DOE/CF-0171
Volume 1

# Department of Energy

## FY 2022 Congressional Budget Request

# National Nuclear Security Administration

## Federal Salaries and Expenses
## Weapons Activities
## Defense Nuclear Nonproliferation
## Naval Reactors

DOE/CF-0171
Volume 1

# Department of Energy

## FY 2022 Congressional Budget Request

# National Nuclear Security Administration

## Federal Salaries and Expenses
## Weapons Activities
## Defense Nuclear Nonproliferation
## Naval Reactors

May 2021 Office of Chief Financial Officer Volume 1

Printed with soy ink on recycled paper

**FY 2022 Congressional Budget Request**

**Volume 1**

**Table of Contents**

DEPARTMENT OF ENERGY
Appropriation Summary
FY 2022
(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs. FY 2021 Enacted $ | FY 2022 Request vs. FY 2021 Enacted % |
|---|---|---|---|---|---|
| **Department of Energy Budget by Appropriation** | | | | | |
| Energy Efficiency and Renewable Energy | 2,777,277 | 2,861,760 | 4,732,000 | +1,870,240 | +65.35% |
| Electricity | 190,000 | 211,720 | 327,000 | +115,280 | +54.45% |
| Cybersecurity, Energy Security and Emergency Response | 156,000 | 156,000 | 201,000 | +45,000 | +28.85% |
| Strategic Petroleum Reserve | 195,000 | 188,000 | 197,000 | +9,000 | +4.79% |
| Naval Petroleum and Oil Shale Reserve | 14,000 | 13,006 | 13,650 | +644 | +4.95% |
| Strategic Petroleum Reserve Petroleum Account | 10,000 | 1,000 | 7,350 | +6,350 | +635.00% |
| Northeast Home Heating Oil Reserve | 10,000 | 6,500 | 0 | -6,500 | -100.00% |
| Total, Petroleum Reserve Accounts | 229,000 | 208,506 | 218,000 | +9,494 | +4.55% |
| Total, Cybersecurity, Energy Security, and Emergency Response | 385,000 | 364,506 | 419,000 | +54,494 | +14.95% |
| Nuclear Energy (270) | 1,340,000 | 1,357,800 | 1,700,700 | +342,900 | +25.25% |
| Fossil Energy and Carbon Management | 750,000 | 750,000 | 890,000 | +140,000 | +18.67% |
| **Total, Fossil Energy Programs** | **750,000** | **750,000** | **890,000** | **140,000** | **+18.67%** |
| Uranium Enrichment Decontamination and Decommissioning (D&D) Fund | 881,000 | 841,000 | 831,340 | -9,660 | -1.15% |
| Energy Information Administration | 126,800 | 126,800 | 126,800 | +0 | +0.00% |
| Non-Defense Environmental Cleanup | 319,200 | 319,200 | 338,860 | +19,660 | +6.16% |
| Science | 7,000,000 | 7,026,000 | 7,440,000 | +414,000 | +5.89% |
| Office of Technology Transitions (OTT) | 0 | 0 | 19,470 | +19,470 | N/A |
| Office of Clean Energy Demonstration (OCED) | 0 | 0 | 400,000 | +400,000 | N/A |
| Advanced Research Projects Agency - Energy | 425,000 | 427,000 | 500,000 | +73,000 | +17.10% |
| Advanced Research Projects Agency - Climate | 0 | 0 | 200,000 | +200,000 | N/A |
| Nuclear Waste Disposal | 0 | 27,500 | 7,500 | -20,000 | -72.73% |
| Departmental Administration | 161,000 | 166,000 | 321,760 | +155,760 | +93.83% |
| Indian Energy Policy and Programs | 22,000 | 22,000 | 122,000 | +100,000 | +454.55% |
| Inspector General | 54,215 | 57,739 | 78,000 | +20,261 | +35.09% |
| Title 17 Innovative Technology Loan Guarantee Program | 29,000 | -363,000 | 179,000 | +542,000 | -149.31% |
| Advanced Technology Vehicles Manufacturing Loan Program | 5,000 | -1,903,000 | 5,000 | +1,908,000 | -100.26% |
| Tribal Energy Loan Guarantee Program | 2,000 | 2,000 | 2,000 | +0 | +0.00% |
| **Total, Credit Programs** | **36,000** | **-2,264,000** | **186,000** | **2,450,000** | **-108.22%** |
| **Total, Energy Programs** | **14,467,492** | **12,295,025** | **18,640,430** | **6,345,405** | **+51.61%** |
| Federal Salaries and Expenses | 434,699 | 443,200 | 464,000 | +20,800 | +4.69% |
| Weapons Activities | 12,457,097 | 15,345,000 | 15,484,295 | +139,295 | +0.91% |
| Defense Nuclear Nonproliferation | 2,164,400 | 2,260,000 | 1,934,000 | -326,000 | -14.42% |
| Naval Reactors | 1,648,396 | 1,684,000 | 1,860,705 | +176,705 | +10.49% |
| **Total, National Nuclear Security Administration** | **16,704,592** | **19,732,200** | **19,743,000** | **10,800** | **+0.05%** |
| Defense Environmental Cleanup | 6,255,000 | 6,426,000 | 6,841,670 | +415,670 | +6.47% |
| Other Defense Activities | 906,000 | 920,000 | 1,170,000 | +250,000 | +27.17% |
| **Total, Environmental and Other Defense Activities** | **7,161,000** | **7,346,000** | **8,011,670** | **665,670** | **+9.06%** |
| Nuclear Energy (050) | 153,408 | 149,800 | 149,800 | +0 | +0.00% |
| **Total, Atomic Energy Defense Activities** | **24,019,000** | **27,228,000** | **27,904,470** | **676,470** | **+2.48%** |
| Southeastern Power Administration (SEPA) | 0 | 0 | 0 | +0 | +0.00% |
| Southwestern Power Administration (SWPA) | 10,400 | 10,400 | 10,400 | +0 | +0.00% |
| Western Area Power Administration | 89,196 | 89,372 | 90,772 | +1,400 | +1.57% |
| Falcon and Amistad Operating and Maintenance Fund | 228 | 228 | 228 | +0 | +0.00% |
| Colorado River Basins Power Marketing Fund * | -21,400 | -21,400 | -21,400 | +0 | +0.00% |
| **Total, Power Marketing Administrations** | **78,424** | **78,600** | **80,000** | **1,400** | **+1.78%** |
| Federal Energy Regulatory Commission | 0 | 0 | 0 | +0 | +0.00% |
| **Total, Energy and Water Development and Related Agencies** | **38,564,916** | **39,601,625** | **46,624,900** | **7,023,275** | **+17.73%** |
| Excess Fees and Recoveries, FERC | -16,000 | -9,000 | -9,000 | +0 | +0.00% |
| Title XVII Loan Guar. Prog Section 1703 Negative Credit Subsidy Receipt | -15,000 | 0 | -10,800 | -10,800 | N/A |
| UED&D Fund Offset | 0 | 0 | -415,670 | -415,670 | N/A |
| **Discretionary Funding by Appropriation** | **38,533,916** | **39,592,625** | **46,189,430** | **+6,596,805** | **+16.66%** |
| | | | | | |
| **DOE Budget Function** | **38,533,916** | **39,592,625** | **46,189,430** | **+6,596,805** | **+16.66%** |
| NNSA Defense (050) Total | 16,704,592 | 19,732,200 | 19,743,000 | +10,800 | +0.05% |
| Non-NNSA Defense (050) Total | 7,314,408 | 7,495,800 | 8,161,470 | +665,670 | +8.88% |
| *Defense (050)* | *24,019,000* | *27,228,000* | *27,904,470* | *676,470* | *2.48%* |
| Science (250) | 7,000,000 | 7,026,000 | 7,440,000 | +414,000 | +5.89% |
| Energy (270) | 7,514,916 | 5,338,625 | 10,844,960 | +5,506,335 | +103.14% |
| *Non-Defense (Non-050)* | *14,514,916* | *12,364,625* | *18,284,960* | *5,920,335* | *47.88%* |

* Amount has been adjusted per Section 127 of Public Law 116-159, Continuing Appropriations Act, 2021 and Other Extensions Act.

## National Nuclear Security Administration
## Overview

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **National Nuclear Security Administration** | | | | | |
| Federal Salaries and Expenses | 434,699 | 443,200 | 464,000 | +20,800 | 4.7% |
| Weapons Activities | 12,457,097 | 15,345,000 | 15,484,295 | +139,295 | 0.9% |
| Defense Nuclear Nonproliferation | 2,164,400 | 2,260,000 | 2,264,000 | +4,000 | 0.2% |
| Naval Reactors [a] | 1,648,396 | 1,684,000 | 1,866,705 | +182,705 | 10.8% |
| NNSA Cancellation of Prior Year Balances [b] | 0 | 0 | -336,000 | -336,000 | 0% |
| **Total, National Nuclear Security Administration** | **16,704,592** | **19,732,200** | **19,743,000** | **+10,800** | **0.1%** |

The National Nuclear Security Administration (NNSA) FY 2022 Request is $19,743,000,000, an increase of $10,800,000 (0.1 percent) above the FY 2021 Enacted Level to support the security and safety of our nation. NNSA's FY 2022 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 to meet nuclear security and nonproliferation policy goals and requirements, support the Navy, and support a highly skilled federal workforce.

**NNSA Future-Years Nuclear Security Program**

Consistent with the past two transition year budgets (FY 2018 and FY 2010), the FY 2022 President's Budget does not include program-based defense budget levels beyond the budget year. Instead, the defense estimates for FY 2023-2026 simply reflect inflated FY 2022 levels, not policy judgments. The Administration will include outyear defense program funding levels in the FY 2023 Budget, in accordance with strategy documents currently under development. The FY 2023 President's Budget will be accompanied by a Future Years Nuclear Security Program that reflects this Administration's policy judgments.

This Request directly supports the President's *Interim National Security Strategy Guidance* through efforts to improve U.S. national security. Continuing the long-standing efforts to modernize America's nuclear stockpile and infrastructure, and the underlying science that supports strategic decisions and certification of the stockpile, the Request ensures the U.S. "strategic deterrent remains safe, secure, and effective and that our extended deterrence commitments to our allies remain strong and credible." . The Request supports the U.S Navy's nuclear fleet through safe and effective integrated nuclear propulsion systems. The Request also supports "renewed American nonproliferation leadership" through programs that will reduce the "existential dangers" of nuclear weapons with "efforts to lock down fissile and radiological materials across the world."

**Public Law Authorizations**

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-283, William M (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021
- P.L. 116-260, Consolidated Appropriations Act, 2021

**Appropriation Summary by Program**

[a] Funding does not reflect the mandated transfer of $88.5 million in FY 2020 and $91.0 million in FY 2021 to the Office of Nuclear Energy for operations of the Advanced Test Reactor.

[b] Includes $330 million from project 99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS, within Defense Nuclear Nonproliferation and $6 million from completed construction projects within Naval Reactors.

## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **NNSA Summary by Appropriation / GPRA Unit** | | | | | |
| **Federal Salaries and Expenses** | **434,699** | **443,200** | **464,000** | **20,800** | +4.7% |
| **Weapons Activities Appropriation** | | | | | |
| Stockpile Management | 3,680,051 | 4,290,244 | 4,632,676 | +342,432 | +8.0% |
| Production Modernization | 1,565,523 | 2,547,897 | 2,910,979 | +363,082 | +14.3% |
| Stockpile Research, Technology, and Engineering | 2,553,119 | 2,813,689 | 2,690,631 | -123,058 | -4.4% |
| Infrastructure and Operations | 3,199,544 | 4,087,507 | 3,586,436 | -501,071 | -12.3% |
| Secure Transportation Asset | 292,660 | 348,684 | 330,764 | -17,920 | -5.1% |
| Defense Nuclear Security | 775,000 | 789,078 | 847,623 | +58,545 | 7.4% |
| Information Technology and Cybersecurity | 300,000 | 366,233 | 406,530 | +40,297 | +11.0% |
| Legacy Contractor Pensions and Settlement Payments | 91,200 | 101,668 | 78,656 | -23,012 | -22.6% |
| **Total, Weapons Activities** | **12,457,097** | **15,345,000** | **15,484,295** | **+139,295** | **+0.9%** |
| **Defense Nuclear Nonproliferation Appropriation** | | | | | |
| Defense Nuclear Nonproliferation Programs | | | | | |
| Material Management and Minimization | 363,533 | 400,711 | 342,946 | -57,765 | -14.4% |
| Global Material Security | 442,909 | 528,939 | 497,941 | -30,998 | -5.9% |
| Nonproliferation and Arms Control | 140,000 | 148,000 | 184,795 | +36,795 | +24.9% |
| National Technical Nuclear Forensics R&D | 0 | 40,000 | 0 | -40,000 | -100.0% |
| Defense Nuclear Nonproliferation R&D | 533,163 | 601,900 | 672,736 | +70,836 | +11.8% |
| Nonproliferation Construction | 299,000 | 148,589 | 156,000 | +7,411 | +5.0% |
| Total, Defense Nuclear Nonproliferation Programs | 1,778,605 | 1,868,139 | 1,854,418 | -13,721 | -0.7% |
| Nuclear Counterterrorism and Incident Response Program | 372,095 | 377,513 | 370,782 | -6,731 | -1.8% |
| Legacy Contractor Pensions and Settlement Payments | 13,700 | 14,348 | 38,800 | +24,452 | +170.4% |
| **Total, Defense Nuclear Nonproliferation Appropriation** | **2,164,400** | **2,260,000** | **2,264,000** | **+4,000** | **+0.2%** |
| **Naval Reactors Appropriation** | | | | | |
| Naval Reactors Programs | 1,648,396 | 1,684,000 | 1,866,705 | +182,705 | +10.8% |
| **NNSA Cancellation of Prior Year Balances** | **0** | **0** | **-336,000** | -336,000 | 0% |
| **Total, National Nuclear Security Administration** | **16,704,592** | **19,732,200** | **19,743,000** | **+10,800** | **0.1%** |

**Overview**

The FY 2022 Request for **Weapons Activities (WA)** is $15,484,295,000, a $139,295,000 (0.9 percent) increase above the FY 2021 Enacted Level. Weapons Activities funds programs primarily at eight NNSA sites managed and operated by NNSA's contractor partners. 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 2022 Request for **Defense Nuclear Nonproliferation (DNN)** is $2,264,000,000, a $4,000,000 (0.2 percent) increase from the FY 2021 Enacted Level. The Request includes increases in Nonproliferation and Arms Control and DNN Research and Development programs which are offset by the completion of activities in Material Management and Minimization and Global Material Security.

NNSA's 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 FY 2022 Request for **Naval Reactors (NR)** is $1,866,705,000, a $182,705,000 (10.8 percent) increase from the FY 2021 Enacted Level. The increased funding maintains support for the current fleet, focuses on advanced technology development for future fleet capabilities, and keeps the Spent Fuel Handling Recapitalization Project on schedule to support the U.S. Navy.

The FY 2022 Request for NNSA **Federal Salaries and Expenses (FSE)** is $464,000,000, a $20,800,000 (4.7 percent) increase above the FY 2021 Enacted Level for the salaries, benefits, and the other expenses of 1,920 federal full-time equivalents (FTEs), 1,898 directly paid from FSE and 22 paid through the Working Capital Fund. The increase reflects the funding required for 151 additional FTEs over the FY 2021 Enacted Level. The request also provides funding for travel, training, support service contracts, space and occupancy needs, funding for the Department of Energy's (DOE) 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 $17.7 billion in Weapons Activities (WA) and Defense Nuclear Nonproliferation (DNN) funding across the nuclear security enterprise.

**Highlights and Major Changes in the FY 2022 Request**

- **Stockpile Management** - The FY 2022 Request includes increases for the W80-4 LEP for entrance to Phase 6.4 (Production Engineering) including readiness activities; the start of Phase 6.2 (Feasibility Study and Design Options)/6.2A (Design Definition and Cost Study) for the W80-4 Alteration for the Navy's Sea-Launched Cruise Missile (SLCM); continued planned ramp-up of the W87-1 program as transition occurs from Phase 6.2A to Phase 6.3 (Development Engineering); and continued planned ramp-up of the W93 program, including transition from Phase 1 (concepts study) to Phase 2 (review of these concepts into a specific set of design options to be down-selected to a final design). Funding for the B61 LEP and W88 Alteration Program ramps down consistent with program plans as these modernization efforts transition to Phase 6.6 (Full-Scale Production). Both programs are scheduled for completion in FY 2026. The increase in Stockpile Sustainment is driven by Integrated Surety Architecture (ISA) activities including development, qualification, and production for the Stockpile Systems and execution of ISA Hub Operations for Multi-Weapon Systems; an increase for development and qualification for W76-1/2 Mk4B Shape Stable Nose Tip

retrofit; and an increase to extend the B83-1 service life per the June 2020 Nuclear Weapons Council (NWC) decision. The B83-1 extension will require replacement of limited life components and restoration of surveillance activities.

- **Production Modernization** – The FY 2022 Request Level includes increases for preliminary design activities supporting the Savannah River Plutonium Processing Facility and the Los Alamos Plutonium Pit Production Project. The Request also includes increases to support other key production capability modernization activities for high explosives and energetic materials, secondary capability, and non-nuclear components. These increases are necessary to support near-term mission requirements and support future weapon systems.

- **Stockpile Research, Technology, and Engineering -** The FY 2022 Request Level supports the continued implementation of the Enhanced Capabilities for Subcritical Experiments (ECSE) and various activities in preparation to accept and operate NNSA's first Exascale high performance computing system for program use in 2023. In addition, the funding supports the necessary development of the design, engineering, and adaptation of physics and engineering codes needed to support stockpile decisions to operate on this new platform. Funding in this area also supports the development of new materials, technologies, and processes to evolve our nuclear systems and production complex. This is accomplished through warhead component and production technology development and maturation needed for on-going, planned, and future warhead modernization programs. It also reinvigorates and develops the future generation of the highly trained technical specialized workforce by experimental and computational programs along with academic institutes. The program includes Assessment Science, Engineering and Integrated Assessments, Inertial Confinement Fusion, Advanced Simulation and Computing, Weapon Technology and Manufacturing Maturation and Academic Programs.

- **Infrastructure and Operations (I&O) -** The FY 2022 Request represents continuation of the long-term effort to modernize NNSA infrastructure. Operations of Facilities supports additional leased space at Kansas City to meet Life Extension Program (LEP) schedules; increased resources at Tritium facilities to meet LEP production needs at the Savannah River Site (SRS); and support for the Safety Analytics, Forecasting, Evaluation, and Reporting (SAFER) system. Safety and Environmental Operations provides additional support for the Site Nuclear Material Managers. The Capability Based Investments subprogram continues to strategically target essential programmatic equipment recapitalization requirements.

  The request also supports Programmatic Construction funding for the Uranium Processing Facility (UPF) per the project execution plan and efforts to phase out mission dependency on the existing aged Y-12 facility. 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; TA-55 Reinvestment Project Phase III (TRP III); HE Synthesis, Formulation, and Production project; and a new start for the Power Sources Capability project. The request for Mission Enabling Construction is to support a new start for the Digital Infrastructure Capability Expansion project at Lawrence Livermore National Laboratory (LLNL).

- **Secure Transportation Asset (STA) -** The FY 2022 Request supports modernizing and sustaining STA transportation assets, including life extension of the Safeguards Transporter (SGT) until replaced by the Mobile Guardian Transporter (MGT) (First Production Unit in FY 2026), replacement of vehicles and tractors, sustainment of the infrastructure and command and control system platforms, and minor construction projects. The Program Direction budget supports STA's focus on recruiting, stabilizing, and retaining the Federal Agent workforce to include federal pilots, emergency management, security and safety programs, and other key elements of the STA mission.

- **Defense Nuclear Security** - The FY 2022 Request includes funding to fill positions in key security program areas required to implement a risk-based, layered protection strategy at the sites. These areas include protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning. The Request supports increased security needs associated with known mission growth in Weapons Programs across the NSE, including pit production at Los Alamos National Laboratory (LANL) and Kansas City expansion efforts; supports initial efforts to replace the aging Argus system with a modern security system, Caerus; and begins efforts to implement additional security requirements resulting from completed design basis threat (DBT) analysis. This Request also includes funding for the highest-priority efforts to

recapitalize security infrastructure through the Security Infrastructure Revitalization Program, as well as funding for 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 National Security Complex (Y-12) Protected Area by approximately 50%.

- **Information Technology and Cybersecurity -** The FY 2022 Request increase for Site Infrastructure and Enterprise Operations is in part due to the transfer of responsibility for the Emergency Communications Network (ECN) from the Emergency Operations subprogram within the Nuclear Counterterrorism and Incident Response program. Additional increases reflect funding for remaining requirements for M&O cybersecurity infrastructure, including full scope enhancements to the Enterprise Secure Network (ESN) infrastructure, upgrades for the inherited legacy classified network systems, as well as funding for the cross site-initiatives Enterprise Efficiency Working Group and pilot testing team for advancing cybersecurity protection measures across the enterprise.

**Defense Nuclear Nonproliferation**

The FY 2022 Request continues DNN's efforts to reduce the danger of hostile nations or terrorist groups acquiring nuclear devices, radiological dispersal devices, weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise. These programs, as part of a whole-of-government approach to nuclear threat reduction, 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 technically trained emergency management personnel are available to respond to nuclear and radiological incidents and accidents domestically and overseas. As part of the DOE's emergency response posture, these programs, in conjunction with key capabilities operated and managed by the NNSA's Office for Information Management and Chief Information Officer, ensure that a worldwide interoperable, secure, and trusted emergency communications network is in place.

**Naval Reactors**

The FY 2022 Request continues NR's core objective of supporting the daily safe and reliable operation of the Nation's nuclear fleet (70 submarines, 11 aircraft carriers, and 5 research, development, and training platforms). The Program's development work consists of refining and improving existing technology to ensure that the U.S. Navy's nuclear propulsion plants are increasingly efficient and effective and will be capable of meeting future threats to national security. In addition to supporting the existing nuclear fleet, NR has three major DOE initiatives—the *Columbia*-Class Reactor System Development, the Land-based S8G Prototype Refueling Overhaul, and the 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 2022 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 1,920 Federal FTEs (1,898 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 NSE. It is essential to have sufficient people, with the right capabilities, to meet growing mission requirements and commitments including modernizing the nuclear deterrent, recapitalizing the aging infrastructure, and continuing to meet the requirements of nonproliferation and counterterrorism programs. 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 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 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 NSE.

**DOE Working Capital Fund (WCF) Support**
NNSA's Total FY 2022 Request includes $73,519,000 for NNSA's projected support to the DOE WCF. Of this amount, $36,129,000 will be paid out of FSE; $32,903,000 out of WA; $4,487,000 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 and Settlement Payments**
NNSA is proposing to expand the scope of this budget line to include funding for the Requa settlement reached in 2019 as well as a portion of an unfunded pension liability at the Savannah River Site.

The *Requa* lawsuit involved University of California (UC) employees of LLNL who retired prior to the Laboratory's transition to a new contractor on October 1, 2007. The retirees had been receiving health insurance through a UC health plan, but when the LLNL contract transitioned to LLNS, the employees were offered health insurance through the new LLNL contractor, leading the retirees to file a lawsuit seeking reinstatement into the UC health plan. The parties settled the lawsuit in 2019, and a final judgment was issued in April 2020. NNSA agreed, pursuant to the legacy UC-LLNL Contract, to provide UC a portion of the total costs to settle the lawsuit, over a period of seven years through FY 2026. NNSA's responsibility for FY 2022 is $16 million.

