**

Naval Reactors
Program Direction - Other Related Expenses

(Dollars in thousands)

Other Related Expenses	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Transportation	800	683	891	+208
Communications, Utilities and Miscellaneous Charges	430	364	486	+122
Other Services from Federal Sources	682	596	837	+241
Advisory and Assistance Services	180	168	202	+34
Operation and Maintenance of Facilities	270	263	298	+35
Operations and Maintenance of Equipment	670	640	746	+106
Supplies and Materials	300	266	362	+96
Equipment	870	761	1,235	+474
Working Capital Fund	870	759	943	+184
Total, Other Related Expenses	**5,072**	**4,500**	**6,000**	**+1,500**

Outyears Program Direction - Other Related Expenses

(Dollars in Thousands)

Other Related Expenses	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request
Transportation	886	912	936	953
Communications, Utilities and Miscellaneous Charges	478	492	505	517
Other Services from Federal Sources	826	851	872	889
Advisory and Assistance Services	209	215	221	234
Operation and Maintenance of Facilities	299	307	315	325
Operations and Maintenance of Equipment	737	758	778	808
Supplies and Materials	368	379	389	400
Equipment	1,254	1,291	1,324	1,350
Working Capital Fund	916	943	967	980
Total, Other Related Expenses	**5,973**	**6,148**	**6,307**	**6,456**

Program Direction
Activities and Explanation of Changes

Salaries and Benefits

FY 2020 Enacted	FY 2021 Request	Exaplanation of Changes FY 2021 Request vs FY 2020 Enacted
$44,250,000	$45,900,000	+$1,650,000

FY 2020 Enacted

- Federal salaries and benefits for employees that directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.

FY 2021 Request

- Federal salaries and benefits for employees that directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.

Explanation of Changes

Reflects a general inflationary increase for personnel and pay related costs as well as anticipated costs of benefits.

Travel

FY 2020 Enacted	FY 2021 Request	Exaplanation of Changes FY 2021 Request vs FY 2020 Enacted
$1,750,000	$1,800,000	+$50,000

FY 2020 Enacted

- Perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety.
- Rotation of Naval Reactors Representatives at the field sites (U.K., Japan, Hawaii, and the continental United States) due to retirement, attrition, and succession planning.

FY 2021 Request

- Perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety.
- Rotation of Naval Reactors Representatives at the field sites (U.K., Japan, Hawaii, and the continental United States) due to retirement, attrition, and succession planning.

Explanation of Changes

Reflects expected travel requirement to execute oversight activities.

Other Related Expenses

FY 2020 Enacted	FY 2021 Request	Exaplanation of Changes FY 2021 Request vs FY 2020 Enacted
$4,500,000	$6,000,000	+$1,500,000

FY 2020 Enacted

- Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work.
- Support planned upgrades and maintenance of video teleconferencing equipment, security investigation of Federal personnel, and training requirements.

FY 2021 Request

- Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work.
- Support planned upgrades and maintenance of video teleconferencing equipment, security investigation of Federal personnel, and training requirements.

Explanation of Changes

Increase supports IT and maintenance operations.

Naval Reactors
Capital Summary[a]

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	17,500	17,500	11,000	4,400	-6,600
Minor Construction	N/A	N/A	53,956	53,956	49,280	25,705	-23,575
Total, Capital Operating Expenses	N/A	N/A	**71,456**	**71,456**	**60,280**	**30,105**	**-30,175**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	12,000	12,000	5,500	4,400	-1,100
High Performance Computer (2020 Buy)	5,500	0	5,500	5,500	5,500	0	-5,500
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**17,500**	**17,500**	**11,000**	**4,400**	**-6,600**

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2019 Actuals	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	51,037	51,037	18,397	6,405	-11,992
BL AMTL Upgrade EMTF Infrastructure	7,900	N/A	500	500	3,080	0	-3,080
KL Legacy Eliminating Office Building	19,000	N/A	0	0	0	19,000	+19,000
KL RML HVAC Upgrade Design	18,230	N/A	0	0	1,945	0	-1,945
KS Service Water and Sanitary Sewer Upgrade	6,754	N/A	469	469	6,285	0	-6,285
KS CAS Relocation	6,100	445	0	0	0	300	+300
KS High Yard 30 Upgrade	8,433	N/A	0	0	623	0	-623
KS S8G Weather Resistant Enclosure	7,700	500	750	750	6,450	0	-6,450
NRF Northeast Boundary Area	13,700	N/A	1,200	1,200	12,500	0	-12,500
Total, Minor Construction Projects	**N/A**	**N/A**	**53,956**	**53,956**	**49,280**	**25,705**	**-23,575**
Total, Capital Summary	**N/A**	**N/A**	**71,456**	**71,456**	**60,280**	**30,105**	**-30,175**

Naval Reactors
Outyears Capital Summary

(Dollars in Thousands)

	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))				
Capital Equipment >$500K (including MIE)	13,400	15,700	19,000	14,900
Minor Construction	38,738	59,760	60,542	60,872
Total, Capital Operating Expenses	**52,138**	**75,460**	**79,542**	**75,772**
Capital Equipment > $500K (including MIE)	7,900	7,400	5,100	2,000
High Performance Computer (2022 Buy)	5,500	0	0	0
High Performance Computer (2023 Buy)	0	5,500	0	0
High Performance Computer (2024 Buy)	0	0	5,500	0
High Performance Computer (2025 Buy)	0	0	0	5,500
RML High Radiation Scanning Electron Microscope Replacement	0	1,500	2,000	1,000
TH1 Test loop	0	1,300	6,400	6,400
Total, Capital Equipment (including MIE)	**13,400**	**15,700**	**19,000**	**14,900**
Minor Construction Projects (Total Estimated Cost (TEC)				
Total Minor Construction Projects (TEC <$5M)	10,368	49,042	27,457	44,797
BL AMTL Upgrade EMTF Infrastructure	560	3,760	0	0
BL A7 Building	19,000	0	0	0
KL Radio Upgrade	1,000	0	16,800	0
KL RML HVAC Upgrade Design	0	0	16,285	0
KS CAS Relocation	0	5,355	0	0
KS High Yard 30 Upgrade	7,810	0	0	0
KS Radio Upgrade	0	1,603	0	16,075
NRF Site Access Entry Point	1,009	0	0	0
Total, Minor Construction Projects	**38,738**	**59,760**	**60,542**	**60,872**
Total, Capital Summary	**52,138**	**75,460**	**79,542**	**75,772**

[a] Funding tables are unclassified.