Funding is also requested for reimbursement of NNSA's portion of the unfunded liability of the Savannah River Nuclear Solutions pension plan. The SRNS pension plan is underfunded by roughly $1.1 billion. The Department is proposing direct funding for this unfunded liability until it is fully funded. The FY 2022 Request includes a total of $218 million for this liability with 60 percent allocated to the Office of Environmental Management (EM) and 40 percent allocated to NNSA. NNSA's portion is allocated between the DNN and Weapons Activities appropriation accounts.

This budget line also continues to include the Weapons Activities share of the DOE's annual reimbursement made to the UC Retirement Plan (UCRP) for former UC employees and annuitants who worked at LLNL and LANL. 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 and Settlement Payments line items.

**Top 15 Property Leases at NNSA**

Rebuilding the NNSA NSE infrastructure requires both federal funding and public-private partnerships. NNSA has leveraged leasing arrangements when in the government's best interest, primarily to address short-term needs for additional space. 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 | $51,274 | 997,587 | Direct |
| Kansas City National Security Campus | National Security Manufacturing Center Building, 14500 Botts Road | $13,882 | 260,906 | Direct |
| Pantex Plant | John C. Drummond Center Office Building | $6,188 | 273,600 | Direct |
| Kansas City National Security Campus | Building 22 | $2,372 | 102,000 | Direct |
| Kansas City National Security Campus | Building 21 | $1,541 | 56,011 | Direct |
| Nevada National Security Site – Las Vegas | Southern Nevada Science Center II | $1,157 | 32,535 | Direct |
| Kansas City National Security Campus | Building 23 | $1,156 | 275,193 | 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 | $3,906 | 118,738 | Indirect |
| Y-12 National Security Complex | New Hope Center | $2,924 | 96,431 | Indirect |
| Sandia National Labs – New Mexico | Sandia @ Buena Vista | $2,459 | 119,560 | Indirect |
| Sandia National Laboratories – New Mexico | Center for Global Security and Cooperation | $1,761 | 45,617 | Indirect |
| Los Alamos National Laboratory | Office Building | $1,461 | 22,659 | Indirect |
| Nevada National Security Site – Los Alamos | Los Alamos Operations | $1,291 | 45,275 | Indirect |
| Y-12 National Security Complex | Commerce Park Offices | $1,058 | 65,000 | 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 – Lawrence Livermore National Laboratory**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| Building 132N Defense Programs Research Variable Air Control Replacement | Infrastructure and Operations: Infrastructure and Safety | 6,500 | Replace the outdated controls system with a state-of-the-art serviceable controls system. Specifically, the plan is to modernize each area (Air Conditioning Units (ACUs) and their associated Variable Air Volume (VAV) boxes. Controls will ensure system meets the needed air balance requirements in the laboratories, and server rooms as well as heating and cooling needs for the over 450 occupants of the facility. | 0 | 0 | 6,500 | 0 | 325 |

**Weapons Activities – Nevada National Security Site**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| New DAF Operations Complex Site Preparations | Infrastructure and Operations: | 6,500 | Includes grading activities to support new vehicle/pedestrian flow, and new facility ground | 0 | 0 | 6,500 | 0 | 800 |

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| | Infrastructure and Safety | | preparation including soil addition, removal, and compaction as well as small structure removal (culverts, concrete) as required for the Device Assembly Facility (DAF) area plan development supporting increased future mission needs at the DAF. | | | | | |
| Area 6 CP Hill to Fire Station Junction Water Line Upgrade | Infrastructure and Operations: Infrastructure and Safety | 5,500 | Replace approximately 8,000 linear feet of water line along Mercury Highway that has exceeded its design life. This water line supports mission critical facilities such as the DAF and U1a Complex. | 0 | 0 | 5,500 | 0 | 500 |
| DAF Deployment Project | Production Modernization: Plutonium Modernization | 6,378 | Design and installation of a Quality Grade (QG)-1 rack system in the DAF. | 0 | 2,984 | 3,394 | 0 | 430 |

**Weapons Activities – Sandia National Laboratories**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| SNL CA High Security Office Modular Addition | Stockpile Management | 7,800 | Install a modular-built high-security building to respond to the urgent need for high security workspace to support Nuclear Deterrence Modernization programs. The modular high-security office will enable critical programs to achieve their mission | 0 | 800 | 7,000 | 0 | 800 |

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| | | | commitments and reduce schedule and security risks. | | | | | |

**Weapons Activities – Savannah River Site**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| TCAP Restoration Column A | Production Modernization: Tritium and Domestic Uranium Enrichment | 6,000 | Replace all hydride beds in the TCAP glovebox due to aging of the hydrogen storage media. Replace TCAP column "A". All replacements are in-kind replacements with only minor upgrades. No functional design changes. | 0 | 1,300 | 4,700 | 0 | 2,050 |

**Weapons Activities – Y-12**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| Building 9201-05N AJ-5714 HVAC Replacement | Infrastructure and Operations: Infrastructure and Safety | 5,413 | Complete replacement of air handling unit AJ-5714 and its support equipment located in building 9201-5N. This air handling unit maintains the required environmental parameters for a key production area within 9201-5N. | 0 | 0 | 5,413 | 0 | 286 |
| Building 9995 198/222 Feeders Electrical Panel & Motor Control Center Replacement | Infrastructure and Operations: Infrastructure and Safety | 9,288 | Replace 26 aged and deteriorated lighting/distribution panels and motor control center. | 0 | 0 | 9,288 | 0 | 1,316 |

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 and FY 2022 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| Shipping & Receiving (Exterior) | Production Modernization | 12,500 | Cover installation of shipping and receiving area that will address safety hazards and security requirements during inclement weather. | 0 | 2,800 | 9,700 | 0 | 3,500 |

**Weapons Activities – Savannah River Site**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| TCAP Restoration Column A | Production Modernization: Tritium and Domestic Uranium Enrichment | 6,000 | Replace all hydride beds in the TCAP glovebox due to aging of the hydrogen storage media. Replace TCAP column "A". All replacements are in-kind replacements with only minor upgrades. No functional design changes. | 0 | 1,300 | 4,700 | 0 | 2,050 |

**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 planned for execution.

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| Building 23 W87-1 Manufacturing Development Area Buildout | KCNSC | Expand the electrical and mechanical distribution systems, increase HVAC capacity, and provide special foundations to prepare the space for equipment installations, adding approximately 35,000 square feet. | Infrastructure and Operations: Infrastructure and Safety | 13,006 | 1,355 | FY 2022 | FY 2022 | FY 2023 |
| New TA-15 Flight Instrumentation Test Laboratory (STAR) | LANL | Construct approximately 6,000 sq ft facility to include four reinforced concrete test bays, a control room for performing remote operations on high-explosives assemblies, and support rooms necessary to effectively conduct tests. | Infrastructure and Operations: Infrastructure and Safety | 19,472 | 1,900 | FY 2021 | FY 2022 | FY 2023 |
| TA-55 Fire Suppression Water Line Installation for Program Expansion within the PIDAS | LANL | Install a new fire suppression water supply system (FSWSS) to support the planned program expansion within the PIDAS at TA-55 concurrent with the removal of the non-seismically qualified buildings from Fire Water yard main water supply West of PF-6. | Infrastructure and Operations: Infrastructure and Safety | 13,895 | 579 | FY 2022 | FY 2022 | FY 2023 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| New TA-22 Detonator Storage Magazines | LANL | Design, procure, fabricate, and install 1,500 sq ft of earthen covered magazine space. Project will also demolish and dispose of the existing magazines at TA-22-0022, TA-22-0023, TA-22-0024, and building TA-22-0025 and disconnect all utilities. | Infrastructure and Operations: Infrastructure and Safety | 11,137 | 1,437 | FY 2022 | FY 2022 | FY 2023 |
| Shipping & Receiving (Exterior) | LANL | Cover installation of shipping and receiving area that will address safety hazards and security requirements during inclement weather. | Production Modernization | 12,500 | 3,500 | FY 2021 | FY 2021 | FY 2024 |
| Site 300 Water Supply Piping & Valve Zone 3 & Other Upgrades | LLNL | Replace approximately 19,000 linear feet of the highest priority water supply piping and valves. The piping will be replaced from Zone 2 booster pump station to Zone 3 booster pump station at the zone 4 border. | Infrastructure and Operations: Infrastructure and Safety | 11,000 | 400 | FY 2022 | FY 2022 | FY 2024 |
| Building 191 HEAF Atrium Conversion to Shot-Ready Workspace | LLNL | Convert HEAF first floor atrium into 2,000 sq ft of space that can accommodate safe and compliant usable experimental and experimental preparation workspace. | Infrastructure and Operations: Infrastructure and Safety | 12,300 | 1,062 | FY 2022 | FY 2022 | FY 2023 |
| New Energetic Material Office Facility (STAR) | LLNL | Construct a 22,000 sf office building near the High Explosives work areas. This office building includes ~100 offices, conference rooms, collaborative space, and mechanical/electrical rooms for building services as well as site preparation and utility services. Reusing the LLNL STAR B224 generic office building design. | Infrastructure and Operations: Infrastructure and Safety | 19,400 | 900 | FY 2022 | FY 2022 | FY 2023 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| New Experimental Science Office Facility (STAR) | LLNL | Construct a 22,000 sf office building near the NA-11 RDT&E work areas. This office building includes ~100 offices, conference rooms, collaborative space, and mechanical/electrical rooms for building services as well as site preparation and utility services. Reusing the LLNL STAR B224 generic office building design. | Infrastructure and Operations: Infrastructure and Safety | 19,400 | 900 | FY 2022 | FY 2022 | FY 2023 |
| New Livermore Federal Center Office Building | LFO | Construct a 25,000 sf building consisting of approximately 110 office spaces (including secured offices), conference rooms, and support spaces for LFO, OIG, NA-MB, and APM. | Infrastructure and Operations: Infrastructure and Safety | 19,300 | 1,300 | FY 2023 | FY 2023 | FY 2024 |
| B654 Expansion | LLNL | This project upgrades the power of the B654 facility from 6MW to 7.5MW and allows for future power upgrades to bring the building to a total of 15MW. It will position the lab to migrate production systems out of the aging B451 facility | Stockpile Research Technology and Engineering | 18,000 | 900 | FY 2022 | FY 2022 | FY 2024 |
| U1a Underground Power Distribution Upgrade | NNSS | Upgrade underground power supply cables and replace existing mining power centers underground with new 5kV to 480V transformers and distribution gear. These transformers and distribution gear will provide increased distribution capacity to support future mission and facility growth. | Infrastructure and Operations: Infrastructure and Safety | 13,000 | 1,500 | FY 2022 | FY 2022 | FY 2025 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| New U1a Operations Support Facility 01-351 (STAR) | NNSS | Construct a new, modern, energy efficient 13,000 sq ft facility to accommodate the increased Operations and Maintenance personnel needed to support the increased tempo at the U1a complex. This project will use the ProtoSTAR common building initiative using a comment kit of parts, developing a flexible, scalable design for administrative spaces. | Infrastructure and Operations: Infrastructure and Safety | 19,500 | 1,000 | FY 2021 | FY 2022 | FY 2024 |
| Tweezer Substation Upgrade | NNSS | Design and install a replacement transformer for the existing 28-year-old transformer. This replacement will increase capacity and ensure power needs at the U1a complex and Area 6 are adequately supported for the growing mission work. | Infrastructure and Operations: Infrastructure and Safety | 11,000 | 1,500 | FY 2022 | FY 2022 | FY 2024 |
| Substation 36 Upgrade | SNL | Replace Substation 36, specifically the transformer and switchgear which are necessary to maintain reliable, sustained operations for numerous major facilities located in TA-I, II, & IV. | Infrastructure and Operations: Infrastructure and Safety | 10,000 | 1,000 | FY 2022 | FY 2022 | FY 2024 |
| TTR Main 13.8 kV Substation & West Feeder Upgrade | SNL | Replace the main 13.8kV substation, west 13.8kV overhead radial lines, and a cut-over switch and meter on the main US Air Force transformer. The project will bring the NNSA/SNL's electric distribution system at TTR into compliance with present day industry standards and practices. | Infrastructure and Operations: Infrastructure and Safety | 12,000 | 500 | FY 2022 | FY 2022 | FY 2024 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| New Geosciences Laboratory (STAR) | SNL | Construct 15,838 sq ft high bay light laboratory facility based on the existing Agile Lab design to replace the 70+ year old buildings supporting SNL's Geosciences research programs. | Infrastructure and Operations: Infrastructure and Safety | 18,500 | 1,750 | FY 2021 | FY 2022 | FY 2023 |
| 725 Additional Power | SNL | This project will provide for additional power in Building 725-E for Commodity Technology (CT) systems and other Testbed systems. | Stockpile Research Technology and Engineering | 10,000 | 300 | FY 2022 | FY 2022 | FY 2023 |
| New Tritium Office Building (STAR) | SRFO | Site preparation and construction of a 30,000 sq ft two story office building. The office building will house approximately 120 - 135 personnel including, conference rooms, classrooms, breakrooms, and a training simulator. | Infrastructure and Operations: Infrastructure and Safety | 19,600 | 1,750 | FY 2022 | FY 2022 | FY 2024 |
| Building 9215 Complex Integration with Bottom Loading Furnace | Y-12 | Site preparation and minor construction to integrate the Direct Chip Melt Bottom Loading Furnace MIE with existing utilities within the Building 9215 complex. | Production Modernization: Secondary Capability Modernization | 18,400 | 1,800 | FY 2021 | FY 2022 | FY 2024 |
| 9990-03 Facility Upgrades, Y-12 | Y-12 | Modifications (to include upgraded power, HVAC, and utility lines; converting a part of the facility into a vault type room; and providing classified network capabilities) to allow building 9990-03 to be a multi-purpose facility on the Y-12 site. | Stockpile Management | 19,952 | 1,750 | FY 2021 | FY 2021 | FY 2023 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| New West End Production Change House | Y-12 | Construct a new change house on the west end of Y-12, outside of the future reduced-footprint Protected Area to maximize efficiency and minimize wasted time due to travel between work area and change house locations. | Infrastructure and Operations: Infrastructure and Safety | 13,824 | 1,284 | FY 2022 | FY 2022 | FY 2024 |
| Vehicle Maintenance Facility – Agent Operation Western Command | STA – Albuquerque, New Mexico | STA Vehicle Maintenance Facilities require rebuild/restructuring to support updated requirements related to Integrated Surety Architecture to support SGT and MGT. | Secure Transportation Asset | 12,000 | 1,200 | FY 2021 | FY 2022 | FY 2023 |
| Vehicle Maintenance Facility – Agent Operations Central Command | STA – Amarillo, Texas | STA Vehicle Maintenance Facilities require rebuild/restructuring to support updated requirements related to Integrated Surety Architecture to support SGT and MGT. | Secure Transportation Asset | 15,000 | 1,500 | FY 2022 | FY 2023 | FY 2024 |
| KL Data Center Power and Capacity Upgrades | Naval Nuclear Laboratory | This project upgrades the power and capacity of stand-by power systems to provide uninterrupted power to the Knolls Laboratory Site Data Center and associated Information Technology equipment and support systems. | Naval Reactors | 12,911 | 1,259 | FY 2022 | FY 2023 | FY 2024 |
| BL A7 Office Building | Naval Nuclear Laboratory | This project constructs a new office building that provides 200 office spaces at the Bettis Laboratory Site. | Naval Reactors | 19,000 | 0 | FY 2022 | FY 2023 | FY 2024 |
| KL Radio Upgrade | Naval Nuclear Laboratory | This project replaces the current radio system for the Knoll Laboratory Site that is beyond end-of-life and end-of-cycle support. | Naval Reactors | 17,800 | 1,000 | FY 2022 | FY 2023 | FY 2028 |

| Project | Site | Project Description | Program | TPC | Construction Design Estimate | Project Milestones | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Project Start | Design Complete | Construction Complete |
| BH-061 Corridor Construction | Washington Headquarters | BH-Corridor project in the Forrestal Building to provide for more than 10,000 square feet of Special Access Program (SAP) and Sensitive Compartmented Information Facility (SCIF) secure office space. | Federal Salaries and Expenses | 13,782 | 882 | FY 2020 | FY 2021 | FY 2023 |

**Major Item of Equipment for NNSA – (>$5M)**
**(Dollars in Thousands)**

NNSA plans to execute these MIE projects in the outyears based on current knowledge, but may accelerate projects into FY 2022 or earlier depending on changes in priorities.

| Project Title | Site | Total | Project Description | Program | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|---|
| Target Alignment Sensor (TAS) Upgrade | LLNL | 11,000 | NIF's TAS was designed over 20 years ago and uses cameras that are no longer available. In addition, the larger targets desired by NIF's users cannot be aligned efficiently with the existing TAS. This project includes the design of a new TAS with modern, rad-hard cameras that will accept larger targets within the field of view. | Stockpile Research Technology and Engineering | 0 | 0 | 0 | 11,000 | 0 |
| Energy Upgrade to Optical Thompson Scattering (OTS) Laser | LLNL | 6,000 | Addition of power amplifiers to the output of the OTS Laser, and larger frequency converter to increase UV laser energy available for OTS and other laser probe work on NIF. | Stockpile Research Technology and Engineering | 0 | 0 | 0 | 6,000 | 0 |
| Time Resolved Magnetic Recoil Spectrometer | LLNL | 6,000 | Develop and field a time resolved Magnetic Recoil Spectrometer for NIF that covers from 11 to 15 meV neutron spectrum with less that 100ps temporal resolution. | Stockpile Research Technology and Engineering | 0 | 0 | 0 | 6,000 | 0 |
| ATS-Application Regression Testbed (ART) System - El Capitan, SNL | SNL | 6,000 | Provide a software development test environment that will facilitate tri-lab code and software development and testing for the anticipated El | Stockpile Research Technology and Engineering | 0 | 0 | 0 | 6,000 | 0 |

| Project Title | Site | Total | Project Description | Program | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|---|
| | | | Capitan (ATS-4) computing architecture at LLNL. | | | | | | |
| ATS-Application Regression Testbed (ART) System - Crossroads, SNL | SNL | 6,000 | Provide a software development test environment that will facilitate tri-lab code and software development and testing for the anticipated Crossroads (ATS-3) computing architecture at LANL. | Stockpile Research Technology and Engineering | 0 | 0 | 0 | 6000 | 0 |

**Institutional Minor Construction Projects for NNSA – (>$5M)**
**(Dollars in Thousands)**

**Weapons Activities – Sandia National Laboratories**

| Project Title | Program | Total | Project Description | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | Outyears | Construction Design Estimate |
|---|---|---|---|---|---|---|---|---|
| Purchase & Install New Fuel Tank Farm | Institutional | 6,005 | The purpose of this investment is to purchase and install five 50,000-gallon fuel tanks that supports electrical resiliency to Mission Essential Functions in multiple buildings and provides on-site, available and consistent infrastructure support in a centralized location for other site services. The tank farm will be located southwest of MO308 in Technical Area 2. | 0 | 0 | 6,005 | 0 | 455 |

**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 Bldg 260 Multi-Program Office Building: New Construction | 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. | 19,000 | 900 | FY 2022 | FY 2022 | FY 2023 |
| New Wet Chemistry Laboratory Replacement Building: New Construction | LLNL | Construct a 14,000 sq ft laboratory building which will have 10,000 sq ft of wet chemistry laboratory space, 1,000 sq ft of storage and loading dock space, with the remainder of the building area used for bathrooms and building mechanical equipment. Laboratories will be configured with chemical fume hoods, flexible benchtop and casework, and divided into HVAC zones with isolated supply air. | 19,000 | 1,000 | FY 2022 | FY 2022 | FY 2024 |
| New National Security Flexible Lab/Office Space | SNL | Design and build a 36,000 GSF (3 stories/12K per floor) Secure Facility (SCIF). This secure facility will include a computer lab and office space building that will replace MO324/MO325. This asset will support SNL's Information Operation Center and multiple government agencies. The new asset will support ~216 FTEs, the structure will be designed to accommodate heavy computer labs and general office areas. | 19,000 | 1,900 | FY 2021 | FY 2022 | FY 2023 |

**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 |
|---|---|---|---|---|---|---|---|---|
| Future Computational testbed | LANL | 80,000 | This project will acquire a computational system using emerging technology to determine pathways for future supercomputing and provide foundational technologies towards future systems in Science, National Security, and industry. | 0 | 23,000 | 20,000 | 37,000 | 0 |
| Splunk Re-design | Y-12 | 6,750 | This project re-designs the Splunk infrastructure to support increased information being gathered for the cyber security program. As we continue to increase the number of endpoints, intrusion detection capabilities, and move to cloud based resources, additional volumes of data are being collected which need to be captured, reviewed, and provided to cyber analysts. | 0 | 0 | 5,000 | 1,750 | 500 |

Information on Maintenance in response 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 , and that was previously included in this Volume, is included within the Infrastructure Crosscut in Volume 2.