Naval Reactors Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 vs FY 2020
14-D-901, Spent Fuel Handling Recapitalization Project						
Total Estimated Cost (TEC)	2,060,000	401,200	287,000	238,000	330,000	+92,000
Other Project Cost (OPC)	174,100	174,100	0	0	0	+0
TPC, 14-D-901, Spent Fuel Handling Recapitalization Project[b]	**2,234,100**	**575,300**	**287,000**	**238,000**	**330,000**	**+92,000**
15-D-904, NRF Overpack Storage Expansion 3						
Total Estimated Cost (TEC)	15,700	2,000	0	0	0	+0
Other Project Cost (OPC)	400	250	150	0	0	+0
TPC, 15-D-904, NRF Overpack Storage Expansion 3	**16,100**	**2,250**	**150**	**0**	**0**	**+0**
17-D-911, BL Fire System Upgrade						
Total Estimated Cost (TEC)	14,600	1,400	13,200	0	0	+0
Other Project Cost (OPC)	2,941	1,600	0	0	500	+500
TPC, 17-D-911, BL Fire System Upgrade	**17,541**	**3,000**	**13,200**	**0**	**500**	**+500**
19-D-930, KS Overhead Piping						
Total Estimated Cost (TEC)	31,894	0	10,994	20,900	0	-20,900
Other Project Cost (OPC)	2,384	0	1,069	430	732	+302
TPC, 19-D-930, KS Overhead Piping	**34,278**	**0**	**12,063**	**21,330**	**732**	**-20,598**
20-D-931, KL Fuel Development Laboratory						
Total Estimated Cost (TEC)	23,700	0	0	23,700	0	-23,700
Other Project Cost (OPC)	2,777	0	0	1,263	198	-1,065
TPC, 20-D-931, KL Fuel Development Laboratory	**26,477**	**0**	**0**	**24,963**	**198**	**-24,765**
21-D-530, KL Steam and Condensate Upgrades						
Total Estimated Cost (TEC)	50,200	0	0	0	4,000	+4,000
Other Project Cost (OPC)	2,820	0	0	0	80	+80
TPC, 21-D-530, KL Steam and Condensate Upgrades	**53,020**	**0**	**0**	**0**	**4,080**	**+4,080**
Total All Construction Projects						
Total Estimated Cost (TEC)	2,196,094	404,600	311,194	282,600	334,000	+51,400
Other Project Cost (OPC)	185,422	175,950	1,219	1,693	1,510	-183
TPC, All Construction Projects	**2,381,516**	**580,550**	**312,413**	**284,293**	**335,510**	**+51,217**

[a] Funding tables are unclassified

[b] The Consolidated and Further Continuing Appropriation Act, 2015 provided funding for Other Project Costs (OPC) within project funds beginning in FY 2015. All prior year funding was OPC. The total amount of the SFHP Project entries is $1,737,500, but the total is stated as $2,060,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline revision. Appropriation requests beyond FY 2021 to implement the Performance Baseline Revision have not been determined and are not included in this table.

Outyears to Completion for Naval Reactors

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
14-D-901, Spent Fuel Handling Recapitalization Project					
Total Estimated Cost (TEC)	193,000	64,400	32,900	13,100	3,800
Other Project Cost (OPC)	0	0	0	0	0
TPC, 14-D-901, Spent Fuel Handling Recapitalization Project	**193,000**	**64,400**	**32,900**	**13,100**	**3,800**
17-D-911, BL Fire System Upgrade					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	400	141	0	0	0
TPC, 17-D-911, BL Fire System Upgrade	**400**	**141**	**0**	**0**	**0**
19-D-930, KS Overhead Piping					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	96	57	0	0	0
TPC, 19-D-930, KS Overhead Piping	**96**	**57**	**0**	**0**	**0**
20-D-931 KL Fuel Development Laboratory					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	277	1,039	0	0	0
TPC, 20-D-931, KL Fuel Development Laboratory	**277**	**1,039**	**0**	**0**	**0**
21-D-530, KL Steam and Condensate Upgrades					
Total Estimated Cost (TEC)	0	0	46,200	0	0
Other Project Cost (OPC)	1,050	1,050	160	480	0
TPC, 21-D-530, KL Steam and Condensate Upgrades	**1,050**	**1,050**	**46,360**	**480**	**0**
22-D-XXX, KL Chemistry and Radiological Health Building					
Total Estimated Cost (TEC)	41,620	0	0	0	0
Other Project Cost (OPC)	100	107	214	0	1,106
TPC, 22-D-XXX, KL Chemistry and Radiological Health Building	**41,720**	**107**	**214**	**0**	**1,106**

Outyears to Completion for Naval Reactors

(Dollars in Thousands)

	FY 2022 Request	FY 2023 Request	FY 2024 Request	FY 2025 Request	Outyears to Completion
22-D-XXX, KL Security Upgrades					
Total Estimated Cost (TEC)	3,404		0	23,100	0
Other Project Cost (OPC)	1,201	0	0	136	0
TPC, 22-D-XXX, KL Security Upgrades	**4,605**	**0**	**0**	**23,236**	**0**
23-D-XXX, NRF Medical Science Complex					
Total Estimated Cost (TEC)	0	32,410	0	0	0
Other Project Cost (OPC)	240	600	0	0	0
TPC, 23-D-XXX, NRF Medical Science Complex	**240**	**33,010**	**0**	**0**	**0**
21-D-XXX, BL Component Test Complex					
Total Estimated Cost (TEC)	0	46,590	0	0	0
Other Project Cost (OPC)	0	6,500	193	480	0
TPC, 21-D-XXX, BL Component Test Complex	**0**	**53,090**	**193**	**480**	**0**
23-D-XXX, Naval Examination Acquisition Project[b]					
Total Estimated Cost (TEC)	0	70,000	70,000	70,000	TBD
Other Project Cost (OPC)[c]	24,200	17,700	8,400	8,100	TBD
TPC, 23-D-XXX, Naval Examination Acquisition Project	**24,200**	**87,700**	**78,400**	**78,100**	**TBD**
25-D-XXX, KL East Side Office Building					
Total Estimated Cost (TEC)	0	0	0	61,596	0
Other Project Cost (OPC)	144	0	0	60	560
TPC, 25-D-XXX, KL East Side Office Building	**144**	**0**	**0**	**61,656**	**560**
Total All Construction Projects					
Total Estimated Cost (TEC)	238,024	213,400	149,100	167,796	3,800
Other Project Cost (OPC)	27,708	27,194	8,967	9,256	1,666
TPC, All Construction Projects	**265,732**	**240,594**	**158,067**	**177,052**	**5,466**

[a] Funding tables are unclassified.

[b] Critical Decision – 0, Mission Need Statement, was issued in January 2018 and established a cost range of $0.5 billion - $1.26 billion (in FY 2018 constant dollars).

[c] Pre-Conceptual and Conceptual Design is estimated to exceed $45 million.

Research and Development[a]

The Office of Management and Budget (OMB) Circular No. A-11, "Preparation, Submission, and Execution of the Budget," dated July 2013, requires the reporting of research and development (R&D) data. Consistent with this requirement, R&D activities funded by NNSA are displayed below.

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2019 Enacted
Research and Development (R&D)				
Basic	0	0	0	0
Applied	0	0	0	0
Development	1,238,000	1,112,000	1,164,000	+52,000
Subtotal, R&D	**1,238,000**	**1,112,000**	**1,164,000**	+52,000
Equipment	18,000	15,000	4,000	-11,000
Construction	287,000	238,000	330,000	+92,000
Total, R&D [b]	**1,543,000**	**1,365,000**	**1,498,000**	+133,000

[a] Funding tables are unclassified.

[b] Amounts do not reflect the transfer of funding to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor in FY 2019 and FY 2020.

21-D-530, KL Steam and Condensate Upgrade
Knolls Atomic Power Laboratory, Schenectady, NY
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary

The FY 2021 request for 21-D-530, KL Steam and Condensate Upgrade is $4,000K. The total project cost (TPC) is $53,370K, approved at Critical Decision (CD) CD-0 on August 2, 2018 with a CD-4 of 1Q FY 2026.

Significant Changes

This Construction Project Data Sheet (CPDS) is new and includes a new start for the budget year.