## Site Estimates
(Dollars in Thousands)

| Site | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | FSE | WA | DNN | NR | NNSA | Total |
| Argonne National Laboratory | 58,771 | 51,480 | 499 | 2,004 | 40,631 | - | - | 43,134 |
| Bettis Atomic Power Laboratory | 393,247 | 364,997 | - | - | - | 418,072 | - | 418,072 |
| Brookhaven National Laboratory | 12,692 | 14,671 | 6 | 477 | 15,121 | - | - | 15,604 |
| Carlsbad Area Office | 42 | 40 | 1 | - | 438 | - | - | 439 |
| Chicago Operations Office | 6 | 2,006 | 6 | 2,000 | - | - | - | 2,006 |
| Consolidated Business Center | 2,400 | 1,859 | 1,218 | - | - | - | - | 1,218 |
| Fermi National Accelerator Laboratory | 500 | 750 | - | - | 792 | - | - | 792 |
| Fluor Marine Propulsion, LLC | 826 | 475 | - | 445 | - | - | - | 445 |
| Idaho National Laboratory | 175,255 | 183,076 | 6 | 3,597 | 79,130 | 89,108 | - | 171,841 |
| Kansas City National Security Complex (KCNSC) | 1,028,697 | 1,185,493 | 110 | 1,234,455 | 45,714 | - | - | 1,280,279 |
| Kansas City Site Office | 7,597 | 7,286 | 7,562 | 145 | - | - | - | 7,707 |
| Knolls Atomic Power Laboratory | 733,031 | 654,727 | - | - | - | 758,240 | - | 758,240 |
| Lawrence Berkeley National Laboratory | 7,357 | 9,911 | - | 530 | 10,241 | - | - | 10,771 |
| Lawrence Livermore National Laboratory | 1,768,368 | 2,129,349 | 1,580 | 1,912,915 | 193,899 | - | - | 2,108,394 |
| Livermore Site Office | 18,314 | 17,006 | 18,791 | - | - | - | - | 18,791 |
| Los Alamos National Laboratory | 2,266,625 | 3,289,685 | - | 2,938,081 | 442,916 | - | - | 3,380,997 |
| Los Alamos Site Office | 17,587 | 17,261 | 19,155 | 60 | - | - | - | 19,215 |
| National Energy Technology Laboratory | 41,517 | 54,195 | 113 | 48,164 | 1,583 | - | - | 49,860 |
| Naval Reactors Facility | 370,761 | 508,930 | - | - | - | 530,226 | - | 530,226 |
| Naval Reactors Laboratory Field Office | 20,240 | 20,680 | - | - | - | 22,232 | - | 22,232 |
| Naval Research Laboratory | 4,600 | 10,100 | - | 2,600 | - | - | - | 2,600 |
| Nevada Field Office | 99,629 | 104,332 | 17,037 | 91,405 | - | - | - | 108,442 |
| Nevada National Security Site | 480,421 | 686,068 | 400 | 516,523 | 93,553 | - | - | 610,476 |
| NNSA Albuquerque Complex | 1,009,925 | 1,064,869 | 3,596 | 705,202 | 136,680 | - | - | 845,478 |
| NNSA Production Office (NPO) | 47,308 | 47,205 | 26,766 | - | 5,000 | - | - | 31,766 |
| Oak Ridge Institute for Science & Education | 3,226 | 2,300 | - | - | 2,698 | - | - | 2,698 |
| Oak Ridge National Laboratory | 162,941 | 146,561 | 120 | 46,472 | 138,398 | - | - | 184,990 |
| Office of Scientific & Technical Information | 480 | 1,490 | - | 448 | 71 | - | - | 519 |
| Pacific Northwest National Laboratory | 258,770 | 307,143 | 1,525 | 64,974 | 240,968 | - | - | 307,467 |
| Pantex Plant | 829,108 | 978,660 | - | 1,008,673 | 7,005 | - | - | 1,015,678 |
| Portsmouth Gaseous Diffusion Plant | - | 84,125 | - | 45,567 | - | - | - | 45,567 |
| Princeton Plasma Physics Laboratory | 300 | 760 | - | - | 803 | - | - | 803 |
| Richland Operations Office | 1,849 | 2,008 | 6 | - | 2,401 | - | - | 2,407 |
| Sandia National Laboratories | 2,318,008 | 2,623,878 | - | 2,418,599 | 271,442 | - | - | 2,690,041 |
| Sandia Site Office | 19,623 | 17,751 | 17,369 | 927 | - | - | - | 18,296 |
| Savannah River Operations Office | 39,623 | 21,938 | 10,349 | 29,132 | 3,474 | - | - | 42,955 |
| Savannah River Site | 904,885 | 1,034,940 | - | 1,033,769 | 250,197 | - | - | 1,283,966 |
| SLAC National Accelerator Laboratory | 1,735 | 1,916 | - | 180 | 1,884 | - | - | 2,064 |
| University of Rochester | - | - | - | 75,000 | - | - | - | 75,000 |
| Washington Headquarters | 1,714,657 | 1,954,134 | 337,785 | 1,237,709 | 226,506 | 48,827 | - | 1,850,827 |
| Waste Isolation Pilot Plant | 2,590 | 4,631 | - | - | 7,280 | - | - | 7,280 |
| Y-12 National Security Complex | 1,881,081 | 2,123,514 | - | 2,064,242 | 45,175 | - | - | 2,109,417 |
| Adjustment | - | - | - | - | - | - | (336,000) | (336,000) |
| **Grand Total** | **16,704,592** | **19,732,200** | **464,000** | **15,484,295** | **2,264,000** | **1,866,705** | **(336,000)** | **19,743,000** |

## Support Service Contracts

**FY 2019 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 2018 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 2021
(As of 10/3/2020)

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| ACCENTURE FEDERAL SERVICES LLC | 89233120FNA000082 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $6,000,000 | 4 | 0 |
| | **89233120FNA000082 Total** | | **$6,000,000** | **4** | **0** |
| ADVANCED MANAGEMENT STRATEGIES GROUP, INC. | DT0008761 89233120FNA400258 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,373,746 | 21 | 0 |
| | **DT0008761 89233120FNA400258 Tot** | **Follow-on for FY20 expired contract.** | **$1,373,746** | **21** | **0** |
| ALUTIIQ COMMERCIAL ENTERPRISES LLC | NA0002827 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 7 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $782,416 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **NA0002827 Total** | | **$782,416** | **7** | **0** |
| ALVAREZ LLC | 89233119FNA000049 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $8,303,316 | 7 | 0 |
| | **89233119FNA000049 Total** | | **$8,303,316** | **7** | **0** |
| | 89233118FNA000026 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $579,844 | 10 | 0 |
| | **89233118FNA000026 Total** | | **$579,844** | **10** | **0** |
| APOGEE GROUP, LLC | 89233118CNA000056 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $448,200 | 1 | 0 |
| | **89233118CNA000056 Total** | | **$448,200** | **1** | **0** |
| ASPEN CULTURAL RESOURCE MANAGEMENT SOLUTIONS | 89233120CNA000139 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $62,383 | 3 | 0 |
| | **89233120CNA000139 Total** | | **$62,383** | **3** | **0** |
| AUGUR CONSULTING INC | 89233120FNA400290 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $418,093 | 1.9 | 0 |
| | **89233120FNA400290 Total** | | **$418,093** | **1.9** | **0** |
| BANDA GROUP INTERNATIONAL,LLC | NA0003413 89233120CNA000128 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,713,384 | 2 | 0 |
| | **NA0003413 89233120CNA000128 To** | **Follow-on for FY20 expired contract.** | **$1,713,384** | **2** | **0** |
| | NA0003413 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 0 | 2 |
| | **NA0003413 Total** | **Expired requirement with a follow-on starting in FY20.** | **$0** | **0** | **2** |
| | NA0003412 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $995,168 | 2 | 0 |
| | **NA0003412 Total** | | **$995,168** | **2** | **0** |
| | NA0002903 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 3 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $215,630 | | |
| | **NA0002903 Total** | | **$215,630** | **3** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | 89233119CNA000066 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $960,690 | 4 | 0 |
| | **89233119CNA000066 Total** | | **$960,690** | **4** | **0** |
| CE2 CORPORATION INC | DT0012670 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 5.2 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $834,757 | | |
| | **DT0012670 Total** | | **$834,757** | **5.2** | **0** |
| | DT0011828 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 3 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $697,543 | | |
| | **DT0011828 Total** | | **$697,543** | **3** | **0** |
| | DT0009761 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 15 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $2,991,301 | | |
| | **DT0009761 Total** | | **$2,991,301** | **15** | **0** |
| | DT0009471 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 16.5 | 0 |
| | **DT0009471 Total** | | **$0** | **16.5** | **0** |
| CE2 CORPORATION, INC. | DT0008938 | (blank) | $0 | 0 | 15 |
| | **DT0008938 Total** | **Expired requirement with a follow-on starting in FY20.** | **$0** | **0** | **15** |
| CHENEGA PROFESSIONAL & TECHNICAL SERVICES, LLC | DT0012824 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | -$125,685 | 18 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,462,540 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **DT0012824 Total** | | **$1,336,855** | **18** | **0** |
| | 89233119CNA000081 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,033,471 | 18 | 0 |
| | **89233119CNA000081 Total** | | **$2,033,471** | **18** | **0** |
| COGENT SECURITY CONSULTING LLC | 89233119FNA400197 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 4 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $853,911 | | |
| | **89233119FNA400197 Total** | | **$853,911** | **4** | **0** |
| CORPORATE ALLOCATION SERVICES, INC | DT0012654 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $305,512 | | |
| | | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $155,343 | 3 | 0 |
| | **DT0012654 Total** | | **$460,855** | **3** | **0** |
| | BP0005605 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $178,608 | 2 | 0 |
| | **BP0005605 Total** | | **$178,608** | **2** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| CORPORATE ALLOCATION SERVICES, INC. | DT0011033 | (blank) | $0 | 0 | 6 |
| | **DT0011033 Total** | **Expired requirement with a follow-on starting in FY20.** | **$0** | **0** | **6** |
| COVENANT PARK INTEGRATED INITIATIVES | 89233118FNA400044 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $2,548,813 | 12 | 0 |
| | **89233118FNA400044 Total** | | **$2,548,813** | **12** | **0** |
| CRITERION SYSTEMS, INC. | BP0005221 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,314,595 | 11 | 0 |
| | **BP0005221 Total** | | **$2,314,595** | **11** | **0** |
| | 89233118FNA000015 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $9,219,742 | 39 | 0 |
| | **89233118FNA000015 Total** | | **$9,219,742** | **39** | **0** |
| DIGON SYSTEMS, LLC | NA0003441 89233120CNA000146 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $937,712 | 13 | 0 |
| | **NA0003441 89233120CNA000146 To** | **Follow-on for FY20 expired contract.** | **$937,712** | **13** | **0** |
| | NA0003441 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $75,988 | 0 | 2 |
| | **NA0003441 Total** | **Expired requirement with a follow-on starting in FY20.** | **$75,988** | **0** | **2** |
| DIVERSIFIED PROTECTION CORPORATION | 89233120FNA400244 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $274,768 | 1 | 0 |
| | **89233120FNA400244 Total** | | **$274,768** | **1** | **0** |
| DOXCELERATE CORPORATION | NA0003349 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1.5 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $232,326 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **NA0003349 Total** | | **$232,326** | **1.5** | **0** |
| ERNST & YOUNG, LLP | 89233120FNA000066 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $461,686 | 8 | 0 |
| | **89233120FNA000066 Total** | | **$461,686** | **8** | **0** |
| GARTNER, INC. | 89233120FNA400298 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,047,275 | 8 | 0 |
| | **89233120FNA400298 Total** | | **$2,047,275** | **8** | **0** |
| GRADILLAS COURT REPORTERS INC | 89233119FNA400231 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 0 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,921 | | |
| | **89233119FNA400231 Total** | | **$1,921** | **0** | **0** |
| HARKCON, INC | DT0008938 89233120FNA400313 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,091,417 | 16 | 0 |
| | **DT0008938 89233120FNA400313 Tot** | **Follow-on for FY20 expired contract.** | **$1,091,417** | **16** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| HENRY L STIMSON CENTER | 89233119CNA000075 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $845,138 | 6 | 0 |
| | **89233119CNA000075 Total** | | **$845,138** | **6** | **0** |
| HYPERION TECHNOLOGIES LLC | 89233119CNA000107 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $240,000 | 4.5 | 0 |
| | | 07060 - 089-19/20-0228 - DA Primary Fund | $0 | | |
| | | 07070 - 089-20/21-0228 - DA Primary Fund | $100,000 | | |
| | **89233119CNA000107 Total** | | **$340,000** | **4.5** | **0** |
| INNOVATIVE TECHNOLOGY PARTNERSHIPS LLC | DT0014072 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 2.05 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,365,675 | | |
| | **DT0014072 Total** | | **$1,365,675** | **2.05** | **0** |
| | 89233120FNA400264 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $6,770,154 | 64 | 0 |
| | | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $82,524 | | |
| | **89233120FNA400264 Total** | | **$6,852,678** | **64** | **0** |
| | 89233120FNA400249 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $3,700,000 | 8 | 0 |
| | **89233120FNA400249 Total** | | **$3,700,000** | **8** | **0** |
| INTERNATIONAL SERVICES AND ADVISORS INC | NA0003742 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $3,431,622 | 5 | 0 |
| | **NA0003742 Total** | | **$3,431,622** | **5** | **0** |
| INTUITIVE INFORMATION SYSTEMS TECHNOLOGIES, LLC | DT0013389 89233120FNA400273 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $1,545,576 | 5.5 | 0 |
| | **DT0013389 89233120FNA400273 Tot** | **Follow-on for FY20 expired contract.** | **$1,545,576** | **5.5** | **0** |
| | DT0013389 | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | -$3,168 | 0 | 5.5 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $92,737 | | |
| | **DT0013389 Total** | **Expired requirement with a follow-on starting in FY20.** | **$89,569** | **0** | **5.5** |
| J.G. MANAGEMENT SYSTEMS, INC. | DT0008536 | (blank) | $0 | 0 | 2 |
| | **DT0008536 Total** | **Expired requirement with a follow-on starting in FY20.** | **$0** | **0** | **2** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| JG MANAGEMENT SYSTEMS INC | DT0012665 | 01050 - 089-X-0243 - Other Defense Activities (ODA) Primary Fund (was TF) | $63,105 | 5 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $626,138 | | |
| | **DT0012665 Total** | | **$689,243** | **5** | **0** |
| | DT0011516 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $840,000 | 7 | 0 |
| | **DT0011516 Total** | | **$840,000** | **7** | **0** |
| | DT0011413 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $153,230 | 3 | 0 |
| | **DT0011413 Total** | | **$153,230** | **3** | **0** |
| | DT0008536 89233120FNA400246 | 00909 - 089-X-0240 - WA Reimbursable Work with Non-Federal Entities (was 2T) | $325,849 | 2 | 0 |
| | **DT0008536 89233120FNA400246 Tot** | **Follow-on for FY20 expired contract.** | **$325,849** | **2** | **0** |
| | BP0005948 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $261,839 | | |
| | | 01684 - 089-17/18-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **BP0005948 Total** | | **$261,839** | **1** | **0** |
| | 89233120FNA400293 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $312,111 | 4.22 | 0 |
| | **89233120FNA400293 Total** | | **$312,111** | **4.22** | **0** |
| | 89233119FNA400184 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 9 | 0 |
| | **89233119FNA400184 Total** | | **$0** | **9** | **0** |
| | 89233118FNA400104 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $193,979 | 2.23 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA400104 Total** | | **$193,979** | **2.23** | **0** |
| | 89233118FNA400103 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $277,304 | 1.85 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA400103 Total** | | **$277,304** | **1.85** | **0** |
| | 89233118FNA400094 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 2 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $276,277 | | |
| | **89233118FNA400094 Total** | | **$276,277** | **2** | **0** |
| | 89233118FNA400056 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $206,432 | 1 | 0 |
| | **89233118FNA400056 Total** | | **$206,432** | **1** | **0** |
| LINK TECHNOLOGIES INC | DT0013473 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $100,000 | | |
| | | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $717,159 | 12 | 0 |
| | **DT0013473 Total** | | **$817,159** | **12** | **0** |
| | 89233120FNA400317 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $50,000 | | |
| | | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $615,000 | 0 | 0 |
| | **89233120FNA400317 Total** | | **$665,000** | **0** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| LONGENECKER & ASSOCIATES, INC. | DT0008761 | (blank) | $0 | 0 | 21 |
| | **DT0008761 Total** | **Expired requirement with a follow-on starting in FY20.** | **$0** | **0** | **21** |
| LONGENECKER AND ASSOCIATES, INC | DT0009564 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 7 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $814,000 | | |
| | **DT0009564 Total** | | **$814,000** | **7** | **0** |
| | 89233119FNA400224 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $566,550 | 8 | 0 |
| | **89233119FNA400224 Total** | | **$566,550** | **8** | **0** |
| | 89233118FNA400112 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $7,168,426 | 7.41 | 0 |
| | **89233118FNA400112 Total** | | **$7,168,426** | **7.41** | **0** |
| | 89233118FNA400109 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 4.01 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $644,418 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA400109 Total** | | **$644,418** | **4.01** | **0** |
| LTD GLOBAL, LLC | NA0003420 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 3 | 0 |
| | | 01660 - 089-20/21-0313 - 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** | **0** |
| | NA0003116 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 5 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $459,627 | | |
| | **NA0003116 Total** | | **$459,627** | **5** | **0** |
| | 89233119CNA000062 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $239,637 | | |
| | | 01250 - 089-X-0251 - Defense Environmental Cleanup Primary Fund (was Defense | $219,903 | 0.85 | 0 |
| | **89233119CNA000062 Total** | | **$459,540** | **0.85** | **0** |
| | 89233118CNA000052 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 4.1 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,162,647 | | |
| | **89233118CNA000052 Total** | | **$1,162,647** | **4.1** | **0** |
| MELE ASSOCIATES INC | DT0013826 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $4,000,000 | 7 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $456,780 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **DT0013826 Total** | | **$4,456,780** | **7** | **0** |
| | DT0013157 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $8,540,096 | 34.5 | 0 |
| | **DT0013157 Total** | | **$8,540,096** | **34.5** | **0** |
| | BP0003826 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | -$436,011 | 0 | 22 |
| | | 01055 - 089-X-0243 - ODA Reimbursable Work with Other Federal Agencies (was 3 | $200,000 | | |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $5,660,375 | | |
| | **BP0003826 Total** | **Expired requirement with a follow-on starting in FY20.** | **$5,424,364** | **0** | **22** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | BP0003375 89233120FNA400260 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $354,132 | 28.75 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $7,557,910 | | |
| | **BP0003375 89233120FNA400260 Tot** | **Follow-on for FY20 expired contract.** | **$7,912,043** | **28.75** | **0** |
| | BP0003375 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $13,868 | 0 | 22.5 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $443,000 | | |
| | **BP0003375 Total** | **Expired requirement with a follow-on starting in FY20.** | **$456,868** | **0** | **22.5** |
| | 89233120FNA400255 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $14,292,256 | 41 | 0 |
| | **89233120FNA400255 Total** | | **$14,292,256** | **41** | **0** |
| | 89233119FNA400200 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $5,049,919 | 16.8 | 0 |
| | **89233119FNA400200 Total** | | **$5,049,919** | **16.8** | **0** |
| | 89233118FNA000008 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,327,183 | 11 | 0 |
| | **89233118FNA000008 Total** | | **$1,327,183** | **11** | **0** |
| MONTECH INC. | NA0003675 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 0 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **NA0003675 Total** | | **$0** | **0** | **0** |
| | NA0003599 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $188,741 | | |
| | **NA0003599 Total** | | **$188,741** | **1** | **0** |
| | NA0003445 | 00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY) | $165,000 | 2.53 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 70052 - 089-19/20-0240 - WA Program Direction | $0 | | |
| | **NA0003445 Total** | | **$165,000** | **2.53** | **0** |
| | NA0003226 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $50,000 | 0 | 0 |
| | | 70052 - 089-19/20-0240 - WA Program Direction | $0 | | |
| | **NA0003226 Total** | | **$50,000** | **0** | **0** |
| NATIONAL ACADEMY OF PUBLIC ADMINISTRATION | NA0003411 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | **NA0003411 Total** | | **$0** | **1** | **0** |
| NATIONAL ACADEMY OF SCIENCES | NA0003381 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **NA0003381 Total** | | **$0** | **1** | **0** |
| NAVARRO RESEARCH AND ENGINEERING, INC | 89233118FNA400122 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | **89233118FNA400122 Total** | | **$0** | **1** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| PARSONS GOVERNMENT SERVICES INC | DT0013580 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 2.59 | 0 |
| | **DT0013580 Total** | | **$0** | **2.59** | **0** |
| | DT0013499 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $0 | 1.09 | 0 |
| | **DT0013499 Total** | | **$0** | **1.09** | **0** |
| | DT0013131 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1.52 | 0 |
| | **DT0013131 Total** | | **$0** | **1.52** | **0** |
| | DT0013106 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | -$13,226 | 0 | 0 |
| | **DT0013106 Total** | | **-$13,226** | **0** | **0** |
| | DT0013042 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $66,705 | 0 | 0 |
| | **DT0013042 Total** | | **$66,705** | **0** | **0** |
| | DT0012681 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $5,000 | 2 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **DT0012681 Total** | | **$5,000** | **2** | **0** |
| | DT0012626 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 3.91 | 0 |
| | **DT0012626 Total** | | **$0** | **3.91** | **0** |
| | DT0011750 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $228,775 | | |
| | | 00922 - 089-X-0240 - Transfers Activity - DOEPAC Phase II (Admin) (was YY) | $0 | 2.99 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $0 | | |
| | **DT0011750 Total** | | **$228,775** | **2.99** | **0** |
| | DT0011157 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | -$632 | 0.91 | 0 |
| | **DT0011157 Total** | | **-$632** | **0.91** | **0** |
| | BP0005907 | 02400 - 089-X-4563 - Working Capital Fund (42 USC 5815) (was WF) | -$5,445 | 0.17 | 0 |
| | **BP0005907 Total** | | **-$5,445** | **0.17** | **0** |
| | 89233120FNA000075 | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $200,000 | 1.05 | 0 |
| | **89233120FNA000075 Total** | | **$200,000** | **1.05** | **0** |
| | 89233120FNA000074 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $567,771 | 2.67 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $350,000 | | |
| | **89233120FNA000074 Total** | | **$917,771** | **2.67** | **0** |
| | 89233120FNA000070 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $4,802,482 | 4.3 | 0 |
| | **89233120FNA000070 Total** | | **$4,802,482** | **4.3** | **0** |
| | 89233120FNA000069 | 05464 - 089-20/21-0321 - EERE Program Direction | $227,802 | 0.91 | 0 |
| | **89233120FNA000069 Total** | | **$227,802** | **0.91** | **0** |
| | 89233120FNA000067 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $442,699 | 8.05 | 0 |
| | **89233120FNA000067 Total** | | **$442,699** | **8.05** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | 89233120FNA000065 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $557,920 | 4 | 0 |
| | **89233120FNA000065 Total** | | **$557,920** | **4** | **0** |
| | 89233119FNA000061 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $278,350 | 2.75 | 0 |
| | **89233119FNA000061 Total** | | **$278,350** | **2.75** | **0** |
| | 89233119FNA000057 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $106,103 | 4.62 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $737,376 | | |
| | **89233119FNA000057 Total** | | **$843,479** | **4.62** | **0** |
| | 89233119FNA000051 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $3,912,356 | 7.18 | 0 |
| | **89233119FNA000051 Total** | | **$3,912,356** | **7.18** | **0** |
| | 89233119FNA000050 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $3,314,460 | 1.69 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $1,081,897 | | |
| | **89233119FNA000050 Total** | | **$4,396,357** | **1.69** | **0** |
| | 89233119FNA000046 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 7.3 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,265,418 | | |
| | **89233119FNA000046 Total** | | **$1,265,418** | **7.3** | **0** |
| | 89233119FNA000045 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $155,000 | 3 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $280,000 | | |
| | **89233119FNA000045 Total** | | **$435,000** | **3** | **0** |
| | 89233119FNA000044 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 3.15 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $470,000 | | |
| | **89233119FNA000044 Total** | | **$470,000** | **3.15** | **0** |
| | 89233119FNA000043 | 01260 - 089-X-0251 - Def. Env. Cleanup ORP Waste Treatment Plant 01-D-416(A-E) | $697,989 | 7.37 | 0 |
| | **89233119FNA000043 Total** | | **$697,989** | **7.37** | **0** |
| | 89233119FNA000041 | 02400 - 089-X-4563 - Working Capital Fund (42 USC 5815) (was WF) | $300,000 | 1.4 | 0 |
| | **89233119FNA000041 Total** | | **$300,000** | **1.4** | **0** |
| | 89233119FNA000040 | 02400 - 089-X-4563 - Working Capital Fund (42 USC 5815) (was WF) | $22,093 | 1.3 | 0 |
| | **89233119FNA000040 Total** | | **$22,093** | **1.3** | **0** |
| | 89233119FNA000039 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,586,649 | 18.9 | 0 |
| | **89233119FNA000039 Total** | | **$2,586,649** | **18.9** | **0** |
| | 89233119FNA000037 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,506,676 | 6.15 | 0 |
| | **89233119FNA000037 Total** | | **$1,506,676** | **6.15** | **0** |
| | 89233118FNA000027 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 0.3 | 0 |
| | **89233118FNA000027 Total** | | **$0** | **0.3** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | 89233118FNA000022 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $100,000 | 2.39 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $300,000 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA000022 Total** | | **$400,000** | **2.39** | **0** |
| | 89233118FNA000020 | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | 0.9 | 0 |
| | **89233118FNA000020 Total** | | **$0** | **0.9** | **0** |
| | 89233118FNA000016 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $215,080 | 0.39 | 0 |
| | **89233118FNA000016 Total** | | **$215,080** | **0.39** | **0** |
| | 89233118FNA000013 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $65,392 | 0.3 | 0 |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA000013 Total** | | **$65,392** | **0.3** | **0** |
| | 89233118FNA000012 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 0.54 | 0 |
| | **89233118FNA000012 Total** | | **$0** | **0.54** | **0** |
| | 89233118FNA000001 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $600,498 | 0.11 | 0 |
| | **89233118FNA000001 Total** | | **$600,498** | **0.11** | **0** |
| Parsons Government Services Inc. | BP0005844 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 0 | 0 |
| | **BP0005844 Total** | | **$0** | **0** | **0** |
| | 89233118FNA000014 | (blank) | $0 | 3.1 | 0 |
| | **89233118FNA000014 Total** | | **$0** | **3.1** | **0** |
| PARSONS GOVERNMENT SERVICES INC. | DT0012466 | (blank) | $0 | 0 | 0 |
| | **DT0012466 Total** | | **$0** | **0** | **0** |
| | DT0012465 | (blank) | $0 | 0 | 0 |
| | **DT0012465 Total** | | **$0** | **0** | **0** |
| PERATON INC. | 89233119CNA000083 | 00909 - 089-X-0240 - WA Reimbursable Work with Non-Federal Entities (was 2T) | $334,465 | 2 | 0 |
| | **89233119CNA000083 Total** | | **$334,465** | **2** | **0** |
| PERIKIN ENTERPRISES, LLC | NA0003707 89233120FNA400291 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $1,459,485 | 9 | 0 |
| | **NA0003707 89233120FNA400291 Tot** | **Follow-on for FY20 expired contract.** | **$1,459,485** | **9** | **0** |
| | NA0003707 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $19,421 | 0 | 9 |
| | **NA0003707 Total** | **Expired requirement with a follow-on starting in FY20.** | **$19,421** | **0** | **9** |
| | NA0003207 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | -$28,710 | 0 | 4 |
| | **NA0003207 Total** | **Expired requirement with a follow-on starting in FY20.** | **-$28,710** | **0** | **4** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | NA0003206 NA0003207 89233120FN | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $1,919,539 | 9 | 0 |
| | **NA0003206 NA0003207 89233120FN** | **Follow-on for FY20 expired contract.** | **$1,919,539** | **9** | **0** |
| | NA0003206 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $80,056 | 0 | 6 |
| | **NA0003206 Total** | **Expired requirement with a follow-on starting in FY20.** | **$80,056** | **0** | **6** |
| | 89233119CNA000080 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $20,000 | | |
| | **89233119CNA000080 Total** | | **$20,000** | **1** | **0** |
| | 89233118CNA000039 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 1 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $98,047 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118CNA000039 Total** | | **$98,047** | **1** | **0** |
| PROJECT ENHANCEMENT CORPORATION | DT0011426 | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $122,000 | 66 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $17,541,893 | | |
| | | 05353 - 089-X-0319 - NE Reimbursable Work with Other Federal Agencies (was 3C | $51,500 | | |
| | **DT0011426 Total** | | **$17,715,393** | **66** | **0** |
| | DT0009849 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,362,214 | 8 | 0 |
| | **DT0009849 Total** | | **$1,362,214** | **8** | **0** |
| | 89233120FNA400303 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $458,319 | 8 | 0 |
| | **89233120FNA400303 Total** | | **$458,319** | **8** | **0** |
| | 89233120FNA400252 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $2,687,022 | 0 | 0 |
| | **89233120FNA400252 Total** | | **$2,687,022** | **0** | **0** |
| | 89233118FNA400114 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 4.5 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $50,000 | | |
| | | 01681 - 089-18/19-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | **89233118FNA400114 Total** | | **$50,000** | **4.5** | **0** |
| RED RIVER COMPUTER CO., INC. | 89233120FNA400304 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $3,983,333 | 1 | 0 |
| | **89233120FNA400304 Total** | | **$3,983,333** | **1** | **0** |
| RHINOCORPS LTD CO | NA0003782 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,463,160 | 8 | 0 |
| | **NA0003782 Total** | | **$2,463,160** | **8** | **0** |
| SABIO SYSTEMS, LLC | NA0003020 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 0 | 0 |
| | | 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** | | **$0** | **0** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| SIGMA SCIENCE INC | 89233119FNA400205 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 6 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,652,836 | | |
| | **89233119FNA400205 Total** | | **$1,652,836** | **6** | **0** |
| | 89233119FNA400196 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $69,829 | 0 | 0 |
| | **89233119FNA400196 Total** | | **$69,829** | **0** | **0** |
| | 89233119FNA400195 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | | |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $234,211 | | |
| | **89233119FNA400195 Total** | | **$234,211** | **1** | **0** |
| | 89233119FNA400189 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | **89233119FNA400189 Total** | | **$0** | **1** | **0** |
| | 89233119FNA400188 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | **89233119FNA400188 Total** | | **$0** | **1** | **0** |
| | 89233119FNA400186 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | **89233119FNA400186 Total** | | **$0** | **1** | **0** |
| | 89233119FNA400185 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $0 | 1 | 0 |
| | **89233119FNA400185 Total** | | **$0** | **1** | **0** |
| | 89233119FNA400172 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 8 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,500,000 | | |
| | **89233119FNA400172 Total** | | **$1,500,000** | **8** | **0** |
| | 89233118FNA400089 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $105,840 | 1 | 0 |
| | **89233118FNA400089 Total** | | **$105,840** | **1** | **0** |
| SOUTHWEST RESEARCH INSTITUTE | 89233120CNA000127 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $11,830,786 | 20 | 0 |
| | **89233120CNA000127 Total** | | **$11,830,786** | **20** | **0** |
| SUMMIT EXERCISES AND TRAINING LLC | 89233118FNA400091 | 00910 - 089-X-0240 - WA Reimbursable Work with Other Federal Agencies (was 3 | $375,000 | 13 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $2,065,000 | | |
| | **89233118FNA400091 Total** | | **$2,440,000** | **13** | **0** |
| SYSTEMATIC MANAGEMENT SERVICES INC | BP0003826 89233120FNA400309 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $5,947,705 | 9.75 | 0 |
| | **BP0003826 89233120FNA400309 Tot** | **Follow-on for FY20 expired contract.** | **$5,947,705** | **9.75** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| TECHNOLOGY VENTURES INC | 89233119CNA000098 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $800,000 | 4 | 0 |
| | **89233119CNA000098 Total** | | **$800,000** | **4** | **0** |
| TECHNOMICS INC | DT0013055 89233120FNA400261 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $4,231,124 | 20 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $756,132 | | |
| | **DT0013055 89233120FNA400261 Tot** | **Follow-on for FY20 expired contract.** | **$4,987,255** | **20** | **0** |
| | 89233119FNA400217 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,888,481 | 8 | 0 |
| | **89233119FNA400217 Total** | | **$1,888,481** | **8** | **0** |
| | 89233118FNA400047 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | -$8,790 | 7 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $2,429,710 | | |
| | **89233118FNA400047 Total** | | **$2,420,920** | **7** | **0** |
| TECHSOURCE INC | DT0014080 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,936,485 | 11 | 0 |
| | **DT0014080 Total** | | **$2,936,485** | **11** | **0** |
| | DT0013591 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,460,000 | 4 | 0 |
| | **DT0013591 Total** | | **$1,460,000** | **4** | **0** |
| | DT0013337 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $130,000 | 3 | 0 |
| | **DT0013337 Total** | | **$130,000** | **3** | **0** |
| | DT0013256 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,203,729 | 4.5 | 0 |
| | **DT0013256 Total** | | **$1,203,729** | **4.5** | **0** |
| | DT0013055 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $5,051 | 0 | 20.5 |
| | **DT0013055 Total** | **Expired requirement with a follow-on starting in FY20.** | **$5,051** | **0** | **20.5** |
| | DT0013032 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $4,489,332 | 7 | 0 |
| | **DT0013032 Total** | | **$4,489,332** | **7** | **0** |
| | DT0012831 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $740,000 | 10 | 0 |
| | **DT0012831 Total** | | **$740,000** | **10** | **0** |
| | DT0012554 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,008,289 | 3 | 0 |
| | **DT0012554 Total** | | **$1,008,289** | **3** | **0** |
| | DT0012050 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,559,026 | 5 | 0 |
| | **DT0012050 Total** | | **$1,559,026** | **5** | **0** |
| | DT0011895 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $909,000 | 3.5 | 0 |
| | **DT0011895 Total** | | **$909,000** | **3.5** | **0** |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | BP0005608 89233120FNA400322 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,824,122 | 8.5 | 0 |
| | **BP0005608 89233120FNA400322 Tot** | **Follow-on for FY20 expired contract.** | **$1,824,122** | **8.5** | **0** |
| | BP0005608 89233120FNA400321 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,344,896 | 22 | 0 |
| | **BP0005608 89233120FNA400321 Tot** | **Follow-on for FY20 expired contract.** | **$1,344,896** | **22** | **0** |
| | BP0005608 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $2,540,000 | 0 | 9 |
| | **BP0005608 Total** | **Expired requirement with a follow-on starting in FY20.** | **$2,540,000** | **0** | **9** |
| | BP0004432 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $3,429,546 | | |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $400,000 | 18.5 | 0 |
| | **BP0004432 Total** | | **$3,829,546** | **18.5** | **0** |
| | 89233120FNA400310 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $615,000 | 4.5 | 0 |
| | **89233120FNA400310 Total** | | **$615,000** | **4.5** | **0** |
| | 89233119FNA400223 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $414,937 | 2.5 | 0 |
| | **89233119FNA400223 Total** | | **$414,937** | **2.5** | **0** |
| TETRA TECH INC | 89233120FNA400272 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,750,000 | 9 | 0 |
| | **89233120FNA400272 Total** | | **$1,750,000** | **9** | **0** |
| | 89233119FNA400183 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $715,011 | 5 | 0 |
| | **89233119FNA400183 Total** | | **$715,011** | **5** | **0** |
| THE A R GROUP LLP | 89233119FNA400174 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | -$25 | 0 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $50,000 | | |
| | **89233119FNA400174 Total** | | **$49,975** | **0** | **0** |
| THE MITRE CORPORATION | 89233120FNA400300 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $700,000 | 2 | 0 |
| | **89233120FNA400300 Total** | | **$700,000** | **2** | **0** |
| | 89233120FNA400276 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,300,000 | 3 | 0 |
| | **89233120FNA400276 Total** | | **$1,300,000** | **3** | **0** |
| TIERRA RIGHT OF WAY SERVICES, LTD. | 89233120PNA000093 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $160,797 | 0.5 | 0 |
| | **89233120PNA000093 Total** | | **$160,797** | **0.5** | **0** |
| TUVA, LLC | NA0003424 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $4,903,530 | 62 | 0 |
| | **NA0003424 Total** | | **$4,903,530** | **62** | **0** |
| VECTOR RESOURCE INC | DT0012586 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $9,797,889 | 29.75 | 0 |
| | **DT0012586 Total** | | **$9,797,889** | **29.75** | **0** |
| | DT0012067 89233120FNA400281 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,000,000 | 4 | 0 |
| | **DT0012067 89233120FNA400281 Tot** | **Follow-on for FY20 expired contract.** | **$1,000,000** | **4** | **0** |
| | DT0012067 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $77,712 | 0 | 4 |