A Federal Project Manager has been assigned to this project and has approved this CPDS. This project provides facilities with adequate heating. FY 2021 funds requested for this project will be used for engineering and design.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2021	8/2/2018	01/31/2020	2Q FY 2020	3Q FY 2022	3Q FY 2023	4Q FY 2023	N/A	1Q FY 2026

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete/d
CD-3 – Approve Start of Construction/Execution
D&D Complete –Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion

Project Cost History[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2021	4,000	46,200	50,200	3,170	0	3,170	53,370

2. Project Scope and Justification

Scope

This project will upgrade and replace major portions of the KL site steam and condensate lines, including stanchions, condensate pumps and pressure reducing stations. Doing so will require routing steam infrastructure outside of tunnels where they currently reside. The requirements placed on the existing steam distribution system have changed with the removal of old buildings, construction of new buildings, and the changing functions or operations within existing buildings. The new steam system arrangement will be improved to facilitate isolation of sections of the system in case of damage or rupture while maintaining steam service operations elsewhere to improve operations and maintenance flexibility.

[a] Schedules are only estimates and consistent with the high end of the schedule ranges.
[b] Figures are only estimates and consistent with the high end of the cost ranges.

Justification

The Knolls Laboratory has many mission critical requirements for steam that support the Naval Nuclear Propulsion Program. Steam is used to provide heat to all buildings during the winter months. Besides providing heat for the comfort of personnel and maintaining specific climatic conditions for testing equipment, all buildings require heat to prevent freezing and rupture of water piping. A water pipe rupture can cause significant equipment damage and create a radiological spill situation in a radiological facility. Steam and condensate lines are operating beyond their service life. The current system has had several failures and provides no redundancy. The main steam header feeding the west side is currently located in a tunnel, and is not fully accessible. Should a major failure occur it would result in heat loss to the upper level, potentially damage water systems, and may require an electrical shutdown. Knolls is mitigating this risk by performing inspections and maintenance on the system each summer during the non-heating season.

The project has an equivalency to the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. The project is being conducted in accordance with the NR Implementation Bulletin for DOE O 413.3B, and all appropriate project management requirements have been met.

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2021	4,000	4,000	1,560
FY 2022	0	0	1,720
FY 2023	0	0	680
FY 2024	0	0	40
Total Design	4,000	4,000	4,000
Construction			
FY 2024	46,200	46,200	14,300
FY 2025	0	0	14,300
FY 2026	0	0	14,300
FY 2027	0	0	3,300
Total Construction	46,200	46,200	46,200
Total, TEC	50,200	50,200	50,200
Other Project Cost (OPC)			
FY 2019	325	325	225
FY 2020	25	25	125
FY 2021	80	80	20
FY 2022	1,050	1,050	860
FY 2023	1,050	1,050	1,070
FY 2024	160	160	390
FY 2025	160	160	160
FY 2026	160	160	160
FY 2027	160	160	160
Total OPC	3,170	3,170	3,170

Total Project Cost (TPC)			
FY 2019	325	325	225
FY 2020	25	25	125
FY 2021	4,080	4,080	1,580
FY 2022	1,050	1,050	2,580
FY 2023	1,050	1,050	1,750
FY 2024	46,360	46,360	14,730
FY 2025	160	160	14,460
FY 2026	160	160	14,460
FY 2027	160	160	3,460
Grand Total	53,370	53,370	53,370

Details of Project Cost Estimate

Overall Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	3,600	N/A	N/A
Contingency	400	N/A	N/A
Total, PED	4,000	N/A	N/A
Construction			
Construction	42,000	N/A	N/A
Site Preparation	0	N/A	N/A
Equipment	0	N/A	N/A
Contingency	4,200	N/A	N/A
Total, Construction	46,200	N/A	N/A
Other TEC			
Contingency	N/A	N/A	N/A
Total, Other TEC			
Total Estimated Cost	45,600	N/A	N/A
Contingency, TEC	4,600	N/A	N/A
Other Project Cost (OPC)			
OPC Except D&D			
OPC	3,170	N/A	N/A
Contingency	0	N/A	N/A
D&D	0	N/A	N/A
Total, OPC	3,170	N/A	N/A
Contingency, OPC	0	N/A	N/A
Total Project Cost	53,370	N/A	N/A
Total, Contingency (TEC+OPC)	4,600	N/A	N/A

Schedule of Appropriation Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2021	TEC	0	0	0	4,000	0	0	46,200	0	50,200
	OPC	0	325	25	80	1,050	1,050	160	480	3,170
	TPC	0	325	25	4,080	1,050	1,050	46,360	480	53,370

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2026
Expected Useful Life	40 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	$1.3	N/A	$51.6

5. D&D Information

There is no new area being constructed in this construction project.

6. Acquisition Approach

The procurement strategy being evaluated for this project is Design-Bid-Build. All contracts will be negotiated procurements and the basis of the award will be a determination of best value through a formalized selection process.

14-D-901, Spent Fuel Handling Recapitalization Project
Naval Reactors Facility, Idaho
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary

The FY 2021 Request for 14-D-901, Spent Fuel Handling Recapitalization Project is $330,000K. Critical Decision (CD)-2/3, Performance Baseline and Start of Permanent Construction, was approved on September 24, 2018 with a total project cost (TPC) of $1,686,500K and a CD-4 of 3Q FY 2025. On October 31, 2019, a revision to the Performance Baseline was approved with a TPC of $2,060,000K and a CD-4 date of 3Q FY 2026.

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2020 CPDS and does not include a new start for the budget year.

Procurement actions in FY 2019 for permanent facility construction resulted in a cost increase and a schedule delay. Specifically, bids for the Project's most significant construction contracts came in higher than expected. The main driver for the high bids was a change in market conditions that was not predicted using standard construction industry forecasting tools at the time the initial Performance Baseline was established. A revision to the Performance Baseline was approved on October 31, 2019, with a TPC of $2,060,000K and a CD-4 date of 3Q FY 2026, to account for the impact of market conditions. Decisions on annual costs and funding requirements to fulfill the Performance Baseline revision beyond FY 2021 have not been made. Consequently, the FY 2021 CPDS reflects the required annual appropriations, obligations, and costs through FY 2021 only. Decisions on annual costs and funding requirements beyond FY 2021 will be made in 2020.

A Federal Project Director has been assigned to this project and has approved this CPDS.

Critical Milestone History

(Fiscal Quarter or Date)

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete[a]	CD-4
FY 2014	03/29/2008		1Q FY 2014	3Q FY 2015	4Q FY 2016	4Q FY 2016	N/A	4Q FY 2022
FY 2015	03/29/2008		1Q FY 2014	3Q FY 2015	4Q FY 2016	4Q FY 2016	N/A	4Q FY 2022
FY 2015 Rev[b]	03/29/2008		1Q FY 2015	3Q FY 2017	4Q FY 2018	1Q FY 2018	N/A	4Q FY 2024
FY 2016[c]	03/29/2008		2Q FY 2015	1Q FY 2018	4Q FY 2019	4Q FY 2018	N/A	3Q FY 2025
FY 2017	03/29/2008	03/19/2015	03/19/2015	1Q FY 2018	3Q FY 2020[d]	4Q FY 2018	N/A	3Q FY 2025
FY 2018	03/29/2008	03/19/2015	03/19/2015	4Q FY 2018[e]	3Q FY 2020	4Q FY 2018	N/A	3Q FY 2025
FY 2019	03/29/2008	03/19/2015	03/19/2015	4Q FY 2018	3Q FY 2020	4Q FY 2018	N/A	3Q FY 2025
FY 2020 PB	03/29/2008	03/19/2015	03/19/2015	09/24/2018	3Q FY 2020	09/24/2018	N/A	3Q FY 2025
FY 2021 PB Rev	03/29/2008	03/19/2015	03/19/2015	09/24/2018	2Q FY 2021[f]	09/24/2018	N/A	3Q FY 2026[f]

[a] D&D is not within the scope of this project.
[b] The FY 2015 Revision incorporated the expected impacts of the Consolidated Appropriations Act, 2014 funding reductions.
[c] The FY 2016 CPDS incorporated the impacts from the FY 2015 delayed appropriation.
[d] The FY 2017 CPDS incorporated a phased design.
[e] The FY 2018 CPDS revised the CD-2 milestone date to be consistent with revisions to DOE Order 413.3.
[f] The FY 2021 CPDS revised the dates for final design complete, CD-4A, and CD-4 to reflect the Performance Baseline revision.