| Awardee Name / Vendor Name | Contract/Order Number | Fund Value and Description | Total FY 20 Obligations | Total FTEs for Active Contracts | Total FTEs for Expired Contracts |
|---|---|---|---|---|---|
| | **DT0012067 Total** | **Expired requirement with a follow-on starting in FY20.** | **$77,712** | **0** | **4** |
| | 89233119FNA400239 | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $518,615 | 4 | 0 |
| | **89233119FNA400239 Total** | | **$518,615** | **4** | **0** |
| | 89233118FNA400053 | 01657 - 089-19/20-0313 - Federal Salaries and Expenses Primary Fund | $0 | 5 | 0 |
| | | 01660 - 089-20/21-0313 - Federal Salaries and Expenses Primary Fund | $1,000,000 | | |
| | **89233118FNA400053 Total** | | **$1,000,000** | **5** | **0** |
| | 89233118FNA400013 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $420,712 | 8 | 0 |
| | | 01551 - 089-X-0309 - Defense Nuclear Nonproliferation (DNN) Primary Fund (was | $583,338 | | |
| | **89233118FNA400013 Total** | | **$1,004,050** | **8** | **0** |
| | 89233118FNA400001 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $825,000 | 4 | 0 |
| | **89233118FNA400001 Total** | | **$825,000** | **4** | **0** |
| WYANT DATA SYSTEMS, INC | 89233119FNA400230 | 00900 - 089-X-0240 - Weapons Activities (WA) Primary Fund (was TC) | $1,662,110 | 6.5 | 0 |
| | **89233119FNA400230 Total** | | **$1,662,110** | **6.5** | **0** |
| **Grand Total** | | | **$275,549,293** | **1168.4** | **150.5** |
| **Active or Follow-on for FY20 expired contract for Total FTEs for Active Contracts.** | | | | | |
| **Expired Requirement with a Follow-on starting in FY20 Total FTEs for Expired Contracts.** | | | | | |
| | | | | | |
| **Total # of Support Service Contract Instruments Active in FY20** | **168** | | | | |

# 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), [$443,200,000] *$464,000,000*, to remain available until September 30, [2022] *2023.* 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 2022 Budget Request for NNSA FSE is $464,000,000, a $20,800,000 (4.7 percent) increase above the FY 2021 enacted for the salaries, benefits, and the other expenses of 1,920 federal full-time equivalents (FTEs), 1,898 paid from FSE and 22 paid through the Working Capital Fund.

**Public Law Authorizations**

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-283, William M (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021
- P.L. 116-260, Consolidated Appropriations Act, 2021

## Federal Salaries and Expenses

| | Funding ($K) | | | | |
|---|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
| **NNSA Federal Salaries and Expenses** | **434,699** | **443,200** | **464,000** | **+20,800** | **4.7%** |

**Funding by Object Class**

Salaries and Benefits: Provides $378,117,000 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 account. The workforce is also comprised of mission support staff focusing on 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 $13,473,000 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. The FY 2022 request reflects reductions consistent with new business practices based on COVID-19 lessons learned.

Support Services: Includes $19,042,000 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, the Corporate Project Management program, and the NNSA Graduate Fellowship Program (NGFP).

Other Related Expenses: Provides $53,368,000 for the following items:

- Training: Provides $3,291,000 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 account which are supported by separate Program Direction accounts. 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 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 $8,291,000 to support minor renovation costs at headquarters and space and occupancy costs at the field offices. The FY 2022 request reflects a one-time reduction because of the use of prior year balances. The actual requirement is $15,181,000.

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 21 foreign countries. This supports both federal employees and locally employed staff, and reimburses the Department of State for International Cooperative Administrative Support Services and Capital Security Cost Sharing charges. The Department's WCF budget chapter provides detail on all programs funded through the WCF.

Other Expenses: Provides $5,657,000 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 2022 Budget Request**

The FY 2022 Request supports a federal staff of 1,920 FTEs providing appropriate oversight to ensure NNSA can meet growing mission requirements and commitments including modernizing the nuclear deterrent, recapitalizing the aging infrastructure, and continuing to meet the requirements of nonproliferation and counterterrorism programs.

**FY 2022 - FY 2026 Strategy**

NNSA will use a variety of innovative methods to grow and shape the professional staff including 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. NNSA's recruitment and hiring actions will continue to support the Administration goals of promoting racial and economic equity while promoting science and research and development.

**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, including the NNSA Graduate Fellowship Program (NGFP), the Minority Serving Institutions Partnership Program, and the Presidential Management Fellows program. The entry level employees from these pipelines will become the qualified professionals who will sustain expertise the NNSA nuclear security enterprise.

In FY 2022, the FSE appropriation will provide up to $1,500,000 for NGFP support and development activities.

## Federal Salaries and Expenses
## Funding by Congressional Control

| | Funding ($K) | | | |
|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| **NNSA Federal Salaries and Expenses** | 434,699 | 443,200 | 464,000 | +20,800 |
| **FTEs (paid from FSE)** | 1,685 | 1,750 | 1,898 | +148 |
| **FTEs (paid from WCF)** | 19 | 19 | 22 | +3 |
| **Total FTEs** | 1,704 | 1,769 | 1,920 | +151 |

## Program Direction

| | Funding ($K) | | | |
|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| **NNSA Federal Salaries and Expenses** | | | | |
| **Headquarters** | | | | |
| Salaries and Benefits | 222,997 | 239,625 | 265,585 | +25,960 |
| Travel | 14,193 | 11,883 | 11,883 | +0 |
| Support Services | 26,615 | 21,579 | 16,803 | -4,776 |
| Other Related Expenses | 46,629 | 50,997 | 45,797 | -5,200 |
| Total, Headquarters | 310,434 | 324,084 | 340,068 | +15,984 |
| Total, Full Time Equivalents | 1,161 | 1,224 | 1,332 | +108 |
| **Livermore Field Office** | | | | |
| Salaries and Benefits | 16,340 | 15,810 | 17,887 | +2,077 |
| Travel | 333 | 222 | 222 | +0 |
| Support Services | 960 | 524 | 459 | -65 |
| Other Related Expenses | 3,481 | 1,212 | 1,803 | +591 |
| Total, Livermore Field Office | 21,114 | 17,768 | 20,371 | +2,603 |
| Total, Full Time Equivalents | 78 | 74 | 82 | +8 |
| **Los Alamos Field Office** | | | | |
| Salaries and Benefits | 15,758 | 16,087 | 18,185 | +2,098 |
| Travel | 439 | 283 | 283 | +0 |
| Support Services | 541 | 456 | 400 | -56 |
| Other Related Expenses | 796 | 372 | 287 | -85 |
| Total, Los Alamos Field Office | 17,534 | 17,198 | 19,155 | +1,957 |
| Total, Full Time Equivalents | 86 | 84 | 93 | +9 |

**Program Direction, Continued**

| | Funding ($K) | | | |
|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| **Sandia Field Office** | | | | |
| Salaries and Benefits | 15,531 | 16,302 | 17,036 | +734 |
| Travel | 305 | 193 | 193 | +0 |
| Support Services | 298 | 136 | 119 | -17 |
| Other Related Expenses | 8,784 | 7,151 | 3,617 | -3,534 |
| Total, Sandia Field Office | 24,918 | 23,782 | 20,965 | -2,817 |
| Total, Full Time Equivalents | 83 | 85 | 87 | +2 |
| **Nevada Field Office** | | | | |
| Salaries and Benefits | 14,570 | 16,046 | 16,803 | +757 |
| Travel | 211 | 174 | 174 | +0 |
| Support Services | 417 | 352 | 308 | -44 |
| Other Related Expenses | 3,038 | 1,191 | 152 | -1,039 |
| Total, Nevada Field Office | 18,236 | 17,763 | 17,437 | -326 |
| Total, Full Time Equivalents | 73 | 78 | 80 | +2 |
| **NNSA Production Office (NPO)** | | | | |
| Salaries and Benefits | 23,421 | 24,036 | 26,063 | +2,027 |
| Travel | 532 | 411 | 411 | +0 |
| Support Services | 377 | 318 | 278 | -40 |
| Other Related Expenses | 2,368 | 1,874 | 1,232 | -642 |
| Total, NNSA Production Office | 26,698 | 26,639 | 27,984 | +1,345 |
| Total, Full Time Equivalents | 126 | 129 | 137 | +8 |

**Program Direction, Continued**

| | Funding ($K) | | | |
|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| **Kansas City Field Office** | | | | |
| Salaries and Benefits | 6,614 | 6,447 | 7,131 | +684 |
| Travel | 224 | 168 | 168 | +0 |
| Support Services | 0 | 0 | 0 | +0 |
| Other Related Expenses | 739 | 641 | 373 | -268 |
| Total, Kansas City Field Office | 7,577 | 7,256 | 7,672 | +416 |
| Total, Full Time Equivalents | 38 | 36 | 39 | +3 |
| **Savannah River Field Office** | | | | |
| Salaries and Benefits | 7,647 | 7,695 | 9,428 | +1,733 |
| Travel | 192 | 139 | 139 | +0 |
| Support Services | 233 | 770 | 675 | -95 |
| Other Related Expenses | 116 | 106 | 107 | +1 |
| Total, Savannah River Field Office | 8,188 | 8,710 | 10,349 | +1,639 |
| Total, Full Time Equivalents | 40 | 40 | 48 | +8 |
| **NNSA Federal Salaries and Expenses** | | | | |
| Salaries and Benefits | 322,878 | 342,048 | 378,117 | +36,069 |
| Travel | 16,429 | 13,473 | 13,473 | +0 |
| Support Services | 29,441 | 24,135 | 19,042 | -5,093 |
| Other Related Expenses | 65,951 | 63,544 | 53,368 | -10,176 |
| **Total, NNSA Federal Salaries and Expenses** | 434,699 | 443,200 | 464,000 | +20,800 |
| **FTEs (paid from FSE)** | 1,685 | 1,750 | 1,898 | +148 |
| **FTEs (paid from WCF)** | 19 | 19 | 22 | +3 |
| **Total FTEs** | 1,704 | 1,769 | 1,920 | +151 |

## Support Services and Other Related Expenses

| | Funding ($K) | | | |
|---|---|---|---|---|
| | FY 2020 Enacted | FY 2021 Request | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| **Support Services** | | | | |
| Management and Professional Services | 23,941 | 18,625 | 16,289 | -2,336 |
| Environmental Safety and Health Support | 253 | 253 | 253 | +0 |
| Corporate Project Management Support | 5,247 | 5,257 | 2,500 | -2,757 |
| **Total, Support Services** | **29,441** | **24,135** | **19,042** | **-5,093** |
| **Other Related Expenses** | | | | |
| **Training** | 4,092 | 5,179 | 3,291 | -1,888 |
| **Space and Occupancy Costs** | 19,658 | 16,385 | 8,291 | -8,094 |

## Support Services and Other Related Expenses, Continued

| | Funding ($K) | | | |
|---|---|---|---|---|
| **Headquarters Working Capital Fund (WCF)** | FY 2020 Enacted | FY 2021 Request | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
| Supplies | 423 | 547 | 547 | +0 |
| Building Occupancy | 12,164 | 20,946 | 20,946 | +0 |
| Telecommunications | 8,879 | 0 | 0 | +0 |
| Corporate Training Services | 429 | 507 | 507 | +0 |
| Corporate Business Systems | 2,405 | 2,405 | 2,405 | +0 |
| Overseas Representation | 11,259 | 11,401 | 11,401 | +0 |
| Health Services | 270 | 323 | 323 | +0 |
| **TOTAL, Headquarters Working Capital Fund (WCF)** | 35,829 | 36,129 | 36,129 | +0 |
| **Other Expenses** | | | | |
| Other Services | 6,355 | 5,834 | 5,640 | -194 |
| Reception and Representation | 17 | 17 | 17 | +0 |
| **Subtotal, Other Expenses** | 6,372 | 5,851 | 5,657 | -194 |
| **Total, Other Related Expenses** | **65,951** | **63,544** | **53,368** | **-10,176** |