CD-0 – Approve Mission Need
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternate Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated date the Project design will be completed
CD-3 – Approve Start of Construction/Execution
D&D Complete – Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion

(Fiscal Quarter or Date)

Fiscal Year	CD-3A	CD-3B	CD-4A
FY 2017	2Q FY 2017	1Q FY2018	3Q FY 2024
FY 2018	12/7/2016	4Q FY 2017	3Q FY 2024
FY 2019	12/7/2016	6/14/2017	3Q FY 2024
FY 2020	12/7/2016	6/14/2017	3Q FY 2024
FY 2021	12/7/2016	6/14/2017	3Q FY 2025[f]

CD-3A – Start of Long Lead Material Procurement
CD-3B – Start of Early Site Preparation
CD-4A – Start of M-290 Shipping Container Unloading Operations

Project Cost History

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2014	369,400	917,100	1,286,500	165,000	N/A	165,000	1,451,500
FY 2015	369,400	917,100	1,286,500	165,000	N/A	165,000	1,451,500
FY 2015 Rev[a]	263,000	1,144,900	1,407,000	178,200	N/A	178,200	1,586,100
FY 2016[b]	268,800	1,182,100	1,450,900	195,600	N/A	195,600	1,646,500
FY 2017[c]	239,800	1,232,600	1,472,400	174,100	N/A	174,100	1,646,500
FY 2018	239,800	1,232,600	1,472,400	174,100	N/A	174,100	1,646,500
FY 2019[d]	306,982	1,165,418	1,472,400	174,100	N/A	174,100	1,646,500
FY 2020[e] PB	302,489	1,169,911	1,472,400	174,100	N/A	174,100	1,686,500[f]
FY 2021[g] PB Rev	278,860	1,607,140	1,886,000	174,000	N/A	174,000	2,060,000

[a] The FY 2015 Revision incorporated the expected impacts of the Consolidated Appropriations Act, 2014 funding reductions.
[b] The FY 2016 CPDS incorporated the impacts from the FY 2015 delayed appropriation.
[c] Divisions between cost categories were updated based on progression of the Project designs and CD-1 completion.
[d] Divisions between cost categories were updated to account for the phased design.
[e] Divisions between cost categories were updated based on establishment of the Performance Baseline in September 2018.
[f] The total amount of the entries in this row is $1,646,500, but the total is stated as $1,686,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline. The additional $40M is first being reflected in the FY 2021 CPDS.
[g] The FY 2021 CPDS revised the TEC, OPC, and TPC to reflect the Performance Baseline revision and includes the $40M funding requirement from the initial Performance Baseline that was not reflected in the FY 2020 CPDS.

2. Project Scope and Justification

Scope

The Spent Fuel Handling Recapitalization Project will design and construct a new facility, the Naval Spent Fuel Handling Facility, to incorporate the capabilities for naval spent nuclear fuel handling that currently exist in the Expended Core Facility and its support facilities. Additionally, a major portion of this new facility is required to support additional capability, which does not exist in the Expended Core Facility, to handle full-length aircraft carrier naval spent nuclear fuel received in M-290 shipping containers. The Naval Spent Fuel Handling Facility footprint will be approximately 213,000 square feet. Of this, approximately 121,000 square feet is required for spent fuel shipping container and dry storage operations, which includes approximately 17,000 square feet for water pool spent fuel preparation and in-process storage. The remainder of the facility, approximately 92,000 square feet, is required for waste management, facility systems operations, staging, and administrative office space. The Spent Fuel Handling Recapitalization Project is currently in the final design phase, site preparation is continuing, and permanent construction has begun.

The following represents the general scope of the Spent Fuel Handling Recapitalization Project:

- Design and construct a facility and facility systems for naval spent nuclear fuel handling, including the capability to receive, unload, prepare, and package naval spent nuclear fuel.
- Design and construct infrastructure needed to support naval spent nuclear fuel handling operations.
- Design and procure equipment to make the facility ready for use to receive, unload, prepare, and package naval spent nuclear fuel, where appropriate.
- Provide the new capability to unload M-290 spent fuel shipping containers.
- Prepare testing, operating, and preventive maintenance procedures and drawings, where appropriate, for the naval spent nuclear fuel handling process systems, equipment, facilities, and facility systems.
- Develop training programs and conduct personnel training, where appropriate.
- Develop project management procedures and manage Project activities.
- Provide support services needed for the Project.
- Manage subcontracts supporting the design and construction.
- Prepare an Environmental Impact Statement in accordance with the National Environmental Policy Act.

Justification

The mission of Naval Reactors is to provide the nation with militarily effective nuclear propulsion plants and to ensure their safe, reliable, long-lived, and affordable operation. Naval Reactors maintains total responsibility for all aspects of the U.S. Navy's nuclear propulsion systems, including research, design, construction, testing, operation, maintenance, and disposal. At the end of reactor service life, Naval Reactors transports naval spent nuclear fuel from its origin (e.g., naval spent nuclear fuel from servicing shipyards and naval training platforms) to the Naval Reactors Facility at the Idaho National Laboratory.

The Expended Core Facility, located at the Naval Reactors Facility in Idaho, is the only facility with the capabilities to receive naval spent nuclear fuel shipping containers and process naval spent nuclear fuel. Although the existing Expended Core Facility continues to be maintained and operated in a safe and environmentally responsible manner, the infrastructure is over 60 years old, does not meet current standards (i.e., requirements that were not applicable at the time of construction) and requires recapitalization. The Expended Core Facility is also incapable of receiving full-length aircraft carrier naval spent nuclear fuel, which is required to support aircraft carrier refuelings. The magnitude of required sustainment efforts and incremental infrastructure upgrades within the Expended Core Facility pose substantial risk to the continued preparation of naval spent nuclear fuel for long term storage. Specifically, sustainment efforts could require delays to naval spent nuclear fuel shipping container unloading operations, which would interrupt refueling and defueling schedules for nuclear-powered vessels and would adversely affect the operational availability of the nuclear fleet. If this interruption were to extend over long periods of time, the ability to sustain fleet operations would be impacted, resulting ultimately in a significant decrement to the Navy's responsiveness and agility to fulfill military missions worldwide.

The existing Expended Core Facility at the Naval Reactors Facility in Idaho is a single facility that is approximately 197,000 square feet. However, other facilities at the Naval Reactors Facility support operations within the Expended Core Facility

and include additional areas for administrative support and warehouse storage. The Expended Core Facility has two major capabilities: (1) to receive, unload, prepare, and package naval spent nuclear fuel and, (2) to conduct naval spent nuclear fuel examinations.

Actions necessary to continue Naval Reactors' ability to support naval spent nuclear fuel handling were the subject of an Environmental Impact Statement. The Final Environmental Impact Statement for recapitalization of the infrastructure supporting naval spent nuclear fuel was published on September 30, 2016 and included an assessment of the environmental impacts associated with handling of naval spent nuclear fuel for the following alternatives:

(1) No Action Alternative – Maintain the naval spent nuclear fuel handling capabilities of the existing Expended Core Facility by continuing to use the existing infrastructure while performing corrective maintenance and repairs.
(2) Overhaul Alternative – Recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility by overhauling the existing facility with major refurbishment projects for the infrastructure and water pools.
(3) New Facility Alternative, including the Spent Fuel Handling Recapitalization Project – Recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility by constructing and operating a new facility at one of two potential locations at the Naval Reactors Facility in Idaho.

The National Environmental Policy Act Record of Decision, which identified the New Facility Alternative as the preferred method to recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility, was published on December 5, 2016.

The Spent Fuel Handling Recapitalization Project has an equivalency to the project management requirements in DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets. The Project is being conducted in accordance with the Naval Reactors Implementation Bulletin for DOE O 413.3, and appropriate project management requirements have been met.

Prior to CD-2/3 approval, an independent cost estimate was completed by the Department of Defense Office of Cost Assessment and Program Evaluation.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs were formally established as part of the Performance Baseline and approval of CD-2/3.

Performance Measure	Threshold	Objective
Provide the facility (infrastructure) to receive, unload, prepare, and package full-length aircraft carrier and submarine naval spent nuclear fuel.	An approximately 185,000 square foot facility, which includes an approximate 15,000 square foot water pool.	An approximately 245,000 square foot facility, which includes an approximate 20,000 square foot water pool.
Provide equipment to receive and unload naval spent nuclear fuel.	Receive and unload 7 M-290 shipping containers per year.	Receive and unload 9 M-290 and 12 M-140 shipping containers per year.
Provide equipment to initially inspect and prepare naval spent nuclear fuel for ultimate disposal.	Initially inspect and prepare 62 full-length NIMITZ Class aircraft carrier spent nuclear fuel modules per year.	Initially inspect and prepare 96 full-length aircraft carrier and 64 submarine spent nuclear fuel modules per year.
Provide equipment to package naval spent nuclear fuel into canisters for dry storage.	Package 6 naval spent fuel canisters per year.	Package 10 naval spent fuel canisters per year.
Provide equipment to temporarily store naval spent nuclear fuel in the water pool.	Storage for 126 full-length NIMITZ Class aircraft carrier spent nuclear fuel modules.	Storage for 408 aircraft carrier and submarine spent nuclear fuel modules.

Performance Measure	Threshold	Objective
Provide equipment to manage remote-handled low level waste generated from receiving, unloading, preparing, and packaging spent nuclear fuel.	Package and ship 9 remote-handled low level waste canisters per year.	Package and ship 20 remote-handled low level waste canisters per year.

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)[a]	Obligations[n]	Costs
Total Estimated Cost (TEC)			
Design			
FY 2015	N/A	N/A	19,542
FY 2016	N/A	N/A	56,846
FY 2017	N/A	N/A	65,964
FY 2018	N/A	N/A	78,704
FY 2019	N/A	N/A	23,848
FY 2020	N/A	N/A	17,648
FY 2021	N/A	N/A	16,307
Total, Design	N/A	N/A	278,860
Construction			
FY 2017	N/A	N/A	1,867
FY 2018	N/A	N/A	11,530
FY 2019	N/A	N/A	105,156
FY 2020	N/A	N/A	500,234
FY 2021	N/A	N/A	287,339
FY 2022	N/A	N/A	294,881
FY 2023	N/A	N/A	107,340
FY 2024	N/A	N/A	27,395
FY 2025	N/A	N/A	25,480
Total Construction	N/A	N/A	1,607,140[b]
TEC			
FY 2015	N/A	N/A	19,542
FY 2016	N/A	N/A	56,846
FY 2017	N/A	N/A	67,831
FY 2018	N/A	N/A	90,234
FY 2019	N/A	N/A	129,004
FY 2020	N/A	N/A	517,882
FY 2021	N/A	N/A	303,646
FY 2022	N/A	N/A	294,881

[a] Due to the Consolidated and Further Continuing Appropriations Act, 2015, the TEC and OPC appropriations/obligations for FY 2015 and beyond are combined into the TPC appropriations/obligations.

[b] The Total Construction cost is revised to reflect the Performance Baseline revision. Annual Construction costs beyond FY 2021 to implement the Performance Baseline revision have not been determined and are not included in this table. As a result, the annual Construction costs do not sum to the revised Total Construction cost.

(Dollars in Thousands)

	Budget Authority (Appropriations)[b]	Obligations[q]	Costs
FY 2023	N/A	N/A	107,340
FY 2024	N/A	N/A	27,395
FY 2025	N/A	N/A	25,480
Total, TEC	N/A	N/A	1,886,000[c]
Other Project Cost (OPC)			
FY 2010	6,600	6,600	6,372
FY 2011	36,100	36,100	31,168
FY 2012	25,200	25,200	29,420
FY 2013	29,000	29,000	27,172
FY 2014	25,400	25,400	28,017
FY 2015	N/A	N/A	8,514
FY 2016	N/A	N/A	1,567
FY 2017	N/A	N/A	1,990
FY 2018	N/A	N/A	3,448
FY 2019	N/A	N/A	2,658
FY 2020	N/A	N/A	4,220
FY 2021	N/A	N/A	3,994
FY 2022	N/A	N/A	5,605
FY 2023	N/A	N/A	6,706
FY 2024	N/A	N/A	5,492
FY 2025	N/A	N/A	4,707
FY 2026	N/A	N/A	3,843
Total, OPC	N/A	N/A	174,000[r]
Total Project Cost (TPC)			
FY 2010	6,600	6,600	6,372
FY 2011	36,100	36,100	31,168
FY 2012	25,200	25,200	29,420
FY 2013	29,000	29,000	27,172
FY 2014	25,400	25,400	28,017
FY 2015	70,000	70,000	28,056
FY 2016	86,000	86,000	58,413
FY 2017	100,000	100,000	69,821
FY 2018	197,000	197,000	93,682
FY 2019	287,000	287,000	131,663
FY 2020	238,000	238,000	522,102
FY 2021	330,000	330,000	307,640
FY 2022	193,000	193,000	300,486
FY 2023	64,400	64,400	114,046

[b] Due to the Consolidated and Further Continuing Appropriations Act, 2015, the TEC and OPC appropriations/obligations for FY 2015 and beyond are combined into the TPC appropriations/obligations.

[c] The Total, TEC and Total, OPC costs are revised to reflect the Performance Baseline revision. Annual TEC and OPC costs beyond FY 2021 to implement the Performance Baseline revision have not been determined and are not included in this table. As a result, the annual TEC and OPC costs do not sum to the revised Total, TEC and Total, OPC costs.