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted |
|---|---|---|
| **Salaries and Benefit $342,048,000** | **Salaries and Benefits $378,117,000** | **Salaries and Benefits +$36,069,000** |
| • Provides support for an NNSA federal staff of 1,750 FTEs, not including 19 that are funded through the WCF<br>• Includes 1% pay raise and 5.5% benefit escalation | • Provides support for an NNSA federal staff of 1,898 FTEs, not including 22 that are funded through the WCF<br>• Includes 2.7% pay raise and 5% benefit escalation | • Increase reflects approximately 150 FTEs above the FY 2021 projected FTE burn rate<br>• Reflects 2.7% pay raise and 5% benefit escalation<br>• Increase is primarily in support of Defense Programs to meet growing mission requirements and commitments including modernizing the nuclear deterrent and recapitalizing the aging infrastructure |
| **Travel $13,473,000** | **Travel $13,473,000** | **Travel +$0** |
| • Supports domestic and foreign travel necessary as part of NNSA's mission | • Supports domestic and foreign travel necessary as part of NNSA's mission | • FY 2021 and FY 2022 reflect reductions consistent with new business practices based on COVID-19 lessons learned |
| **Support Services $24,135,000** | **Support Services $19,042,000** | **Support Services -$5,093,000** |
| • Includes Management and Professional Services; Environment Safety and Health support; NGFP support ($18,878,000)<br>• Includes Corporate Project Management program ($5,257,000) | • Includes Management and Professional Services; Environment Safety and Health support; and NGFP support ($16,542,000)<br>• Includes Corporate Project Management program ($2,500,000) | • **Management and Professional Services; Environment Safety and Health support; and NGFP support** (-$2,336,000): Reflects one-time use of prior year balances in FY 2022; actual requirement is $24,900,000<br>• **Corporate Project Management program** (-$2,757,000): Reflects use of prior year balances in FY 2022; actual requirement is $5,657,000 |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted |
|---|---|---|
| **Other Related Expenses $63,544,000** | **Other Related Expenses $53,368,000** | **Other Related Expenses -$10,176,000** |
| • Provides funding for Space and Occupancy costs at Headquarters and field sites ($16,385,000).<br>• Includes FSE's contribution to the DOE WCF ($36,129,000)<br>• Provides necessary training and skills maintenance of the NNSA federal staff ($5,179,000)<br>• Includes funding for miscellaneous procurements ($5,851,000) | • Provides funding for Space and Occupancy costs at Headquarters and field sites ($8,291,000).<br>• Includes FSE's contribution to the DOE WCF ($36,129,000)<br>• Provides necessary training and skills maintenance of the NNSA federal staff to address future workforce needs and administration priorities, advance employee competencies, and demonstrate NNSA's commitment to the strategic development of all employees ($3,291,000)<br>• Includes funding for miscellaneous procurements ($5,657,000) | • **Space and Occupancy** (-$8,094,000): Reflects the one-time use of prior year balances in FY 2022; actual requirement is $15,181,000<br>• **Training** (-$1,888,000): Reflects projected efficiencies<br>• **Other Expenses (-**$194,000): Reflects projected efficiencies |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 0 | 0 | 0 | 0 |
| BH-061 Corridor Construction, WDC | 13,782 | 0 | 782 | 13,000 | 0 | -13,000 |
| **Total, Minor Construction Projects** | **13,782** | **N/A** | **782** | **13,000** | **0** | **-13,000** |
| **Total, Capital Summary** | **13,782** | **N/A** | **782** | **13,000** | **0** | **-13,000** |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Federal Salaries and Expenses BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Argonne National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 512 | 489 | 499 |
| **Total Argonne National Laboratory** | **512** | **489** | **499** |
| **Brookhaven National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 6 | 6 | 6 |
| **Total Brookhaven National Laboratory** | **6** | **6** | **6** |
| **Carlsbad Area Office** | | | |
| Program Direction - National Nuclear Security Administration | 1 | 1 | 1 |
| **Total Carlsbad Area Office** | **1** | **1** | **1** |
| **Chicago Operations Office** | | | |
| Program Direction - National Nuclear Security Administration | 6 | 6 | 6 |
| **Total Chicago Operations Office** | **6** | **6** | **6** |
| **Consolidated Business Center** | | | |
| Program Direction - National Nuclear Security Administration | 2,300 | 1,859 | 1,218 |
| **Total Consolidated Business Center** | **2,300** | **1,859** | **1,218** |
| **Idaho National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 422 | 6 | 6 |
| **Total Idaho National Laboratory** | **422** | **6** | **6** |
| **Kansas City National Security Complex (KCNSC)** | | | |
| Program Direction - National Nuclear Security Administration | 110 | 110 | 110 |
| **Total Kansas City National Security Complex (KCNSC)** | **110** | **110** | **110** |
| **Kansas City Site Office** | | | |
| Program Direction - National Nuclear Security Administration | 7,467 | 7,146 | 7,562 |
| **Total Kansas City Site Office** | **7,467** | **7,146** | **7,562** |
| **Lawrence Livermore National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 2,950 | 762 | 1,580 |
| **Total Lawrence Livermore National Laboratory** | **2,950** | **762** | **1,580** |
| **Livermore Site Office** | | | |
| Program Direction - National Nuclear Security Administration | 18,164 | 17,006 | 18,791 |
| **Total Livermore Site Office** | **18,164** | **17,006** | **18,791** |
| **Los Alamos Site Office** | | | |
| Program Direction - National Nuclear Security Administration | 17,534 | 17,198 | 19,155 |
| **Total Los Alamos Site Office** | **17,534** | **17,198** | **19,155** |
| **National Energy Technology Lab** | | | |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Federal Salaries and Expenses BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Program Direction - National Nuclear Security Administration | 113 | 113 | 113 |
| **Total National Energy Technology Lab** | **113** | **113** | **113** |
| **Nevada Field Office** | | | |
| Program Direction - National Nuclear Security Administration | 17,836 | 17,363 | 17,037 |
| **Total Nevada Field Office** | **17,836** | **17,363** | **17,037** |
| **Nevada National Security Site** | | | |
| Program Direction - National Nuclear Security Administration | 400 | 400 | 400 |
| **Total Nevada National Security Site** | **400** | **400** | **400** |
| **NNSA Albuquerque Complex** | | | |
| Program Direction - National Nuclear Security Administration | 8,200 | 7,136 | 3,596 |
| **Total NNSA Albuquerque Complex** | **8,200** | **7,136** | **3,596** |
| **NNSA Production Office (NPO)** | | | |
| Program Direction - National Nuclear Security Administration | 24,398 | 24,780 | 26,766 |
| **Total NNSA Production Office (NPO)** | **24,398** | **24,780** | **26,766** |
| **Oak Ridge National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 1,220 | 120 | 120 |
| **Total Oak Ridge National Laboratory** | **1,220** | **120** | **120** |
| **Pacific Northwest National Laboratory** | | | |
| Program Direction - National Nuclear Security Administration | 1,255 | 1,382 | 1,525 |
| **Total Pacific Northwest National Laboratory** | **1,255** | **1,382** | **1,525** |
| **Richland Operations Office** | | | |
| Program Direction - National Nuclear Security Administration | 6 | 6 | 6 |
| **Total Richland Operations Office** | **6** | **6** | **6** |
| **Sandia National Laboratories** | | | |
| Program Direction - National Nuclear Security Administration | 16,718 | 16,646 | 17,369 |
| **Total Sandia National Laboratories** | **16,718** | **16,646** | **17,369** |
| **Savannah River Operations Office** | | | |
| Program Direction - National Nuclear Security Administration | 8,188 | 8,710 | 10,349 |
| **Total Savannah River Operations Office** | **8,188** | **8,710** | **10,349** |
| **Washington Headquarters** | | | |
| Program Direction - National Nuclear Security Administration | 306,893 | 321,955 | 337,785 |
| **Total Washington Headquarters** | **306,893** | **321,955** | **337,785** |
| **Total Funding by Site for Federal Salaries and Expenses** | **434,699** | **443,200** | **464,000** |

# Weapons Activities

# Weapons Activities

**FY 2022 Congressional Budget Justification**

**Weapons Activities**

**Table of Contents**

**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 ambulance* for replacement only, [$*15,345,000*,000] *$15,484,295,000* to remain available until expended: Provided, That of such amount, [$*123,684*,000] *$117,060,000* shall be available until September 30, [2022] *2023*, for program direction.

**Explanation of Change**

The FY 2022 Budget Request provides a 0.9% increase from the FY 2021 Enacted Level to support: on-going warhead acquisition programs – B61-12, W88 Alt 370, W80-4, W87-1, the W93 Program and the W80-4 Alteration for the Navy's Sea-Launched Cruise Missile-Nuclear (SLCM-N); development and qualification for the W76-1/2 Mk4B Shape Stable Nose Tip retrofit and further extension of the B83-1 in addition to legacy Stockpile Sustainment activities; production facility and capability modernization to include plutonium pit production, radiation case manufacturing, special materials for canned subassembly component manufacturing, implementation of enhanced experimental (Enhanced Capabilities for Subcritical Experiments) and computational capabilities (Exascale) required to support the warhead acquisition programs.

**Public Law Authorizations**

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-283, William M (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021
- P.L. 116-260, Consolidated Appropriations Act, 2021

## Weapons Activities

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| Weapons Activities | 12,457,097 | 15,345,000 | 15,484,295 | +139,295 | 0.9% |

**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 underground nuclear explosive testing. Weapons Activities provides for the maintenance and refurbishment of nuclear weapons to continue sustained confidence in their safety, reliability, military effectiveness; investment in scientific, engineering, 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.

NNSA's Management and Operating (M&Os) contractors employ approximately 50,000 people across the enterprise, predominantly at eight geographical sites; including Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), Los Alamos National Laboratory (LANL), Nevada National Security Site (NNSS), Pantex, Y-12, Kansas City National Security Campus (KCNSC), and Savannah River Site (SRS); 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 2022 Stockpile Stewardship and Management Plan (SSMP).

**Highlights and Major Changes in the FY 2022 Budget**

**Stockpile Management**

The Stockpile Management program requirements are to maintain a safe, secure, and effective nuclear weapons stockpile; continue production activities for the B61-12 Life Extension Program (LEP) and W88 Alteration Program; continue work to deliver the W80-4 LEP, enter Phase 6.2/6.2A for the W80-4 Alteration of the Navy's Sea-Launched Cruise Missile-Nuclear (SLCM-Nuclear), complete Phase 6.2A, and enter Phase 3 of the W87-1 Modification Program; conduct Phase 1 assessment activities and begin Phase 2 feasibility study and design options for the W93 Program (formerly W93); meet required stockpile sustainment activities to include maintenance, surveillance, assessment, development, and program planning; continue Phase 6.3 activities for W76-1/2 Mk4B Shape Stable Nose Tip Retrofit; 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: Stockpile Major Modernization, Stockpile Sustainment, Weapons Dismantlement and Disposition, and Production Operations.

<u>Stockpile Major Modernization</u>

The Stockpile Major Modernization subprogram is where all the approved warhead acquisition programs are conducted. The acquisition programs are necessary to extend the expected life of stockpile systems for an additional 20 to 30 years. NNSA, in conjunction with the Department of Defense (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. The W93 Program modernization activity will use the joint NNSA-DOD Phase 1-7 weapons acquisition process that is very similar to the Phase 6.X process. The seven phases consist of Phase 1 (Concept Assessment), Phase 2 (Feasibility Study and Design Options), Phase 2A (Design Definition and Cost Study), Phase 3 (Developmental Engineering), Phase 4 (Production Engineering), Phase 5 (First Production), Phase 6 (Full-Scale Production/Sustainment), and Phase 7 (Retirement, Dismantlement, and Disposal).

Stockpile Sustainment

The Stockpile Sustainment program directly executes maintenance, surveillance, assessment, surety, and management activities for all enduring weapons systems in the stockpile. The program includes the B61, W76, W78, W80, B83, W87, and W88 Stockpile Systems as well as Multi-Weapon Systems. The FY 2022 request supports the W76-1/2 Mk4B Shape Stable Nose Tip Retrofit activity and further extension of the B83-1.

Weapons Dismantlement and Disposition

The Weapons Dismantlement and Disposition (WDD) program 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 and offices to complete its mission, such as Production Operations for shipping, receiving, and equipment maintenance; Infrastructure and Operations for infrastructure sustainment and containers; and Secure Transportation Asset for the movement of weapons and weapon components.

Production Operations

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 as well as several capability modernization programs to ensure the correct capabilities are in place to support the stockpile demands. 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 Modernization**

The Production Modernization program focuses on the production capabilities of nuclear weapons components 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: Primary Capability Modernization, Secondary Capability Modernization, Tritium and Domestic Uranium Enrichment, and Non-Nuclear Capability Modernization.

Primary Capability Modernization

The Primary Capability Modernization Program consolidates management of primary stage material processing and component production capabilities in the NNSA nuclear security enterprise. The program includes Plutonium Modernization, the funding efforts across the nuclear security enterprise to restore the Nation's capability to produce 80 plutonium pits per year (ppy), and the High Explosives and Energetics program which focuses on modernization and prioritization of high explosives (HE) processing facilities and qualification of high explosive, pyrotechnic, and propellant materials across the nuclear security enterprise. The program enables the production of HE and energetic materials for nuclear explosive package and non-nuclear components required for an effective stockpile.

Secondary Capability Modernization

The Secondary Capability Modernization program is responsible for restoring and increasing manufacturing capabilities for the secondary stage of nuclear weapons in the nuclear security enterprise. 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 Uranium Modernization (which consolidates Uranium Sustainment and Process Technology Development investments); Depleted Uranium Modernization; and Lithium Modernization activities.

Uranium Modernization

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.

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 support the three current major items of equipment (MIE) and associated technology development efforts: Electrorefining, Calciner, and Direct Chip Melt.

Depleted Uranium Modernization

The Depleted Uranium (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 DU and DU-niobium alloying and manufacturing capabilities, and investing in key new technologies.

Lithium Modernization

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

Tritium and Domestic Uranium Enrichment

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 Tritium Modernization and Domestic Uranium Enrichment.

The Tritium Modernization Program operates the national capability for producing, recovering, and recycling tritium, and it is expanding capacity to meet increased national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating tritium-producing burnable absorber rods (TPBAR) in the Watts Bar Unit 1 (WBN1) nuclear power reactor operated by the Tennessee Valley Authority. In FY 2021, tritium production began in Watts Bar Unit 2 (WBN2) as well. Tritium recovery and recycling is completed at the 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 national security. The DUE program provides unobligated, low-enriched uranium (LEU) for tritium production by managing existing uranium stocks and downblending highly enriched uranium (HEU) declared excess to national security needs. LEU inventories identified by the DUE program will sustain tritium production through 2044, at which point the United States 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 national security needs.

Non-Nuclear Capability Modernization

The Non-Nuclear Capability Modernization program provides funding to modernize production of non-nuclear components for multiple weapon systems. Non-nuclear components are a significant portion of the costs for the Life Extension Programs due to the number of parts, complexity, and testing of the warhead. 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 nuclear security enterprise to manufacture stockpile components in categories that include (but are not limited to): Cable Assemblies; Neutron Generators; Polymers; Electronic Assemblies; Gas Transfer System Production; Microelectronics Packaging; Power Sources; Radiation Hardened Microelectronics; Testers, and Lightning Arrest Connectors.

**Stockpile Research, Technology, and Engineering**

Stockpile Research, Technology, and Engineering (SRT&E) provides the data and tools that underpin science-based stockpile decisions, along with the development and maturation of component and manufacturing technologies for future insertion in the stockpile; focuses on the most pressing investments the nuclear security enterprise needs to meet DoD warhead needs and schedules; and enables assessment and certification capabilities used throughout the nuclear security enterprise. The program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without the need for underground nuclear explosive testing. Funding requested in FY 2022 supports the continued implementation of the Enhanced Capabilities for Subcritical Experiments (ECSE) and various activities in preparation to accept and operate NNSA's first Exascale high performance computing system for program use in 2023. Both of these capabilities are needed to support W80-4 LEP design validation and W87-1 Modification certification requirements. In addition, the funding supports the necessary development of the design, engineering, and adaptation of physics and engineering codes needed to support stockpile decisions to operate on this new platform. Funding in this area also supports the development of new materials, technologies, and processes to evolve our nuclear systems and production complex. This is accomplished through warhead component and production technology development and maturation needed for on-going, planned, and future warhead modernization programs. It also reinvigorates and develops the future generation of the highly trained technical and specialized workforce by experimental and computational programs along with academic institutions. The program includes Assessment Science, Engineering and Integrated Assessments, Inertial Confinement Fusion, Advanced Simulation and Computing, Weapon Technology and Manufacturing Maturation and Academic Programs.

Assessment Science

The Assessment Science program provides the theoretical and experimental knowledge and expertise needed to maintain confidence in the nuclear stockpile in the absence of nuclear explosive testing. ECSE consolidates a portfolio of work that includes (1) the Major Item of Equipment (MIE) titled Advanced Sources and Detectors, (2) a developing reactivity measurement technology named Neutron-Diagnosed Subcritical Experiments, and (3) ECSE subcritical experiment entombment activities. Assessment Science pursues CD-4 in FY 2025 for the Advanced Sources and Detectors MIE for the 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. 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.

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 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.

Inertial Confinement Fusion

The Inertial Confinement Fusion (ICF) program provides high energy density (HED) science capabilities and expertise that support research and testing across the breadth of stockpile stewardship. Its two-fold mission is to meet immediate and emerging HED science needs to support the deterrent of today, and to advance the R&D capabilities necessary to meet those needs for the deterrent of the future. The ICF program enables access to and study of the HED regime through (1) the design and execution of complex physics experiments to improve our fundamental science understanding, (2) the development of instrumentation to diagnose physics phenomena at the extreme temperature, pressure, and density conditions relevant to nuclear weapons performance, and (3) the development and operation of experimental facilities capable of reaching those conditions. The ICF program's flagship facilities, the National Ignition Facility (NIF) at LLNL, the Z

Pulsed Power Facility at SNL, and the Omega Laser Facility at the University of Rochester's Laboratory for Laser Energetics, represent a complementary set of capabilities designed to meet the diverse needs of weapons physics, the pursuit of ignition, and the exploration of fundamental HED science.

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 nuclear underground 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. 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. ASC will deliver the Crossroads high-performance computing system for annual assessment, modernization programs, and safety & surety assessments in FY 2022; and prioritizes delivery of an exascale-class computing environment in FY 2022 as preparation for the El Capitan system delivery in FY 2023.

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. The efforts enable evolving stockpile and production capabilities away from legacy systems and processes, provides for resilience, and lays the future success of the nuclear security enterprise. The core areas of work in FY 2022 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

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 are designed to support academic programs in science and engineering disciplines of critical importance to the nuclear security enterprise, 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. Funding in this area directly supports the President's Executive Order on Advancing Racial Equity and Support for Underserved Communities through the Federal Government. The Minority Serving Institutions Partnership Program (MSIPP) within Academic Programs helps develop the next generation of diverse, highly trained technical workers able to support NNSA's core missions. MSIPP also reinvigorates and develops the future generation of the highly-trained technical and specialized workforce by experimental and computational programs along with academic institutions. The role of the broader collection of 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 nuclear security enterprise for providing valuable oversight, cross-check, and review and (3) Enable scientific innovation to enhance the nuclear security enterprise missions to strengthen the basic fields of research relevant to the NNSA mission.

**Infrastructure and Operations (I&O)**

The Infrastructure and Operations (I&O) program maintains, operates, and modernizes the NNSA infrastructure in a safe, secure, and cost-effective manner to support all NNSA programs. I&O 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. The FY 2022 Budget Request supports plutonium pit production, meets LEP schedules at KCNSC, and addresses infrastructure modernization. Furthermore, the funding will allow execution of Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; reduce future operating costs by replacing older facilities with new, efficient facilities; and reduce safety, security, environmental, and program risk.

The Request supports funding for 9 construction projects, including Programmatic Construction for the Uranium Processing Facility (UPF) which will phase out mission dependency of Building 9212 at the Y-12 National Security Complex. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project; U1a Complex Enhancements project; Lithium Processing Facility; Tritium Finishing Facility; TA-55 Reinvestment Project Phase III (TRP III); HE Synthesis, Formulation, and Production project; and a new start for the Power Sources Capability project. The request for Mission Enabling Construction is to support a new start for the Digital Infrastructure Capability Expansion project at LLNL.

**Secure Transportation Asset**

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.

**Defense Nuclear Security**

The Defense Nuclear Security ( DNS) program 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 NNSS. In addition, DNS provides nuclear security expertise for a broad set of 21$^{st}$ century national security needs, in line with its core mission, such as those in defense nuclear nonproliferation, homeland security, and intelligence. Employing more than 1,800 Protective Force officers, DNS secures more than 4,400 buildings and protects more than 62,000 personnel.

**Information Technology and Cybersecurity**

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 and execute the President's Executive Order to Improve the Nation's Cybersecurity. The OCIO supports Information Technology (IT) and cybersecurity services and solutions, which includes continuous monitoring, cloud-based technologies, and enterprise security technologies (i.e., identity, credential, and access management) to help meet security challenges. The IT and Cybersecurity Program is based on practical principles that provide superior information management support to current operations, while implementing unclassified and classified cloud-based technologies and infrastructure to support the Nuclear Security Enterprise. The OCIO prioritizes the implementation of a strong and comprehensive IT and Cybersecurity Program to support the nuclear security enterprise mission, to protect and defend nuclear security enterprise information, information assets of sites, employees, and the public. The program collaborates with the DOE Office of the Chief Information Officer (DOE OCIO) on IT and cybersecurity solutions providing protection for DOE information and information assets. The FY 2022 Request includes funding for the operation and modernization of Emergency Communications Network previously funded under Emergency Operations within the Defense Nuclear Nonproliferation Account.

**Legacy Contractor Pensions and Settlement Payments**

NNSA is proposing to expand the scope of this budget line to include funding for the Requa settlement reached in 2019 as well as a portion of an unfunded pension liability at the Savannah River Site.

The *Requa* lawsuit involved UC employees of LLNL who retired prior to the Laboratory's transition to a new contractor on October 1, 2007. The retirees had been receiving health insurance through a UC health plan but when the LLNL contract transitioned to LLNS, the employees were offered health insurance through the new LLNL contractor, leading the retirees to file a lawsuit seeking reinstatement into the UC health plan. The parties settled the lawsuit in 2019, and a final judgment was issued in April 2020. NNSA agreed, pursuant to the legacy UC-LLNL Contract, to provide UC a portion of the total costs to settle the lawsuit, over a period of seven years through FY 2026. NNSA's responsibility for FY 22 is $16 million.

Funding is also requested for reimbursement of NNSA's portion of the unfunded liability of the Savannah River Nuclear Solutions pensions plan. The SRNS pension plan is underfunded by roughly $1.1 billion. The Department is proposing direct funding for this unfunded liability until it is fully funded. The FY 2022 Request includes a total of $218 million for this liability with 60 percent allocated to the Office of Environmental Management (EM) and 40 percent allocated to the

National Nuclear Security Administration (NNSA). NNSA's portion is allocated between the DNN and Weapons Activities appropriation accounts.

This budget line also continues to include 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 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 and settlement payments line item.

The Weapons Activities share of these costs in the FY 2022 Budget is $78,656,000.

**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 within the NNSA nuclear security enterprise. In FY 2022, the Weapons Activities appropriation projects providing $5.5 million for NGFP support and development activities.

**DOE Working Capital Fund (WCF) Support**

NNSA Weapons Activities appropriation projected contribution to the DOE WCF for FY 2022 is $35,370,000. This funding covers certain shared enterprise activities including managing enterprise-wide systems, data, and telecommunications and supporting the integrated acquisition environment.