(Dollars in Thousands)

	Budget Authority (Appropriations)[a]	Obligations[s]	Costs
FY 2024	32,900	32,900	32,887
FY 2025	13,100	13,100	30,187
FY 2026	3,800	3,800	3,843
Grand Total[b]	2,060,000	2,060,000	2,060,000

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate[c]	Previous Total Estimate[d]	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	277,860	300,789	300,789
Contingency	1,000	1,700	1,700
Total, Design	278,860	302,489	302,489
Construction			
Long Lead Material and Site Preparation	41,148	41,148	41,148
Spent Fuel Handling Equipment	228,936	215,454	215,454
Facility Construction	1,261,679	845,841	845,841
Contingency	75,377	107,467	107,467
Total, Construction	1,607,140	1,209,911	1,209,911
Total Estimated Cost	1,886,000	1,512,400	1,512,400
Contingency, TEC	76,377	109,167	109,167
Other Project Cost (OPC)			
Conceptual Planning	37,540	37,540	37,540
Conceptual Design	99,427	99,427	99,427
Start-up	26,273	26,273	26,273
Other (e.g., EIS, Project Reviews)	7,301	7,301	7,301
Contingency	3,459	3,559	3,559
Total, OPC	174,000	174,100	174,100
Contingency, OPC	3,459	3,559	3,559
Total Project Cost	2,060,000	1,686,500	1,686,500
Total, Contingency (TEC+OPC)	80,000	112,726	112,726

[a] Due to the Consolidated and Further Continuing Appropriations Act, 2015, the TEC and OPC appropriations/obligations for FY 2015 and beyond are combined into the TPC appropriations/obligations.

[b] The total amount of the entries is $1,737,500, but the total is stated as $2,060,000 to reflect the TPC that was established with the Performance Baseline revision. The FY 2021 appropriation request includes the $40M funding requirement and an additional $51M requirement to implement the Performance Baseline revision. The FY 2021 appropriation schedule also includes a shift of $16.7M from FY 2025 to FY 2023 from the initial Performance Baseline that was not reflected in the FY 2020 CPDS. Appropriation requests beyond
FY 2021 to implement the Performance Baseline revision have not been determined and are not included in this table.

[c] Current Total Estimate reflects the costs and contingencies for the Performance Baseline revision.

[d] Previous Total Estimate is from the FY 2020 CPDS.

5. Schedule of Appropriation Requests

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY2024	FY2025	Outyears	Total
FY 2014	TEC	1,039,200	132,300	64,300	50,700	0	0	0	0	1,286,500
	OPC	137,300	7,700	10,700	9,300	0	0	0	0	165,000
	TPC	1,176,500	140,000	75,000	60,000	0	0	0	0	1,451,500
FY 2015	TEC	1,039,200	132,300	64,300	50,700	0	0	0	0	1,286,500
	OPC	137,300	7,700	10,700	9,300	0	0	0	0	165,000
	TPC	1,176,500	140,000	75,000	60,000	0	0	0	0	1,451,500
FY 2015 Rev	TEC	824,600	265,600	197,900	66,900	33,200	19,700	0	0	1,407,900
	OPC	139,400	4,500	6,500	6,700	7,900	9,600	3,600	0	178,200
	TPC	964,000	270,100	204,400	73,600	41,100	29,300	3,600	0	1,586,100
FY 2016	TEC	617,800	313,700	234,300	186,100	54,800	24,500	19,700	0	1,450,900
	OPC	148,700	5,300	4,700	6,900	7,200	8,500	10,300	4,000	195,600
	TPC	766,500	319,000	239,000	193,000	62,000	33,000	30,000	4,000	1,646,500
FY 2017	TEC	625,500	315,300	234,700	186,700	57,300	29,300	23,600	0	1,472,400
	OPC	141,800	3,700	4,300	6,300	4,400	3,600	6,200	3,800	174,100
	TPC	767,300	319,000	239,000	193,000	61,700	32,900	29,800	3,800	1,646,500
FY 2018	TEC	639,500	315,300	234,700	186,700	43,300	29,300	23,600	0	1,472,400
	OPC	141,800	3,700	4,300	6,300	4,400	3,600	6,200	3,800	174,100
	TPC	781,300	319,000	239,000	193,000	47,700	32,900	29,800	3,800	1,646,500
FY 2019[a]	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,472,400
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	174,100
	TPC	781,300	319,000	239,000	193,000	47,700	32,900	29,800	3,800	1,646,500
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,472, 400
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	174,100
	TPC	862,300	238,000	239,000	193,000	47,700	32,900	29,800	3,800	1,686,500[b]
FY 2021	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,886,000
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	174,000
	TPC	862,300	238,000	330,000	193,000	64,400	32,900	13,100	3,800	2,060,000[c]

[a] Per the Consolidated and Further Continuing Appropriations Act, 2015, the Spent Fuel Handling Recapitalization Project Major Construction Project funding includes both Total Estimated Cost and Other Project Cost. For clarity, the FY2019 CPDS was updated to reflect appropriations only at the Total Project Cost level.

[b] The total amount of the entries is $1,646,500, but the total is stated as $1,686,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline. The additional $40 million is first being reflected in the FY 2021 CPDS.

[c] The total amount of the entries is $1,737,500, but the total is stated as $2,060,000 to reflect the TPC that was established with the Performance Baseline revision. The FY 2021 appropriation request includes the $40M funding requirement and an additional $51M requirement to implement the Performance Baseline revision. The FY 2021 appropriation schedule also includes a shift of $16.7M from FY 2025 to FY 2023 from the initial Performance Baseline that was not reflected in the FY 2020 CPDS. Appropriation requests beyond FY 2021 to implement the Performance Baseline revision have not been determined and are not included in this table.

6. Related Operations and Maintenance Funding Requirements

Start of Operation of Beneficial Occupancy	4Q FY 2025 [a]
Expected Useful Life	40 years
Expected Future Start of D&D	4Q FY 2065

Related Funding Requirements
(Budget Authority in Thousands of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	166.4	166.4	6,655.7	6,655.7

7. D&D Information

The new area being constructed in this project is replacing existing facilities. However, spent fuel handling operations in the existing Expended Core Facility will overlap with operations in the new Naval Spent Fuel Handling Facility for a period of 5 to 12 years, and examination operations in the existing Expended Core Facility will continue for the foreseeable future; therefore, the costs associated with D&D of the Expended Core Facility are not included in the costs cited for the Spent Fuel Handling Recapitalization Project.

	Square Feet
New area being constructed by this Project at the Naval Reactors Facility	213,000
Area of D&D in this Project at the Naval Reactors Facility	0
Area at the Naval Reactors Facility to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
Area of D&D in this Project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the Project including area previously "banked"	0
Total area eliminated	0

8. Acquisition Approach

The integrated Management & Operating (M&O) prime partners will plan and execute the Spent Fuel Handling Recapitalization Project in accordance with requirements. Naval spent nuclear fuel handling equipment will be procured through the procurement M&O partners. An Engineering, Procurement, and Construction Management (EPCM) firm was selected as the subcontracting strategy for design and construction management of the facility and facility systems. A 2019 amendment to the EPCM's contract changed the contract type from cost plus fixed fee to cost plus incentive fee, reflecting the maturing design and the improved certainty in Project costs and schedules. Long-lead materials were purchased and site preparation work was performed ahead of CD-2/3.

[a] The Performance Baseline revision updated the CD-4A and CD-4 dates to 3Q FY 2025 and 3Q FY 2026, respectively, which resulted in shifting the beneficial occupancy date to 4Q FY 2025.

DEPARTMENT OF ENERGY
Funding by Site Detail
Naval Reactors
(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Bettis Atomic Power Laboratory			
Naval Reactors Development	212,421	231,140	264,037
Columbia-Class Reactor Systems Development	66,014	23,881	15,028
S8G Prototype Refueling	19,424	3,245	2,888
Naval Reactors Operations and Infrastructure	107,499	117,287	82,407
17-D-911 BL Fire System Upgrade	13,200	0	0
14-D-901 Spent Fuel Handling Recapitalization Project, NRF	13,759	11,409	11,465
Construction - Naval Reactors	26,959	11,409	11,465
Total Bettis Atomic Power Laboratory	**432,317**	**386,962**	**375,825**
Idaho National Laboratory			
Naval Reactors Development	97,776	102,114	101,809
S8G Prototype Refueling	0	786	738
Naval Reactors Operations and Infrastructure	163,554	144,103	163,809
Construction - Naval Reactors	267,275	221,642	314,371
Total Idaho National Laboratory	**528,605**	**468,645**	**580,727**
Knolls Atomic Power Laboratory			
Naval Reactors Development	203,163	181,043	222,505
Columbia-Class Reactor Systems Development	71,986	51,619	49,672
S8G Prototype Refueling	230,576	165,969	131,374
Naval Reactors Operations and Infrastructure	245,320	282,538	250,125
21-D-530 KL Steam and Condensate Upgrades	0	0	4,000
20-D-931, KL Fuel Development Laboratory	0	23,700	0
19-D-930 KS Overhead Piping	10,994	20,900	0
14-D-901 Spent Fuel Handling Recapitalization Project, NRF	5,966	4,949	4,164
Construction - Naval Reactors	16,960	49,549	8,164
Total Knolls Atomic Power Laboratory	**768,005**	**730,718**	**661,840**
Naval Reactors Laboratory Field Office			
Program Direction - Naval Reactors	19,484	20,200	21,480
Total Naval Reactors Laboratory Field Office	**19,484**	**20,200**	**21,480**
Washington Headquarters			
Naval Reactors Development	1,591	1,908	1,955
Naval Reactors Operations and Infrastructure	9,391	9,663	9,953
Program Direction - Naval Reactors	29,225	30,300	32,220
Total Washington Headquarters	**40,207**	**41,871**	**44,128**

GENERAL PROVISIONS—DEPARTMENT OF ENERGY
(INCLUDING TRANSFER AND CANCELLATION OF FUNDS)

SEC. 301. (a) No appropriation, funds, or authority made available by this title for the Department of Energy shall be used to initiate or resume any program, project, or activity or to prepare or initiate Requests For Proposals or similar arrangements (including Requests for Quotations, Requests for Information, and Funding Opportunity Announcements) for a program, project, or activity if the program, project, or activity has not been funded by Congress.

(b)(1) Unless the Secretary of Energy notifies the Committees on Appropriations of both Houses of Congress at least 3 full business days in advance, none of the funds made available in this title may be used to—

(A) make a grant allocation or discretionary grant award totaling $1,000,000 or more;

(B) make a discretionary contract award or Other Transaction Agreement totaling $1,000,000 or more, Including a contract covered by the Federal Acquisition Regulation;

(C) issue a letter of intent to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B); or

(D) announce publicly the intention to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B).

(2) The Secretary of Energy shall submit to the Committees on Appropriations of both Houses of Congress within 15 days of the conclusion of each quarter a report detailing each grant allocation or discretionary grant award totaling less than $1,000,000 provided during the previous quarter.

(3) The notification required by paragraph (1) and the report required by paragraph (2) shall include the recipient of the award, the amount of the award, the fiscal year for which the funds for the award were appropriated, the account and program, project, or activity from which the funds are being drawn, the title of the award, and a brief description of the activity for which the award is made.

(c) The Department of Energy may not, with respect to any program, project, or activity that uses budget authority made available in this title under the heading "Department of Energy-Energy Programs", enter into a multiyear contract, award a multiyear grant, or enter into a multiyear cooperative agreement unless—

(1)the contract, grant, or cooperative agreement is funded for the full period of performance as anticipated at the time of award; or

(2) the contract, grant, or cooperative agreement includes a clause conditioning the Federal Government's obligation on the availability of future year budget authority and the Secretary notifies the Committees on Appropriations of both Houses of Congress at least 3 days in advance.

(d) Except as provided in subsections (e), (f), **[**and**]** (g)*, and (h)*, the amounts made available by this title shall be expended as authorized by law for the programs, projects, and activities specified in the "Final Bill" column in the "Department of Energy" table included under the heading "Title III-Department of Energy" in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act).

(e) The amounts made available by this title may be reprogrammed for any program, project, or activity, and the Department shall notify, and obtain the prior approval of, the Committees on Appropriations of both Houses of Congress at least 30 days prior to the use of any proposed reprogramming that would cause any program, project, or activity funding level to increase or decrease by more than $5,000,000 or 10 percent, whichever is less, during the time period covered by this Act.

(f) None of the funds provided in this title shall be available for obligation or expenditure through a reprogramming of funds that—

(1) creates, initiates, or eliminates a program, project, or activity;

(2) increases funds or personnel for any program, project, or activity for which funds are denied or restricted by this Act; or

(3) reduces funds that are directed to be used for a specific program, project, or activity by this Act.

(g) (1) The Secretary of Energy may waive any requirement or restriction in this section that applies to the use of funds made available for the Department of Energy if compliance with such requirement or restriction would pose a substantial risk to human health, the environment, welfare, or national security.

(2) The Secretary of Energy shall notify the Committees on Appropriations of both Houses of Congress of any waiver under paragraph (1) as soon as practicable, but not later than 3 days after the date of the activity to which a requirement or restriction would otherwise have applied. Such notice shall include an explanation of the substantial risk under paragraph (1) that permitted such waiver.

(h) *EXCLUSIONS.—Subsections (d), (e), and (f) shall not apply to applied energy program funds transferred or reprogrammed under —*

(1) *the small business innovation research program under section 9 of the Small Business Act (15 U.S.C 638); or*

(2) *the small business technology transfer program under that section.*

(**[**h**]***i*) The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. 302. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 3094) during fiscal year 2020 until the enactment of the Intelligence Authorization Act for fiscal year 2020.

SEC. 303. None of the funds made available in this title shall be used for the construction of facilities classified as high-hazard nuclear facilities under 10 CFR Part 830 unless independent oversight is conducted by the Office of Enterprise Assessments to ensure the project is in compliance with nuclear safety requirements.

SEC. 304. None of the funds made available in this title may be used to approve critical decision–2 or critical decision–3 under Department of Energy Order 413.3B, or any successive departmental guidance, for construction projects where the total project cost exceeds $100,000,000, until a separate independent cost estimate has been developed for the project for that critical decision.

SEC. 305. (a) None of the funds made available in this or any prior Act under the heading "Defense Nuclear Nonproliferation" may be made available to enter into new contracts with, or new agreements for Federal assistance to, the Russian Federation.

(b) The Secretary of Energy may waive the prohibition in subsection (a) if the Secretary determines that such activity is in the national security interests of the United States. This waiver authority may not be delegated.

(c) A waiver under subsection (b) shall not be effective until 15 days after the date on which the Secretary submits to the Committees on Appropriations of both Houses of Congress, in classified form if necessary, a report on the justification for the waiver.