## Weapons Activities
## Funding by Program

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Weapons Activities Appropriation** | | | | | |
| **Stockpile Management** | | | | | |
| **Stockpile Major Modernization** | | | | | |
| B61 Life Extension Program | 792,611 | 815,710 | 771,664 | -44,046 | -5.4% |
| W76-2 Modification Program | 10,000 | 0 | 0 | 0 | 0% |
| W88 Alteration Program | 304,186 | 256,922 | 207,157 | -49,765 | -19.4% |
| W80-4 Life Extension Program | 898,551 | 1,000,314 | 1,080,400 | +80,086 | +8.0% |
| W80-4 ALT-SLCM | 0 | 0 | 10,000 | +10,000 | 0% |
| W87-1 Modification Program | 112,011 | 541,000 | 691,031 | +150,031 | +27.7% |
| W93 Program | 0 | 53,000 | 72,000 | +19,000 | +35.8% |
| **Total, Stockpile Major Modernization** | **2,117,359** | **2,666,946** | **2,832,252** | **+165,306** | **+6.2%** |
| **Stockpile Sustainment** | **962,728** | **998,357** | **1,180,483** | **+182,126** | **+18.2%** |
| **Weapons Dismantlement and Disposition** | **56,000** | **56,000** | **51,000** | **-5,000** | **-8.9%** |
| **Production Operations** | **543,964** | **568,941** | **568,941** | **0** | **0%** |
| **Total, Stockpile Management** | **3,680,051** | **4,290,244** | **4,632,676** | **+342,432** | **+8.0%** |
| **Production Modernization** | | | | | |
| **Primary Capability Modernization** | | | | | |
| **Plutonium Modernization** | | | | | |
| **Los Alamos Plutonium Modernization** | **308,131** | **836,599** | **1,010,419** | **+173,820** | **+20.8%** |
| Los Alamos Plutonium Operations | 286,975 | 610,599 | 660,419 | +49,820 | +8.2% |
| 21-D-512 Plutonium Pit Production Project, LANL | 21,156 | 226,000 | 350,000 | +124,000 | +54.9% |
| **Savannah River Plutonium Modernization** | **410,458** | **441,896** | **603,000** | **+161,104** | **+36.5%** |
| Savannah River Plutonium Operations | 410,458 | 200,000 | 128,000 | -72,000 | -36.0% |
| 21-D-511 Savannah River Plutonium Processing Facility, SRS | 0 | 241,896 | 475,000 | +233,104 | +96.4% |
| **Enterprise Plutonium Support** | **79,216** | **90,782** | **107,098** | **+16,316** | **+18.0%** |

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **High Explosives & Energetics** | **13,768** | **67,370** | **68,785** | **+1,415** | **+2.1%** |
| High Explosives & Energetics | 13,768 | 63,620 | 68,785 | +5,165 | +8.1% |
| HESE OPC's | 0 | 3,750 | 0 | -3,750 | -100.0% |
| **Secondary Capability Modernization** | **293,545** | **457,004** | **488,097** | **+31,093** | **+6.8%** |
| Uranium Sustainment | 194,245 | 242,732 | 0 | -242,732 | -100.0% |
| Uranium Modernization | 0 | 0 | 306,086 | +306,086 | 0% |
| Process Technology Development | 70,000 | 63,957 | 0 | -63,957 | -100.0% |
| Depleted Uranium Modernization | 0 | 110,915 | 138,216 | +27,301 | +24.6% |
| Lithium Modernization | 29,300 | 39,400 | 43,795 | +4,395 | +11.2% |
| **Tritium and Domestic Uranium Enrichment** | **446,500** | **547,109** | **489,017** | **-58,092** | **-10.6%** |
| Tritium Modernization | 286,500 | 312,109 | 349,036 | +36,927 | +11.8% |
| Domestic Uranium Enrichment | 70,000 | 70,000 | 139,981 | +69,981 | +100.0% |
| HEU downblend | 90,000 | 90,000 | 0 | -90,000 | -100.0% |
| Uranium Reserve | 0 | 75,000 | 0 | -75,000 | -100.0% |
| **Non-Nuclear Capability Modernization** | **13,905** | **107,137** | **144,563** | **+37,426** | **+34.9%** |
| **Total, Production Modernization** | **1,565,523** | **2,547,897** | **2,910,979** | **+363,082** | **+14.3%** |
| | | | | | |
| **Stockpile Research, Technology, and Engineering** | | | | | |
| **Assessment Science** | **594,834** | **769,394** | **689,578** | **-79,816** | **-10.4%** |
| **Engineering and Integrated Assessments** | **325,134** | **337,404** | **336,766** | **-638** | **-0.2%** |
| **Inertial Confinement Fusion** | **556,508** | **575,000** | **529,000** | **-46,000** | **-8.0%** |
| **Advanced Simulation and Computing** | **767,849** | **732,014** | **747,012** | **+14,998** | **+2.0%** |
| **Weapon Technology and Manufacturing Maturation** | **222,302** | **297,965** | **292,630** | **-5,335** | **-1.8%** |
| **Academic Programs** | **86,492** | **101,912** | **95,645** | **-6,267** | **-6.1%** |
| **Total, Stockpile Research, Technology, and Engineering** | **2,553,119** | **2,813,689** | **2,690,631** | **-123,058** | **-4.4%** |
| | | | | | |
| **Infrastructure and Operations** | | | | | |
| **Operating** | | | | | |
| **Operations of Facilities** | **900,000** | **1,014,000** | **1,014,000** | **0** | **0%** |
| **Safety and Environmental Operations** | **130,970** | **165,354** | **165,354** | **0** | **0%** |
| **Maintenance and Repair of Facilities** | **456,000** | **667,000** | **670,000** | **+3,000** | **+0.4%** |
| **Recapitalization** | | | | | |
| Infrastructure and Safety | 447,657 | 573,717 | 508,664 | -65,053 | -11.3% |
| Capability Based Investments | 112,473 | 149,117 | 143,066 | -6,051 | -4.1% |
| Planning for Programmatic Construction (Pre-CD-1) | 0 | 10,000 | 0 | -10,000 | -100.0% |
| **Total, Operating** | **2,047,100** | **2,579,188** | **2,501,084** | **-78,104** | **-3.0%** |

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Construction** | | | | | |
| Programmatic Construction | 1,137,444 | 1,386,319 | 1,077,352 | -308,967 | -22.3% |
| Mission Enabling Construction | 15,000 | 122,000 | 8,000 | -114,000 | -93.4% |
| **Total, Construction** | **1,152,444** | **1,508,319** | **1,085,352** | **-422,967** | **-28.0%** |
| **Total, Infrastructure and Operations** | **3,199,544** | **4,087,507** | **3,586,436** | **-501,071** | **-12.3%** |
| | | | | | |
| **Secure Transportation Asset** | | | | | |
| Operations and Equipment | 185,000 | 225,000 | 213,704 | -11,296 | -5.0% |
| Program Direction | 107,660 | 123,684 | 117,060 | -6,624 | -5.4% |
| **Total, Secure Transportation Asset** | **292,660** | **348,684** | **330,764** | **-17,920** | **-5.1%** |
| | | | | | |
| **Defense Nuclear Security** | | | | | |
| Operations and Maintenance | 750,000 | 763,078 | 824,623 | +61,545 | +8.1% |
| Construction | | | | | |
| 17-D-710, West End Protected Area Reduction Project, Y-12 | 25,000 | 26,000 | 23,000 | -3,000 | -11.5% |
| **Total, Defense Nuclear Security** | **775,000** | **789,078** | **847,623** | **+58,545** | **+7.4%** |
| | | | | | |
| **Information Technology and Cybersecurity** | **300,000** | **366,233** | **406,530** | **+40,297** | **+11.0%** |
| | | | | | |
| **Legacy Contractor Pensions and Settlement Payments** | **91,200** | **101,668** | **78,656** | **-23,012** | **-22.6%** |
| **Subtotal, Weapons Activities** | **12,457,097** | **15,345,000** | **15,484,295** | **+139,295** | **+0.9%** |
| **Total, Weapons Activities** | **12,457,097** | **15,345,000** | **15,484,295** | **+139,295** | **+0.9%** |

## 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Research and Development (R&D)** | | | | | |
| Basic | 0 | 0 | 0 | 0 | 0% |
| Applied | 5,283,714 | 4,115,247 | 3,885,844 | -229,402 | -5.6% |
| Development | 302,810 | 1,178,917 | 1,156,072 | -22,845 | -1.9% |
| Subtotal, R&D | **5,586,524** | **5,294,164** | **5,041,916** | **-252,248** | **-4.8%** |
| Equipment | 251,320 | 320,949 | 323,102 | +2,153 | 0.7% |
| Construction | 108,718 | 308,128 | 186,734 | -121,394 | -39.4% |
| **Total, R&D** | **5,946,562** | **5,923,241** | **5,551,752** | **-371,489** | **-6.3%** |

## Stockpile Management

**Overview**

The Stockpile Management program requirements are to maintain a safe, secure, and effective nuclear weapons stockpile; continue production activities for the B61-12 Life Extension Program (LEP) and W88 Alteration Program; continue work to deliver the W80-4 LEP, enter Phase 6.2/6.2A for the W80-4 Alteration for the Navy Sea-Launched Cruise Missile (SLCM), complete Phase 6.2A and enter Phase 3 of the W87-1 Modification Program; conduct Phase 1 assessment activities and begin Phase 2 feasibility study and design options for the W93 Program (formerly W93); meet required stockpile sustainment activities to include maintenance, surveillance, assessment, development, and program planning; continue Phase 6.3 activities for W76-1/2 Mk4B Shape Stable Nose Tip Retrofit; 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 four major subprograms are:**

**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.

**Stockpile Sustainment**, which directly executes maintenance, surveillance, assessment, surety, and management activities for all enduring weapons systems in the stockpile.

- Conducts scheduled weapons maintenance, including production and replacement of Limited Life Components (LLCs).
- Conducts surveillance and evaluations to assess weapons reliability as well as detect and anticipate potential weapons issues.
- Supports the assessment of the current state of the stockpile underpinning the safety, security, and effectiveness of the nation's nuclear deterrent.
- Executes the Integrated Surety Architecture (ISA) program for NNSA transportation safety and security by implementing new weapon shipping configurations.

**Weapons Dismantlement and Disposition (WDD),** which dismantles retired weapons and dispositions retired components from the stockpile.

- 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.

**Production Operations**, which provides the manufacturing-based program that drives individual site production capabilities for LEPs, 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.

- Provides engineering and quality assurance processes to support component production.
- Enables Model Based Engineering (MBE) to improve efficiency, reduce translation errors, and reduction of product realization cycle times through electronic exchange of engineering and product information.
- Provides unique skills, equipment, and logistics to enable nuclear weapons operations.

## Stockpile Management
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Stockpile Management** | | | | | |
| **Stockpile Major Modernization** | | | | | |
| B61 Life Extension Program | 792,611 | 815,710 | 771,664 | -44,046 | -5.4% |
| W76-2 Modification Program | 10,000 | 0 | 0 | 0 | 0% |
| W88 Alteration Program | 304,186 | 256,922 | 207,157 | -49,765 | -19.4% |
| W80-4 Life Extension Program | 898,551 | 1,000,314 | 1,080,400 | +80,086 | +8.0% |
| W80-4 Alteration (SLCM) | 0 | 0 | 10,000 | +10,000 | 0% |
| W87-1 Modification Program | 112,011 | 541,000 | 691,031 | +150,031 | +27.7% |
| W93 Program | 0 | 53,000 | 72,000 | +19,000 | +35.8% |
| **Total, Stockpile Major Modernization** | **2,117,359** | **2,666,946** | **2,832,252** | **+165,306** | **+6.2%** |
| **Stockpile Sustainment** | **962,728** | **998,357** | **1,180,483** | **+182,126** | **+18.2%** |
| **Weapons Dismantlement and Disposition** | **56,000** | **56,000** | **51,000** | **-5,000** | **-8.9%** |
| **Production Operations** | **543,964** | **568,941** | **568,941** | **0** | **0%** |
| **Total, Stockpile Management** | **3,680,051** | **4,290,244** | **4,632,676** | **+342,432** | **+8.0%** |

**Stockpile Management**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Stockpile Management** | |
| **Stockpile Major Modernization:** The change represents the W80-4 ramp-up for entrance to Phase 6.4 (production engineering) including readiness activities; the start of Phase 6.2 Feasibility Study and Design Options/6.2A, Design Definition and Cost Study for the W80-4 Alteration for the Navy Sea-Launched Cruise Missile (SLCM); the W87-1 continued planned ramp-up of the program as transition occurs from Phase 6.2A (Design Definition and Cost Study) to Phase 6.3 (development engineering); and the W93 Program continued planned ramp-up including transition from Phase 1 (concepts study) to Phase 2 (review of these concepts into a specific set of design options to be down-selected to a final design). | **+165,306** |
| **Stockpile Sustainment:** The change primarily represents an increase for development and qualification for W76-1/2 Mk4B Shape Stable Nose Tip retrofit; an increase to extend the B83-1 service life per the June 2020 Nuclear Weapons Council (NWC) decision; an increase in Integrated Surety Architecture (ISA) activities including development, qualification, and production for the Stockpile Systems and execution of ISA Hub Operations for Multi-Weapon Systems; and an increase in Joint Test Assembly (JTA) activities. | **+182,126** |
| **Weapons Dismantlement and Disposition:** The change represents a reduction in disposition of legacy component inventories while safe and secure dismantlement of nuclear weapons and components remains level. | **-5,000** |
| **Production Operations:** No change. NNSA will prioritize production operation capabilities to ensure stockpile requirements are met. | **0** |
| **Total, Stockpile Management** | **+342,432** |

**Overview**

The Stockpile Major Modernization program 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.

B61 Life Extension Program

- Continue full rate production on all B61-12 components including production ramp-up of the six electrical components affected by the capacitor issue.
- Complete system level qualification, achieve Pantex First Production Unit (FPU), and authorize Phase 6.6 Full-Scale Production to enable B61-12 shipments to the Air Force.

W88 Alteration Program

- Continue full rate production.
- Convene the Design Review and Acceptance Group, conduct the final system flight test, and enter Phase 6.6, Full-Scale Production.
- Deliver Initial Operational Capability (IOC) quantity of the W88 Alt 370 to the Navy.

W80-4 Life Extension Program

- Complete Phase 6.3 Development for components and start of Phase 6.4 Production Engineering Phase.
- Complete Component Final Design Reviews.
- Execute Preliminary Design Review and Acceptance (PDRAAG) Review.
- Complete the Preliminary Weapon Development Report (PWDR) and update the PWDR following PDRAAG.
- Conduct joint testing with Air Force Long Range Stand-Off (LRSO) Program including: Instrumented Captive Carry, Separation & Control, functional Ground, and Powered Flight Testing.

W80-4 Alteration (SLCM)

- Coordinate with the DOD to define specific operational requirements and translate those into warhead performance characteristics.
- Enter Phase 6.2 Feasibility Study and Design Options/6.2A, Design Definition and Cost Study, depending on the W80-4 Alteration changes compared to the W80-4 LEP configuration.

W87-1 Modification Program

- Complete Phase 6.2A Design Definition and Cost Study, including independent cost estimate.
- Mature technologies, progress component and sub-system designs, and conduct component conceptual design reviews.
- Issue Major Impact Report (MIR), Phase 6.2A Report, Weapon Design and Cost Report (WDCR), and enter Phase 6.3.

W93 Program

- Conduct Phase 1 Concept Assessment.
- Evaluate warhead architectures and available technologies 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 Program will be deployed.
- Issue results of Concept Assessment study and provide recommendations for scope of feasibility study and design options for Phase 2.
- The UK is participating as observers in the US W93/Mk7 warhead program.

**Description**

Stockpile Major Modernization is the stockpile management subprogram necessary to address updated DoD requirements for potentially new capabilities or extending the expected life of stockpile systems for an additional 20 to 30 years. NNSA, in conjunction with DOD, executes stockpile modernization following the Phase X/6.X process guidelines, which provides a framework to conduct and manage refurbishment activities for potentially new or existing weapons, respectively. Phase 1/6.1 (Concept Assessment) should provide sufficient information for the Nuclear Weapons Council (NWC) to authorize Phase 2/6.2 (Feasibility Study and Design Options). Follow-on phases include: Phase 2A/6.2A (Design Definition and Cost Study), Phase 3/6.3 (Development Engineering), Phase 4/6.4 (Production Engineering), Phase 5/6.5 (First Production) and Phase 6/6.6 (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 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 enhances its reliability, field maintenance, safety, and Use Control. With these upgrades and the addition of an Air Force-supplied 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 (Production Engineering). 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. In September 2020, NNSA authorized the program to transition into Phase 6.5 (First Production) and the Air Force conducted Final Design Review and Acceptance Group (FDRAAG). NNSA is currently on schedule to provide the system-level FPU in FY 2022, and program completion is planned for FY 2026.

**W88 Alteration Program**
The W88 Alt 370 Program increases the W88 lifetime by modernizing the arming, fuzing and firing (AF&F) assembly; improving surety; and incorporating a lightning arrestor connector. It also provides required logistical spares for sustaining the life of the system. During development, the arming and fuzing portion of the AF&F was designed to be forward compatible with Air Force Fuze requirements. Joint capability is being maintained during production. The maintenance programs for neutron generator (NG) and gas transfer system (GTS) replacement will be funded under the W88 enduring stockpile system, and as required, while LLC 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 Navy. 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. Phase 6.5 authorization occurred in November 2020. NNSA is currently on schedule to provide reentry body assembly FPU in FY 2021. The program completion date is planned for FY 2026.

**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. To support classified component

work, the program will be initiating two projects (a Minor Construction project and Major Item of Equipment project) to bring up a new processing line at Y-12. The FPU is currently planned for FY 2025, and the program completion date is FY 2031.

**W80-4 Alteration (SLCM)**
The DOD is conducting an Analysis of Alternatives on an employment platform and a delivery platform for a nuclear-armed SLCM. To meet schedule requirements and fit within the existing nuclear enterprise production footprint, NNSA has recommended an alteration to the W80-4 with a continuation of the W80-4 production line. The W80-4 Alteration program would need to start in FY 2022 with a Phase 6.2/6.2A-like effort to integrate the ALT with the W80-4. The major objectives in FY 2022 include assisting the Navy in defining operational requirements and translating those requirements into specific warhead performance characteristics, including the electrical and mechanical system interfaces. This will define the extent of the warhead alteration. The request assumes the warhead will be an ALT of the existing W80-4 with minimal change in design, size, or missile interface and that the Military Characteristics (MCs) and Stockpile-to-Target Sequence (STS) are either identical or only slightly modified.

**W87-1 Modification Program**
The W87-1 Modification Program will replace the W78 warhead and support fielding on the Air Force 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. The W87-1 Modification Program is based on a modified design of the W87-0 and will be fielded in the Mk21A reentry vehicle. In FY 2022 the program will complete Phase 6.2A and will request NWC approval to enter Phase 6.3. The FPU is currently planned for early FY 2030.

**W93 Program**
The W93 Program 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 Program will include Phase 1 Concept Assessment to evaluate warhead architectures and available technologies 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 Program will be deployed. Deliverables also include documenting the results of the Concept Assessment study, providing recommendations for scope of feasibility study and design options for Phase 2, and beginning execution for Phase 2. The UK is participating as observers in the US W93/Mk7 warhead program.

**Highlights of the FY 2022 Budget Request**
**B61 Life Extension Program**
- Achieve First Production Unit in November 2021 and proceed into ramp-up rate production.
- Execute aircraft compatibility testing with dual capable aircraft (U.S. and North Atlantic Treaty Organization (NATO)), including the Air Force F-35A and B-21.
- Execute the Qualification Design Review with the Air Force and obtain Phase 6.6 Full-Scale Production Authorization.
- Achieve and maintain full scale production rates at NNSA Plants and deliver B61-12 bombs to the Air Force to support U.S. and NATO Initial Operational Capability (IOC) and Full Operational Capability (FOC) dates.
- Execute System Retrofit Evaluation System Testing (REST).

**W88 Alteration Program**
- Execute steady state production of all components.
- Release final Alt 370 addendum to the W88 weapon development report.
- Conduct Final Design Review and Acceptance Group (FDRAAG) and obtain authorization to enter Phase 6.6.
- Perform initial Retrofit Evaluation System Testing (REST) Disassemblies.
- Deliver Joint Test Assembly (JTA) 8 test unit to the Navy for a flight in FY 2022.
- Deliver IOC quantities of W88 Alt 370's to the Navy and support the Navy/NNSA turnaround logistics plan.

**W80-4 Life Extension Program**
- Complete Phase 6.3 activities for the W80-4 LEP in support of the Air Force LRSO program.
- Begin Component Final Design Reviews.

- Complete Component Product Definition and Documentation Reviews.
- Execute Component Product Pre-Pilot Production Gate Reviews.
- Begin Facility Upgrade Minor Construction project and Major Item of Equipment for the Fulmer project.
- Complete System Baseline Design Review.
- Develop Preliminary Weapon Development Report.
- Execute PDRAAG Review.
- Finalize Baseline Cost Report.

**W80-4 Alteration (SLCM)**
- Coordinate with the DOD to define specific operational requirements and translate those into warhead performance characteristics.
- Enter Phase 6.2 Feasibility Study and Design Options/6.2A, Design Definition and Cost Study, depending on the W80-4 Alteration changes compared to the W80-4 LEP configuration.

**W87-1 Modification Program**
- Complete W87-1 Modification Program Phase 6.2A, design definition and cost study and enter Phase 6.3, development engineering.
- Complete WDCR, the supporting independent cost estimate and the system cost gate.
- Complete the MIR.
- Mature program management and program controls.
- Conduct component conceptual design reviews.
- Advance technology maturation and manufacturing readiness levels.
- Conduct qualitative risk identification and impact analysis and mature quantitative risk analysis process.
- Establish initial performance management baseline.
- Complete Joint Integrated Program Plan with Air Force.
- Complete 6.2/6.2A Independent Peer Review and document findings and resolution.
- Release W87-1 classification guide.

**W93 Program**
- Complete Phase 1 study report.
- Begin the Phase 2 Feasibility Study and Design Option with NWC approval to ascertain and down-select major subsystem designs and components.
- Establish a Federal Program Office (FPO) with designated Federal Program Manager (FPM).
- Conduct customer requirements review with the Navy and begin requirements assignment to lower-level systems and major components.
- Establish a Government Work Breakdown Structure to serve as the basis for the Phase 2A Weapon Design Cost Report (WDCR) for eventual entry into Phase 3.
- Assess technology and manufacturing readiness levels for potential feasible designs.
- Generate FPO program and development plans technical design, risk, business operations and nuclear enterprise assurance.
- Coordinate with the UK on their Replacement Warhead.

**FY 2020 Accomplishments**

**B61 Life Extension Program**
- Achieved FPU on 105 of 112 weapon components including all nuclear components.
- Completed six system joint flight tests on B-2A and F-15E aircraft platforms and F-35A compatibility flight test.
- Completed system level mechanical, thermal and electrical testing to verify B61-12 meets military requirements.
- Executed Production Prove-In (PPI) and Qualification Evaluation (QE) builds for all capacitor-affected components.
- Achieved FPU for two of the six affected components.
- Received Phase 6.5, First Production and authorization.
- Completed the Final Design Review and Acceptance Group (FDRAAG) with Air Force.
- Completed two First Production Capability Units (FPCU) at Pantex in support of Readiness and REST Surveillance activities.

**W76-2 Modification Program**
- Completed Phase 6.6 activities for the W76-2 Modification Program with achievement of the warhead FPU and quantity production, consistent with NWC direction.
- Completed FOC warhead production in June 2020 and FOC deliveries in July 2020.

**W88 Alteration Program**
- Completed 2 system-level qualification tests.
- Completed production on six major components. Built First Production Capability Units (2) and Nuclear Explosive Package War Reserve FPU, at the Pantex Plant.
- Completed all board level re-spin qualification testing.
- Conducted the dry run FDRAAG review.

**W80-4 Life Extension Program**
- Successfully completed Component Product Conceptual Design Gates for over 32 active Product Realization Teams (PRTs).
- Completed all Conceptual Design Reviews.
- Submitted Initial Site Acquisition Report.
- Completed Phase II of the Integrated Baseline Review.
- Started Component Baseline Design Reviews.
- Started Component Pre-Production Engineering Gates.

**W87-1 Modification Program**
- Finalized and documented W87-1 surety architecture down-select.
- Establish product realization teams (PRTs) and conducted feasibility and trade studies.
- Coordinated schedules and strategies for canned subassembly work at Y-12.
- Conducted several life-of-program material procurements.
- Completed Systems Engineering Plan, Quality Management Plan, Configuration Management Plan, and Program Controls Plan.
- Established risk registers and initial program risks.
- Established NNSA integrated master schedule framework.
- Established Program Controls Working Group.
- Establish Weapon Design and Cost Report requirements and guidance.
- Complete NNSA Work Breakdown Structure.
- Conducted Integrated Product Team (IPT) meetings and chartered a new Joint Test Assembly/System Test IPT.
- Established W87-1/Mk21A Memorandum of Understanding with Air Force.
- Started Customer Requirements Review with Air Force.
- Coordinated flight test requirements with Air Force.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **B61 Life Extension Program $815,710,000** | **B61 Life Extension Program $771,664,000** | **B61 Life Extension Program -$44,046,000** |
| • Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the Air Force F-35A and B-21.<br>• Execute steady state component production on all components unaffected by capacitor issue.<br>• Achieve First Production for capacitor affected components and begin shipments to Pantex.<br>• Complete system validation testing for capacitor affect components.<br>• Complete two remaining FPCUs. | • Achieve System FPU at Pantex.<br>• Maintain component full-scale production to sustain system production at Pantex.<br>• Authorize Phase 6.6 Full-Scale Production.<br>• Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the Air Force F-35A and B-21. | • The change represents the planned ramp-down of design scope, as system qualification scope is completed and production increases. |
| **W88 Alteration Program $256,922,000** | **W88 Alteration Program $207,157,000** | **W88 Alteration Program -$49,765,000** |
| • Complete FPU for the reentry body assembly and JTA8 Test Body and ramp-up to full-scale production.<br>• Execute full-scale production of all components not affected by the capacitor issue supporting original delivery schedules.<br>• Complete qualification activities for components affected by the capacitor issue and executed full-scale production.<br>• Complete all System Qualification tests, including those added due to the capacitor issue. | • Execute steady state production of all components.<br>• Release final Alt 370 addendum to the W88 weapon development report.<br>• Conduct FDRAAG and obtain authorization to enter Phase 6.6.<br>• Perform initial Retrofit Evaluation System Testing (REST) Disassemblies.<br>• Deliver IOC quantities of W88 Alt 370's to the Navy and support the Navy/NNSA turnaround logistics plan. | • The change represents the planned ramp-down in design activities and the transition to full rate production from ramp-up activities. |
| **W80-4 Life Extension Program $1,000,314,000** | **W80-4 Life Extension Program $1,080,400,000** | **W80-4 Life Extension Program +$80,086,000** |
| • Continue Phase 6.3 activities as staffing levels ramp-up which is consistent with the increase in PPI and QE builds and testing activities.<br>• Commencement of Baseline Cost Report Update/Independent Cost Estimate for 6.4 Authorization. | • Complete Phase 6.3 activities for the W80-4 LEP in support of the Air Force LRSO program as staffing levels ramp-up which is consistent with the increase in PPI and QE builds and testing activities.<br>• Begin Component Final Design Reviews. | • The change represents entrance into Phase 6.4 (production engineering), including readiness activities. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Complete Component Baseline Design Reviews and Product Pre-Production Engineering Gates. Associated testing and analysis continued to increase with a focus on progressing Technology and Manufacturing Readiness Levels and transitioning towards 6.4 Authorization and Production Engineering.<br>• Continue Warhead simulators/test unit deliveries as the W80-4 LEP integrates with Cruise Missile contractor.<br>• Continue fit Check Units and Separation Control Test Vehicle warheads to be delivered to the Air Force.<br>• Continue LEP system level mechanical, electrical, electromagnetic, and abnormal testing.<br>• Continue hydrodynamic physics test to support component First Production and design changes primarily focused on producibility improvement. | • Complete Component Product Definition and Documentation Reviews.<br>• Execute Component Product Pre-Pilot Production Gate Reviews.<br>• Complete System Baseline Design Review.<br>• Develop Preliminary Weapon Development Report.<br>• For the Fulmer project begin Facility Upgrade Minor Construction project and Major Item of Equipment project<br>• Execute PDRAAG Review.<br>• Finalize Baseline Cost Report.<br>• Entrance to Phase 6.4 of the program which is production engineering including readiness activities. | |
| **W80-4 Alteration (SLCM) $0** | **W80-4 Alteration (SLCM) $10,000,000** | **W80-4 Alteration (SLCM) +$10,000,000** |
| • No funding in FY 2021. | • Coordinate with the DOD to define specific operational requirements and translate those into warhead performance characteristics.<br>• Enter Phase 6.2 Feasibility Study and Design Options/6.2A, Design Definition and Cost Study. | • The change represents the stand-up of the W80-4 Alteration in support of SLCM. The program will enter development at Phase 6.2/6.2A depending on the extent of the changes from the W80-4. |
| **W87-1 Modification Program $541,000,000** | **W87-1 Modification Program $691,031,000** | **W87-1 Modification Program +$150,031,000** |
| • Complete the feasibility study of design options (Phase 6.2) and enter design definition and cost study phase (6.2A).<br>• Advance technology maturation.<br>• Continue program management and control implementation.<br>• Integrate with Air Force acquisition programs.<br>• Conduct inter-laboratory peer review.<br>• Conduct independent cost review. | • Complete W87-1 Modification Program Phase 6.2A, design definition and cost study and enter Phase 6.3, development engineering.<br>• Complete WDCR, the supporting Independent cost estimate and the system cost gate.<br>• Complete MIR.<br>• Mature program management and program controls. | • The change represents entrance into Phase 6.3, development engineering, including the associated maturation of components and system design. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Complete initial Major Impact Report (MIR).<br>• Initiate Weapon Design and Cost Report (WDCR)<br>• Complete Phase 6.2 report. | • Mature program management and program controls.<br>• Conduct component conceptual design reviews.<br>• Advance technology maturation and manufacturing readiness levels.<br>• Conduct qualitative risk identification and impact analysis and mature quantitative risk analysis process.<br>• Establish initial performance management baseline.<br>• Complete Joint Integrated Program Plan with Air Force.<br>• Complete 6.2/6.2A Independent Peer Review and document findings and resolution.<br>• Release W87-1 classification guide.<br>• Conduct inter-laboratory peer review. | |
| **W93 Program $53,000,000** | **W93 Program $72,000,000** | **W93 Program +$19,000,000** |
| • Conduct Phase 1 Concept Assessment to evaluate warhead architectures and available technologies against potential range of desired attributes, draft military characteristics and known constraints.<br>• Inform the Navy Mk 7 aeroshell development program and assess warhead and aeroshell requirements.<br>• Produce Phase 1 study report and provide recommendations for the Phase 2 Feasibility Study and Design Options.<br>• Coordinate with UK on their Replacement Warhead. | • Complete Phase 1 study report.<br>• Begin Phase 2 Feasibility Study and Design Option to ascertain and down-select major subsystem designs and components.<br>• Establish a Federal program Manager and Federal Program Office for this newly established program of record.<br>• Conduct customer requirements review with the Navy and begin requirements assignment to lower-level systems and major components.<br>• Establish a Government Work Breakdown structure to serve as the basis for a Weapon Design Cost Report required for entry into Phase 3.<br>• Assess technology and manufacturing readiness levels for potential feasible designs.<br>• Prepare for independent laboratory and other independent reviews. | • The change represents the continued planned ramp-up of the W93/Mk7 Program and transition from Phase 1 to Phase 2. Phase 1 provides potential concepts for a W93 Program warhead while Phase 2 reviews these concepts into a specific set of design option to be analyzed and then down-selected to a final design option. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | • Generate program and development plans for technical design risk, business operations and nuclear enterprise assurance.<br>• Coordinate with UK on their Replacement Warhead. | |

**Overview**

The Stockpile Sustainment program directly executes maintenance, surveillance, assessment, surety, and management activities for all enduring weapons systems in the stockpile. The program includes the B61, W76, W78, W80, B83, W87, and W88 Stockpile Systems as well as Multi-Weapon Systems (MWS).

**Stockpile Sustainment**

Execution of all required sustainment activities to include maintenance, surveillance, assessment, development, and program planning for all Stockpile Systems. Additionally, the following weapon unique activities are planned for FY 2022:

- B61 Stockpile Systems: Production for LLCEs; B61 transition costs for the B61-12s; and support of Integrated Surety Architecture (ISA) requirements.
- W76 Stockpile System: Production for LLCEs, W76-1 JTA3 development and qualification, W76-1/-2 ALT 939 ISA design and development, and W76-1/-2 Mk4B development and qualification (Shape Stable Nose Tip installation and Unique Identifier design, development and production).
- W78 Stockpile Systems: Production for LLCEs; warhead repairs; development for flight in FY 2025.
- W80 Stockpile Systems: Production for LLCEs; ALT 369 surveillance builds, and continued development, qualification, and production activities to support of ISA requirements.
- B83 Stockpile Systems: Design and development activities for ALT 753 and ALT 353 in support of NWC direction; and design and development activities to support ISA requirements.
- W87-0 Stockpile Systems: Production for LLCEs; MK21 Replacement Fuze and Ground Based Strategic Deterrent (GBSD) integration/qualification (per AF/NNSA MOU); NG retrofit repairs and rebuilds. GTS hedge production; and FSA and other non-nuclear component production.
- W88 Stockpile Systems: Production for LLCEs in support of ALT 370; continued qualification and production of ALT 940.
- Multi-Weapon Systems: Execution of multi-weapon surveillance activities, ensuring safe operations through weapon response and nuclear explosive safety, maintaining weapon product realization tools and applications, developing and maintaining multi-weapon handling and test gear, supporting DoD through military liaison, and Use Control capability development and system studies to support stockpile modernization, the enduring stockpile, and other 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.

**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 |
| W87-0 | 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 | 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 aircraft. 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 and -4, supporting the Nation's 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/W87-0 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 (MWS) 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 (WRRs), as well as activities needed to assess/resolve system-specific weapon response issues and to provide support to the Nuclear Explosive Safety Study Groups (NESSGs) and the Nuclear Weapon System Surety Groups (NWSSGs) 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 2022 Budget Request**

- The Stockpile Sustainment overall request for FY 2022 is $1,180,483,000. The funding is currently allocated as such; the B61 is $102,679,000, the W76 is $169,220,000, the W78 is $94,766,000, the W80 is $91,669,000, the B83 is $98,456,000, the W87 is $117,297,000, the W88 is $142,841,000 and MWS is $363,555,000.
- 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 program activities 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.
- Conclude fragmentation testing on B61 Mod -11.
- Continue legacy component builds on legacy equipment for life of program needs.
- 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 development and qualification activities for ALT 939 Integrated Surety Architecture (ISA) implementation on the family of W76 warheads.
- Continue development and qualification of the W76-1/2 Mk4B Shape Stable Nose Tip (SSNT) and Unique Identifier (UID) retrofit program.
- Continue pre-production activities and to development of W78 JTA6R technology to support flight test missions.
- Continue W78 repair activities at Pantex.
- Continue development, qualification, and production activities to support W80-1 ISA requirements.
- Continue ALT 369 surveillance production activities for the W80-1 program.
- Conduct B83 NWC- directed program of record activities and to support ISA requirements. Begin implementation of B83 extension per the NWC decision to extend the B83-1 service life.
- Start initial activities for the B83 replacement of the neutron generators (Alt 753), tritium reservoirs (Alt 353), and development of Joint Test Assembly Sustainment.
- Continue production for ALT 360 on the W87-0 program.
- Continue integration of W87-0 with GBSD and Mk21 Fuze.
- Continue W87-0 NG Retrofit activities including Stockpile Laboratory Test (SLT)/Stockpile Flight Test (SFT) rebuilds at Pantex.
- Continue development and production of Firing Set Assemblies and other non-nuclear components for the W87-0.
- Continue procurement of W88 H1514C shipping and storage containers.
- Complete qualification of W88 ALT 940 ISA and meet Initial Operational Capability.
- Continue production of ALT 940 activities toward implementing W88 ALT 940 ISA activities.
- Establish Initial ISA hub operations at Kansas City New Mexico Operations (KC-NMO) in support of ALT 940 for the W88 as first user and prepare for Multiuse Transfer Attachment Device (MTAD) employment.
- Establish initial operational capability (IOC) for the Safeguard Transporter (SGT) Capability Retrofit (SCR) as the ISA application for transportation solution for the W88.
- 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 multi-system ISA requirements across the stockpile, specifically with progress toward IOC of an Enhanced Capability Shipping Configuration.

- Conduct multi-system Use Control system studies and equipment procurements to align with nuclear weapon FPUs and enduring stockpile refresh opportunities.

**FY 2020 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 B61- Mod 11 Fragmentation Test build.
- Completed build of three B61 Mod -11 cutaways.
- Completed B61 ALT 372 fielding.
- Developed reacceptance criteria for components related to B61 legacy extension JTAs.
- Completed build-up of B61 Mod -11 Type 6 JTA for cable pull down test.
- Continued planning and early development for the W76 JTA 3 (JTA1 refresh). Completed W76-1 JTA3 associated Feasibility Gate Reviews.
- Completed tailored Analysis of Alternatives study to determine container replacement or refurbishment option for H1333B shipping container for W76 warheads.
- Continued planning activities for W76/Mk4B retrofit campaign.
- Continued W78 repairs.
- Continued development of the W78 JTA6R (JTA6 Refresh)
- Completed Design Review for JTA6R development on the W78 program.
- Completed the FY 2020 W80-1 ALT 369 deliveries to the Air Force.
- Continued W80-1 ISA PRT support of ISA implementation plans.
- Completed a congressional report detailing the current status and future plans for the B83.
- Met DOD requirements for W87-0 Small Ferroelectric Neutron Generator retrofits.
- Continued W87-0 integration activities to support MK21 Replacement Fuze and GBSD including Joint Environmental Test Unit (JETU), JTA4a and JTA4b development.
- Continued W87-0 development and production activities for FSA and other non-nuclear components.
- Completed development of W88 ALT 940 ISA transportation surety solution and initiated production activities.
- Met FPU for ALT 940 Mechanical Module on the W88.
- Met FPU for H1514C containers and began deliveries to the DOE/NNSA and DOD for the W88.
- Continued development of SGT Capability Retrofit (SCR) ISA application for W88 transportation for the W88.
- Delivered the Weapon Reliability Report to the DOD for MWS.
- Completed all Weapons Evaluation Test Laboratory (WETL) lab test requirements for MWS.
- Achieved FPU (4/16) ahead of 4/30 schedule for Code Management System (CMS) Controller for MWS.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Stockpile Sustainment $998,357,000** | **Stockpile Sustainment $1,180,483,000** | **Stockpile Sustainment +$182,126,000** |
| Overall:<br>• Continue to produce LLC operations.<br>• Continue surveillance activities, including Disassembly and Inspection (D&I), system-level laboratory tests, joint flight tests, component and material evaluations, and assessment.<br>• Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required.<br>• Continue activities associated with management of fielded weapon systems. Provided systems and component engineering support for planning, resolution, and documentation. | Overall:<br>• Continue to produce LLC operations.<br>• Continue surveillance activities, including Disassembly and Inspection (D&I), system-level laboratory tests, joint flight tests, component and material evaluations, and assessment.<br>• Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required.<br>• Continue activities associated with management of fielded weapon systems. Provided systems and component engineering support for planning, resolution, and documentation. | Overall:<br>• The change primarily represents an increase for development and qualification for W76-1/2 Mk4B Shape Stable Nose Tip retrofit; an increase to extend the B83-1 service life per the NWC decision; an increase in Integrated Surety Architecture (ISA) activities including development, qualification, and production for the Stockpile Systems and execution of ISA Hub Operations for Multi-Weapon Systems; and an increase in JTA activities. |
| *B61 Stockpile Systems* | *B61 Stockpile Systems* | *B61 Stockpile Systems* |
| • Continue production of the ELNG for the B61-11.<br>• 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.<br>• Increase activities associated with management of fielded weapon systems to support the transition costs for the B61-12.<br>• Perform development and qualification activities to support Integrated Surety Architecture (ISA) requirements. Continued feasibility studies as required and in conjunction with DOD as necessary for the B61. | • Perform development and qualification activities to support ISA requirements. Continued feasibility studies as required and in conjunction with DOD as necessary. | • The change represents transition costs from the B61-12 FPU schedule change, refinement of risk mitigation, and reduction of component build ahead on legacy equipment. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| *W76 Stockpile Systems* | *W76 Stockpile Systems* | *W76 Stockpile Systems* |
| • W76-1 and W76-2 requirements are being assumed by the W76 Stockpile Systems program.<br>• Continue full program execution for development of W76-1 JTA3 to ensure on time FPU prior to JTA1 end of life.<br>• Start ALT 939 development activities to support ISA implementation on the W76-1 and W76-2. | • Begin joint development and qualification activities with the Navy on the Mk4B project for the W76-1 and W76-2 systems. Development and qualification activities include: warhead level ground testing and analysis, Unique Identifier (UID) component qualification testing and analysis, execution of Phase 6.3 design engineering reviews, and planning for authorization of Mk4B nuclear explosive operations at Pantex to support warhead conversion from Mk4A to Mk4B configuration for warhead FPU and quantity production.<br>• Continue full program execution for development and qualification of W76-1 JTA3 to ensure on time FPU prior to JTA1 end of life.<br>• Continue ALT 939 development and production activities to support Integrated Surety Architecture (ISA) implementation on the W76-1 and W76-2 systems. | • The change represents an increase in ALT 939 ISA development and qualification activities and the start of W76-1/-2 Mk4B development and qualification activities. |
| *W78 Stockpile Systems* | *W78 Stockpile Systems* | *W78 Stockpile Systems* |
| • Continue to conduct studies in conjunction with DOD as necessary. Continued JTA6R development technology to support flight test missions in support of the production engineering stage.<br>• Begin planning for ISA development activities. | • Continue JTA6R development technology to support flight test missions. Conduct studies in conjunction with DOD as necessary.<br>• Begin ISA development activities. | • The change represents increases in JTA6R, ISA development activities, and detonator production. |
| *W80 Stockpile Systems* | *W80 Stockpile Systems* | *W80 Stockpile Systems* |
| • Complete ALT 369 production.<br>• Perform development and qualification activities to support ISA/MTAD requirements. Provided laboratory and management expertise to the Project Officers Group (POG) and DOD Safety Studies. | • Complete ALT 369 surveillance replacement builds.<br>• Continue development and qualification activities to support ISA/MTAD requirements. Provided laboratory and management expertise to the POG and DOD Safety Studies. | • The change represents an increase in development and qualification activities to support ISA. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| *B83 Stockpile Systems* | *B83 Stockpile Systems* | *B83 Stockpile Systems* |
| • Continue to support NWC decision. | • Increase to surveillance activities, including D&Is, system-level laboratory tests, joint flight tests, CMEs, and assessment.<br>• Begin development activities for Alt 753 and Alt 353.<br>• Begin Joint Test Assembly Sustainment development activities.<br>• Begin development of Integrated Surety Architecture (ISA).<br>• Begin 10-year Nuclear Explosive Safety Study. | • The change represents three key activities required to enact the NWC decision to extend the service life of the B83-1. Key activities include the replacement of the neutron generators (Alt 753), tritium reservoirs (Alt 353), and development of Joint Test Assembly Sustainment. |
| *W87 Stockpile Systems* | *W87 Stockpile Systems* | *W87 Stockpile Systems* |
| • Continue GBSD qualification activities as required in conjunction with the DOD.<br>• Continue firing set development and production activities that support out year production and stockpile rebuilds. | • Continue GTS production to support LLCE deliveries and hedge.<br>• Continue GBSD qualification activities as required in conjunction with the DOD. This includes working with GBSD to develop test plans, flight test vehicles and conduct stockpile planning.<br>• Continue firing set development and production activities that support out year production and stockpile rebuilds. | • The change represents an increase in JTA4a GBSD activities, ISA activities, and increased procurement and production of Alt 360 GTS to support increased AF demand. |
| *W88 Stockpile Systems* | *W88 Stockpile Systems* | *W88 Stockpile Systems* |
| • Continue system level qualification activities for surety enhancements, began production of ALT 940. Conduct appropriate studies in conjunction with DOD; provided laboratory and management expertise to the POG and DOD safety studies. Executed H1514C container production.<br>• Continue system level qualification activities for SGT Capability Retrofit (SCR) ISA transportation solution and begin production activities. | • Continue full program execution for production of ALT 940 Integrated Surety Architecture (ISA) and SGT Capability Retrofit (SCR) to ensure on time FPU in accordance with program of record. | • The change represents completion of ALT 940 ISA design and qualification activities and execution of production activities. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Establish Initial ISA hub operations at Kansas City New Mexico Operations (KC-NMO) in support of ALT 940 and prepare for Multiuse Transfer Attachment Device (MTAD) employment. Complete required physical and security upgrades at the hub. | | |
| *Multi-Weapon Systems* | *Multi-Weapon Systems* | *Multi-Weapon Systems* |
| • Continue Use Control capability development, equipment procurements and studies supporting LEP FPUs, the enduring stockpile, and external deliverables. Increased Use Control training and capability integration with DOD customers.<br>• 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.<br>• 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.<br>• Operate and maintain daily-used Product Realization Integrated Digital Enterprise (PRIDE) systems to include design, product as-built, surveillance, and dismantlement information in support of the Stockpile Management mission from design through dismantlement.<br>• Continue sustainment of critical manufacturing skills in support of LEP production.<br>• Respond to DOD Unsatisfactory Reports (URs) about issues with the stockpile. | • Execute increased Use Control activities required to satisfy the 2018 DOD Initial Capabilities Document (ICD).<br>• Assume custody of ISA Hub Operations as cross-cutting function across all ISA enabled systems.<br>• 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.<br>• 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.<br>• Operate and maintain daily-used product realization systems to include design, product as-built, surveillance, and dismantlement information in support of the Stockpile Management mission from design through dismantlement.<br>• Continue sustainment of critical manufacturing skills in support of LEP production.<br>• Respond to DOD URs about issues with the stockpile.<br>• Provide DOD training on weapons maintenance activities in the field. | • The change represents an increase in Use Control activities.<br>• The change also represents execution of program Hub Operations. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Provide DOD training on weapons maintenance activities in the field.<br>• Perform production and maintenance of test and handling gear, spare parts for DOD, and containers.<br>• Conduct multi-weapon surveillance activities and tester development.<br>• Conduct program management and oversight of weapon sustainment activities. | • Perform production and maintenance of test and handling gear, spare parts for DOD, and containers.<br>• Continue multi-weapon surveillance activities and increased tester development.<br>• Conduct program management and oversight of weapon sustainment activities. | |

## Stockpile Management
## Weapons Dismantlement and Disposition

**Overview**

The Weapons Dismantlement and Disposition program provides weapon dismantlements, safety studies on retired systems, material characterization, legacy component disposition, and the disposal of retired weapon parts. Includes activities for technical analysis needed to dismantle and safely store weapons being removed from the stockpile.