SEC. 306. Notwithstanding section 161 of the Energy Policy and Conservation Act (42 U.S.C. 6241), upon a determination by the President in this fiscal year that a regional supply shortage of refined petroleum product of significant scope and duration exists, that a severe increase in the price of refined petroleum product will likely result from such shortage, and that a draw down and sale of refined petroleum product would assist directly and significantly in reducing the adverse impact of such shortage, the Secretary of Energy may draw down and sell refined petroleum product from the Strategic Petroleum Reserve. Proceeds from a sale under this section shall be deposited into the SPR Petroleum Account established in section 167 of the Energy Policy and Conservation Act (42 U.S.C. 6247), and such amounts shall be available for obligation, without fiscal year limitation, consistent with that section.

[SEC. 307. Of the offsetting collections, including unobligated balances of such collections, in the "Department of Energy-Power Marketing Administration-Colorado River Basins Power Marketing Fund, Western Area Power Administration", $21,400,000 shall be transferred to the "Department of Interior-Bureau of Reclamation-Upper Colorado River Basin Fund" for the Bureau of Reclamation to carry out environmental stewardship and endangered species recovery efforts.**]**

[SEC. 308. (a) Of the unobligated balances available from amounts appropriated in prior Acts under the heading "Title III-Department of Energy-Energy Programs", $12,723,000 is hereby rescinded.

(b) No amounts may be rescinded under (a) from amounts that were designated by the Congress as an emergency requirement pursuant to a concurrent resolution on the budget or the Balanced Budget and Emergency Deficit Control Act of 1985.**]**

[SEC. 309. Beginning in fiscal year 2021 and for each fiscal year thereafter, fees collected pursuant to subsection (b)(1) of section 6939f of title 42, United States Code, shall be deposited in "Department of Energy-Energy Programs-Non-Defense Environmental Cleanup" as discretionary offsetting collections.**]**

[SEC. 310. During fiscal year 2020 and each fiscal year thereafter, notwithstanding any provision of title 5, United States Code, relating to classification or rates of pay, the Southeastern Power Administration shall pay any power system dispatcher employed by the Administration a rate of basic pay and premium pay based on those prevailing for similar occupations in the electric power industry. Basic pay and premium pay may not be paid under this section to any individual during a calendar year so as to result in a total rate in excess of the rate of basic pay for level V of the Executive Schedule (section 5316 of such title).**]**

SEC. 307. Section 611 of the Energy and Water Development Appropriations Act, 2000 (P.L. 106–60; 10 U.S.C 2701 note) is amended as follows:

(a) *In subsection (a) in the matter preceding paragraph (1), by striking "the Army, acting through the Chief of Engineers" and inserting "Energy".*

(b) *In subsection (a)(6), by striking "by the Secretary of the Army, acting through the Chief of Engineers," and striking ", which may be transferred upon completion of remediation to the administrative jurisdiction of the Secretary of Energy".*

(c) *In subsection (a), by adding after paragraph (6) the following undesignated matter: "Upon completion of remediation of a site acquired by the Secretary of the Army prior to fiscal year 2021, the Secretary of the Army may transfer administrative jurisdiction of such site to the Secretary of Energy.".*

(d) *In subsection (b), by striking "the Army, acting through the Chief of Engineers," and inserting "Energy".*

(e) *In subsection (c), by striking "amounts made available to carry out that program and shall be available until expended for costs of response actions for any eligible site" and inserting "'Other Defense Activities' appropriation account or successor appropriation account and shall be available until expended for costs of response actions for any eligible Formerly Utilized Sites Remedial Action Program Site".*

(f) *By redesignating subsection (f) as subsection (g).*

(g) *By inserting after subsection (e) the following new subsection:*

"(f) The Secretary of Energy, in carrying out subsection (a), shall enter into an agreement with the Secretary of the Army to carry out the remediation functions and activities described in subsections (a)(1) through (a)(6).".

SEC. 308. Section 2307 of the Energy Policy Act of 1992 (42 U.S.C 13526) is repealed.

SEC. 309. Notwithstanding section 161 of the Energy Policy and Conservation Act (42 U.S.C. 6241), the Secretary of Energy shall draw down and sell 15 million barrels of refined petroleum product from the Strategic Petroleum Reserve during fiscal year 2021. Proceeds from sales under this section shall be deposited into the general fund of the Treasury during fiscal year 2021, with the exception of $242,000,000 from such proceeds to be deposited in the "Naval Petroleum and Oil Shale Reserves" account for comprehensive remediation of the Naval Petroleum Reserve–1 site near Elk Hills, California, to remain available until expended.

SEC. 310. Treatment of Lobbying and Political Activity Costs as Allowable Costs under Department of Energy Contracts.—

(a) *Allowable Costs.—*

(1) *Section 4801(b) of the Atomic Energy Defense Act (50 U.S.C. 2781(b)) is amended—*

(A) *by striking "(1)" and all that follows through "the Secretary" and inserting "The Secretary"; and*

(B) *by striking paragraph (2).*

(2) *Section 305 of the Energy and Water Development Appropriation Act, 1988, as contained in section*

101(d) of Public Law 100–202 (101 Stat. 1329–125), is repealed.

(b) *Regulations Revised.—The Secretary of Energy shall revise existing regulations consistent with the repeal of 50 U.S.C. 2781(b)(2) and section 305 of Public Law 100–202 and shall issue regulations to implement 50 U.S.C. 2781(b), as amended by subsection (a) of this section, no later than 150 days after the date of the enactment of this Act. Such regulations shall be consistent with the Federal Acquisition Regulation 48 C.F.R. 31.205–22.*

SEC. 311. Pursuant to a request by the Secretary of Defense, and upon determination by the Director of the Office of Management and Budget in consultation with the Secretary of Energy that such action is necessary, the Secretary of Energy may, with the approval of the Office of Management and Budget, transfer not to exceed $2,500,000,000 of funds made available in this Act to the Department of Energy for National Nuclear Security Administration functions to the Department of Defense, to be merged with and to be available for the same purposes, and for the same time period, as the appropriation or fund to which transferred: Provided, That the Secretary of Energy shall notify the Congress promptly of all transfers made pursuant to this authority or any other authority in this Act: Provided further, That this transfer authority is in addition to any other transfer authority provided in this Act.

TITLE V—GENERAL PROVISIONS
(INCLUDING TRANSFER OF FUNDS)

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

[SEC. 502. (a) None of the funds made available in title III of this Act may be transferred to any department, agency, or instrumentality of the United States Government, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act), or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality.

(b) None of the funds made available for any department, agency, or instrumentality of the United States Government may be transferred to accounts funded in title III of this Act, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act), or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality.

(c) The head of any relevant department or agency funded in this Act utilizing any transfer authority shall submit to the Committees on Appropriations of both Houses of Congress a semiannual report detailing the transfer authorities, except for any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality, used in the previous 6 months and in the year-to-date. This report shall include the amounts transferred and the purposes for which they were transferred, and shall not replace or modify existing notification requirements for each authority.**]**

SEC. 503. None of the funds made available by this Act may be used in contravention of Executive Order No. 12898 of February 11, 1994 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

SEC. 504. (a) None of the funds made available in this Act may be used to maintain or establish a computer network unless such network blocks the viewing, downloading, and exchanging of pornography.

(b) Nothing in subsection (a) shall limit the use of funds necessary for any Federal, State, tribal, or local law enforcement agency or any other entity carrying out criminal investigations, prosecution, or adjudication activities.