## 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 2022 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 2020 Accomplishments**

- Met stockpile and naval reactor requirements through prioritized weapon and component dismantlement schedules.
- Maintained focus on the FY 2022 dismantlement program of record despite challenges from COVID-19.
- Dispositioned weapon program components, keeping legacy piles from growing.
- Managed dismantlement system safety concerns.
- Conducted component characterization of hazards on time with no impact to worker safety.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Weapons Dismantlement and Disposition (WDD)**<br>**$56,000,000** | **Weapons Dismantlement and Disposition (WDD)**<br>**$51,000,000** | **Weapons Dismantlement and Disposition (WDD)**<br>**-$5,000,000** |
| • Continue safe and secure dismantlement of nuclear weapons and components in excess of national security requirements.<br>• Recycle material and components from dismantled unites required for LEPs, the stockpile, and other customers.<br>• Reduce Legacy component inventories to make space available for incoming LEP material. | • Continue safe and secure dismantlement of nuclear weapons and components in excess of national security requirements.<br>• Recycle material and components from dismantled unites required for LEPs, the stockpile, and other customers.<br>• Ramp-down of reduction for Legacy component inventories to make space available for incoming LEP material. | • The change represents a reduction in disposition of legacy component inventories while safe and secure dismantlement of nuclear weapons and components remains level. |

## Stockpile Management
## Production Operations

**Overview**

Productions Operations 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:

Provides 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.

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

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

Supports 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 as well as several capability modernization programs to ensure the correct capabilities are in place to support the stockpile demands.

**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.
- **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.
- **Nuclear Enterprise Assurance (NEA)** – The set of activities that reduce the risk of subversion of the U.S. nuclear weapons stockpile or its supporting Nuclear Security Enterprise (NSE) by a sophisticated and well-resourced adversary.

**Highlights of the FY 2022 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 current levels of plant capability and capacity.

**FY 2020 Accomplishments**

- Sustained base capabilities for multi-system operations and maintenance support to meet all LLCE GTS Fills and GTS Surveillance NNSA deliverables.
- Completed Calibration Services of over 1,200 critical equipment calibrations on-time in support of production activities.
- Completed unloading Laser B System replacement installation/startup.
- Supported 240 LLNL Engineering Authorizations (EA), 340 NSE EAs, and 180 PRT meetings. Successfully completed Advanced Engineering Simulation Analysis for 62 projects. This is a newly funded Production Operations project for FY 2020 and beyond.
- Deployed and executed CNS Y-12 comprehensive corrective and preventative maintenance program activities for production related equipment enabling the site to complete life extension, surveillance, and dismantlement deliverables.
- Performed Tritium process computing maintenance to support LLCE GTS production and GTS surveillance and classified communications/data management.
- Accepted over 79,500 SNL components at a 100% NNSA acceptance rate in FY 2020.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Production Operations $568,941,000** | **Production Operations $568,941,000** | **Production Operations $0** |
| • Continue engineering operations for weapon operations including LEP, surveillance, dismantlement, and component production to meet directive schedules and meet DOD delivery schedules.<br>• Continue 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.<br>• Continue 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. Executed activities to enable on-time completion of deliverables by ensuring Process Equipment availability.<br>• Provide labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload.<br>• Continue engineering and quality assurance expansion for increased non-nuclear component production requirements.<br>• Increase intra-site logistical support required to support weapon and component moves related to production.<br>• Continue engineering and quality assurance preparation for B61-12 and W88 Alt 370 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.<br>• Continue 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.<br>• Continue 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. Executed activities to enable on-time completion of deliverables by ensuring Process Equipment availability.<br>• Provide smaller amount of labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload.<br>• Continue engineering and quality assurance expansion for increased non-nuclear component production requirements.<br>• Increase intra-site logistical support required to support weapon and component moves related to production.<br>• Continue engineering and quality assurance preparation for B61-12 and W88 Alt 370 non-nuclear component production. | • No change. NNSA will prioritize production operation capabilities to ensure stockpile requirements are met. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Develop policy implementation strategies, tools, and techniques for use across programs and all sites in the NSE to reduce the risks of subversion.<br>• Refined and deploy NEA awareness education across the NSE and site-specific training at all sites.<br>• 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. | • Develop policy implementation strategies, tools, and techniques for use across programs and all sites in the NSE to reduce the risks of subversion.<br>• 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.<br>• Continue to provide tooling to certify weapons and components, and the production schedule through product qualification. | |

## Stockpile Management
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 65,246 | 62,292 | 92,461 | +30,169 |
| Minor Construction | N/A | N/A | 9,274 | 14,028 | 38,889 | +24,861 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **74,520** | **76,320** | **131,350** | **55,030** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 56,689 | 57,936 | 66,511 | +8,575 |
| Cold Hearth Electron Beam Melting (CHM), LLNL | 8,000 | 5,000 | 3,000 | 0 | 0 | 0 |
| Life Extension Program Project 4, Y12 | 28,750 | 0 | 0 | 2,800 | 25,950 | +23,150 |
| Multi-Mass Leak Detector, Y-12 | 7,813 | 4,700 | 1,557 | 1,556 | 0 | -1,556 |
| Special Materials Facility Capacity Build up, Y-12 | 10,000 | 6,000 | 4,000 | 0 | 0 | 0 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **65,246** | **62,292** | **92,461** | **30,169** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 9,274 | 9,478 | 9,687 | +209 |
| SNL CA High Security Office Modular Addition, NNSS | 7,800 | 0 | 0 | 800 | 7,000 | +6,200 |
| 9990-03 Facility Upgrades, Y-12 | 19,952 | 0 | 0 | 1,750 | 18,202 | +16,452 |
| Building 9201-1 Pangborn Upgrades, Y-12 | 6,000 | 0 | 0 | 2,000 | 4,000 | +2,000 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **9,274** | **14,028** | **38,889** | **24,861** |
| **Total, Capital Summary** | **N/A** | **N/A** | **74,520** | **76,320** | **131,350** | **55,030** |

## Production Modernization

**Overview**

The Production Modernization program focuses on the production capabilities of nuclear weapons components 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 primary stage material processing and component production capabilities in the National Nuclear Security Administration's (NNSA) nuclear security enterprise. 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 nuclear security enterprise. 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 requirements 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.

**The Production Modernization program:**

1. Provides funding for efforts across the nuclear security enterprise to restore the Nation's capability to produce 80 pits per year (ppy).
2. Enables sustainment and modernization across the nuclear security enterprise of high explosives and energetics infrastructure and capabilities necessary for the timely delivery of qualified explosive, pyrotechnic, and propellant materials to meet current and future stockpile requirements.
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, recycling, and recovering tritium and is expanding capacity to reliably meet additional national security requirements.
7. Provides funding to modernize production of non-nuclear components for multiple weapon systems.

## Production Modernization
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Production Modernization** | | | | | |
| **Primary Capability Modernization** | | | | | |
| **Plutonium Modernization** | | | | | |
| **Los Alamos Plutonium Modernization** | **308,131** | **836,599** | **1,010,419** | **+173,820** | **+20.8%** |
| Los Alamos Plutonium Operations | 286,975 | 610,599 | 660,419 | +49,820 | +8.2% |
| 21-D-512 Plutonium Pit Production Project, LANL | 21,156 | 226,000 | 350,000 | +124,000 | +54.9% |
| **Savannah River Plutonium Modernization** | **410,458** | **441,896** | **603,000** | **+161,104** | **+36.5%** |
| Savannah River Plutonium Operations | 410,458 | 200,000 | 128,000 | -72,000 | -36.0% |
| 21-D-511 Savannah River Plutonium Processing Facility, SRS | 0 | 241,896 | 475,000 | +233,104 | +96.4% |
| **Enterprise Plutonium Support** | **79,216** | **90,782** | **107,098** | **+16,316** | **+18.0%** |
| **High Explosives & Energetics** | **13,768** | **67,370** | **68,785** | **+1,415** | **+2.1%** |
| High Explosives & Energetics | 13,768 | 63,620 | 68,785 | +5,165 | +8.1% |
| HESE OPC's | 0 | 3,750 | 0 | -3,750 | -100.0% |
| **Secondary Capability Modernization** | **293,545** | **457,004** | **488,097** | **+31,093** | **+6.8%** |
| Uranium Sustainment | 194,245 | 242,732 | 0 | -242,732 | -100.0% |
| Uranium Modernization | 0 | 0 | 306,086 | +306,086 | 0% |
| Process Technology Development | 70,000 | 63,957 | 0 | -63,957 | -100.0% |
| Depleted Uranium Modernization | 0 | 110,915 | 138,216 | +27,301 | +24.6% |
| Lithium Modernization | 29,300 | 39,400 | 43,795 | +4,395 | +11.2% |
| **Tritium and Domestic Uranium Enrichment** | **446,500** | **547,109** | **489,017** | **-58,092** | **-10.6%** |
| Tritium Sustainment and Modernization | 286,500 | 312,109 | 349,036 | +36,927 | +11.8% |
| Domestic Uranium Enrichment | 70,000 | 70,000 | 139,981 | +69,981 | +100.0% |
| HEU Downblend | 90,000 | 90,000 | 0 | -90,000 | -100.0% |
| Uranium Reserve | 0 | 75,000 | **0** | -75,000 | -100.0% |
| **Non-Nuclear Capability Modernization** | **13,905** | **107,137** | **144,563** | **+37,426** | **+34.9%** |
| **Warhead Assembly** | **0** | **0** | **0** | **0** | **0%** |
| **Total, Production Modernization** | **1,565,523** | **2,547,897** | **2,910,979** | **+363,082** | **14.3%** |

**Production Modernization**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Production Modernization** | |
| **Plutonium Modernization** | **+351,240** |
| Increase includes funding for preliminary design activities supporting the Savannah River Plutonium Processing Facility and the Los Alamos Plutonium Pit Production Project. The increase also reflects additional investments for modernization of high explosives and energetics capabilities. | |
| **Los Alamos Plutonium Operations** | **+49,820** |
| Increase supports plutonium pit production process development and qualification activities and the hiring, training, and qualification of additional staff to support war reserve (WR) pit production ramp up. | |
| **21-D-512 Plutonium Pit Production Project, LANL** | **+124,000** |
| Increase supports investments in expanding plutonium pit production capabilities at Los Alamos National Laboratory's Plutonium Facility (PF)-4, including preliminary design and long-lead equipment procurement activities. | |
| **Savannah River Plutonium Operations** | **-72,000** |
| Decrease is due to Other Project Cost (OPC) funding moving into the construction project line item. Activities include maturation of a program office capability at the Savannah River Site (SRS) to support project design efforts; hire, train, and qualify future production staff; and planning for future operational needs including plutonium pit certification and product acceptance. | |
| **21-D-511 Savannah River Plutonium Processing Facility, SRS** | **+233,104** |
| Increase for preliminary design efforts of the Savannah River Plutonium Processing Facility, long-lead equipment procurements, site preparation and installation of buried utilities, D&D of existing equipment and installed commodities, and construction of support buildings. The increase also includes the transfer of funding from the Savannah River Plutonium Operations funding line for OPCs. | |
| **Enterprise Plutonium Support** | **+16,316** |
| Increase in funding for activities that support pit production across the enterprise including certification activities at Lawrence Livermore National Laboratory (LLNL), production at Kansas City National Security Campus (KCNSC), and material management and storage activities at National Nuclear Security Site (NNSS). | |

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **High Explosives and Energetics** | **+1,415** |
| Increase for activities that support sustainment, qualification, and modernization across the nuclear security enterprise of high explosives and energetics production and capabilities necessary to meet current and future stockpile requirements in a timely manner. This increase reflects material and infrastructure efforts to maintain and modernize the stockpile. Material requirements will produce and qualify high explosive material (LX-17 and LX-21) for the W87-1 program, reconstitute THKP for energetic actuators for the W80-4 and W87-1, and formulate PBX-9502 for the B61-12. Infrastructure efforts will enable future material production, testing, and qualification of energetic materials and components. | |
| **Secondary Capability Modernization** | **+31,093** |
| 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 support the transition of new capabilities into new and enduring facilities. Finally, this increase further reflects growth in Lithium Modernization scope and processing requirements to meet national security requirements. | |
| **Tritium and Domestic Uranium Enrichment** | **-58,092** |
| Decrease reflects the absence of a funding request for the Uranium Reserve program. The decrease also reflects that HEU downblending activities required advance funding provided in prior fiscal years, reducing the FY 2022 request level. | |
| **Non-Nuclear Capability Modernization** | **+37,426** |
| Increase in funding reflects significant growth in equipment procurements at KCNSC that are necessary to modernize capabilities for development and production of non-nuclear components for multiple weapon systems. The increase also supports Other Project Cost (OPC) activities for the Non-Nuclear Component Capacity and the Power Sources Capability Line Items and adds OPC funding for the Heterogeneous Integration Facility project. This increase supports at-risk materials efforts to identify supply issues for those materials for which obsolescence, discontinuation, scarceness, or unavailability is likely to occur over the timeline for which it is needed or required. The increase supports equipment for the neutron generator and power sources facilities at Sandia National Laboratories (SNL) and continues development and implementation of an assurance system model for Commercial Off-the-Shelf (COTS) parts to avoid delays in weapons modernization programs. The increase also supports the development of a thermal spray production capability needed for the W87-1 and future systems. | |
| **Total, Production Modernization** | **+363,082** |

## Production Modernization
## Primary Capability Modernization

**Overview**

The Primary Capability Modernization program consolidates management of primary stage material processing and component production 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 nuclear security enterprise to restore the Nation's capability to produce 80 pits per year (ppy). 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 ppy, 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**: 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 for War Reserve (WR) pit production; pit production process development and certification 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 2022, LANL will continue process development and qualification activities to continue advancing towards producing the first WR pit during 2023. LANL Plutonium Operations also provides funding for key support services and safety management programs in PF-4, including: a radiological control program, facility and equipment maintenance, a criticality safety program, shipping and receiving, authorization basis, work control documentation, training and qualification, waste management, material handling and storage, and facility availability to maintain plutonium capabilities.

  Activities within LANL Plutonium Modernization also include the LANL Plutonium Pit Production Project, 21-D-512. This project will manage capital acquisitions to increase production capability of PF-4 from 10 ppy to 30 ppy, as well as associated infrastructure investments at LANL to support pit production. FY 2022 funding will be used to develop preliminary design documentation needed for CD-2, deactivate & decommission legacy equipment in PF-4, and procure long-lead equipment.

- **Savannah River Plutonium Modernization**: Supports the establishment of a program office capability at SRS to support pit production development efforts, train and hire future production staff, and support future production and operations planning.

  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 2022 activities are focused on maturing preliminary design to support CD-2, as well as site and facility preparation, and long lead procurement. Preliminary design scope includes facility Balance of Plant systems, production equipment and gloveboxes, and support infrastructure.

- **Enterprise Plutonium Support:** Provides funding for activities that support pit production across the nuclear security enterprise, including Kansas City National Security Campus (KCNSC) production of non-nuclear components, certification activities at Lawrence Livermore National Laboratory (LLNL), management of the plutonium pit Product Realization Team (PRT), and material management activities at the Nevada National Security Site (NNSS).

**Highlights of the FY 2022 Budget Request**

- Support pit production capability modernization in accordance with Federal law and Department of Defense requirements.
- Prove-in pit production processes and perform certification tests to support production of the first War Reserve (WR) pit during 2023.
- Continue investments to install additional production equipment and recapitalize end-of-life equipment in PF-4 to reduce pit production mission risk.

- Continue hiring, training, and qualifying staff to ramp up future pit production.
- Complete de-inventory of the Chemistry and Metallurgy Research (CMR) facility at LANL.
- 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.
- Continue to mature the new SRS Plutonium Operations program to include expanded knowledge transfer/training.
- Continue efforts to mature the SRPPF from conceptual to preliminary design.

**FY 2020 Accomplishments**

- Successfully produced development (DEV) pits.
- Installed equipment to produce the first WR pit during 2023 in PF-4.
- Improved Transuranic (TRU) waste management and characterization capabilities to support increased Waste Isolation Pilot Plant (WIPP) shipments that improved overall capacity health metric at LANL.
- Completed removal of TRU waste associated with confinement vessel disposition project from CMR, reducing material-at-risk (MAR) in the facility by 60% in support of the CMR Facility Exit Plan.
- Completed material movements at NNSS in support of Plutonium Pit Production Mission.
- Deployed initial SRS personnel to LANL as part of the Plutonium Program Knowledge Transfer initiative.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Plutonium Modernization $1,369,277,000** | **Plutonium Modernization $1,720,517,000** | **Plutonium Modernization +$351,240,000** |
| ***Los Alamos Plutonium Modernization $836,599,000*** | ***Los Alamos Plutonium Modernization $1,010,419,000*** | ***Los Alamos Plutonium Modernization +$173,820,000*** |
| ***Los Alamos Plutonium Operations $610,599,000*** | ***Los Alamos Plutonium Operations $660,419,000*** | ***Los Alamos Plutonium Operations +$49,820,000*** |
| • Maintains base personnel while adding additional personnel to ramp up work and sustain pit-manufacturing capability.<br>• Continue to recapitalize end-of-life equipment vital to the pit manufacturing mission.<br>• Invests in personnel and equipment needed to support pit production.<br>• Produce pits for the Process Prove-in (PPI) phase of product realization.<br>• Continue design agency qualification of production processes through engineering evaluations.<br>• Continue to recover, recycle, and disposition nuclear materials in support of pit production mission at LANL.<br>• Continue CMR de-inventory of legacy special nuclear material in accordance with the CMR Facility Exit Plan.<br>• Provide safe and secure storage, disposition, and management of nuclear materials in support of plutonium missions at LANL. | • Continue to maintain base personnel while adding additional personnel to ramp up work and sustain pit-manufacturing capability.<br>• Continue to recapitalize end-of-life equipment vital to the pit manufacturing mission.<br>• Invest in personnel and equipment needed to support pit production.<br>• Produce qualification pits in the product realization phase, supports achieving FPU WR pits during FY 2023.<br>• Continue engineering evaluation of processes and conduct pit certification activities.<br>• 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.<br>• Continue to recover, recycle, and disposition DP nuclear materials in support of pit production mission at LANL.<br>• Complete CMR de-inventory of legacy special nuclear material in accordance with the CMR Facility Exit Plan.<br>• Provide safe and secure storage, disposition, and management of nuclear materials in support of plutonium missions at LANL. | • Increase supports plutonium pit production process development and qualification activities and the hiring, training, and qualification of additional staff to support war reserve (WR) pit production ramp up. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ***21-D-512 Plutonium Pit Production Project, LANL<br>$226,000,000*** | ***21-D-512 Plutonium Pit Production Project, LANL<br>$350,000,000*** | ***21-D-512 Plutonium Pit Production Project, LANL<br>+$124,000,000*** |
| • Develop design documentation to complete CD-1 and advance toward CD-2.<br>• Pursue long-lead procurements.<br>• Conduct facility and site preparation. | • Mature preliminary design documentation to support CD-2.<br>• Execute deactivation and decommissioning of legacy equipment.<br>• Pursue long-lead procurements.<br>• Conduct facility and site preparation. | • Increase supports significant additional investments at LANL necessary for plutonium pit production, including equipment installations. |
| ***Savannah River Plutonium Modernization<br>$441,896,000*** | ***Savannah River Plutonium Modernization<br>$603,000,000*** | ***Savannah River Plutonium Modernization<br>+$161,104,000*** |
| ***Savannah River Plutonium Operations<br>$200,000,000*** | ***Savannah River Plutonium Operations<br>$128,000,000*** | ***Savannah River Plutonium Operations<br>-$72,000,000*** |
| • Continue establishing and staffing a program office at SRS to support project and future production activities.<br>• Complete conceptual design to achieve CD-1. | • Mature SRS program office to support future production activities. | • Decrease is due to the Other Project Cost (OPC) funding moving into the construction project line item. The program continues to mature the program office capability at SRS to support continued project design efforts, train and hire future staff, and support future operations. |
| ***21-D-511 Savannah River Plutonium Processing Facility, SRS $241,896,000*** | ***21-D-511 Savannah River Plutonium Processing Facility, SRS $475,000,000*** | ***21-D-511 Savannah River Plutonium Processing Facility, SRS +$233,104,000*** |
| • Continue site preparatory work.<br>• Begin long lead procurements, including gloveboxes.<br>• Complete conceptual design to achieve CD-1.<br>• Begin planning and design on high fidelity training facility design.<br>• Mature preliminary design to advance toward CD-2. | • Continue site preparatory work.<br>• Continue long lead procurements, including gloveboxes.<br>• Continue planning and design on high fidelity training facility design.<br>• Mature preliminary design for CD-2.<br>• OPCs for the SRPPF project to develop and support for anticipated CD-2 preliminary design and CD-3A. | • Increase for preliminary design of the Savannah River Plutonium Processing Facility to advance toward CD-2/3 and the reallocation of funding from the Savannah River Plutonium Operations funding line for OPCs. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ***Enterprise Plutonium Support***<br>***$90,782,000*** | ***Enterprise Plutonium Support***<br>***$107,098,000*** | ***Enterprise Plutonium Support***<br>***+$16,316,000*** |
| • Continue LLNL certification activities associated with pit production.<br>• Continue KCNSC non-nuclear component production.<br>• Support Product Realization Team management at LLNL.<br>• Execute material management and storage activities at NNSS. | • Continue LLNL certification activities associated with pit production.<br>• Continue KCNSC non-nuclear component production.<br>• Continue to support Product Realization Team management at LLNL.<br>• Execute material management and storage activities at NNSS. | • Increase in funding for activities that support pit production, including increased certification testing efforts to support production of a War Reserve pit in FY 2023. |

**Primary Capability Modernization**
**High Explosives and Energetics**

**Description**

The High Explosives and Energetics (HE&E) program focuses on modernization and prioritization of High Explosives (HE) processing facilities and qualification of high explosive, pyrotechnic, and propellant materials for supplying the nuclear security enterprise across five M&O sites (Pantex Plant, SNL, LANL, LLNL, and NNSS). The HE&E program enables the production of HE and energetic materials required for an effective stockpile including the main charge, boosters, detonators, actuators, timer/drivers, and spin rockets, as well as the materials necessary to achieve safety and security.

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 HE&E Program manages the capital investment of the HE&E infrastructure and equipment to modernize manufacturing capabilities in aging facilities and provide efficiencies in material processing to make for a safer working environment. Through active supply chain management and modernization projects, the HE&E Program ensures the infrastructure and vendor base is in place to meet tight material production requirements to sustain and modernize the stockpile. 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 HE&E Program is also conducting analyses of alternatives (AoAs) and conceptual design for the Energetics Materials Characterization (EMC) and the Radiography/Assembly Complex Replacement (RACR) projects at LANL. The HE&E Modernization Program ensures materials and capabilities, such as main charge material development, procurement, and characterization, are available and efficient to ensure a safe, secure, and effective stockpile as NNSA continues to modernize the stockpile to meet nuclear deterrent requirements.

The modernization program will:

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 2022 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.
- Procure energetic material to meet development and qualification needs of the W87-1.
- Stabilize the supply chain and enable material/manufacturing maturation, where needed, to meet the energetic material requirements of the current and future stockpile modernization programs.
- Provide guidance and contract support for programmatic activities to obtain CD-3A for the High Explosive Synthesis, Formulation, and Production Facility.
- Obtain and demonstrate a new capability for insensitive high explosives qualification to hostile impulse requirements at full scale.
- Complete the Radiography/Assembly Complex Replacement (RACR) AoA to support consolidation efforts to modernize and streamline assembly and radiography capabilities for energetic materials and components at LANL.
- Provide an assessment of the historic pentaerythritol tetranitrate (PETN) production deliverables, with an accompanying lessons-learned in the context of this schedule's impact on detonator production and continue PETN Pilot Plant improvements from FY 2021.
- Finish upgrades to the HE thermal/mechanical test capability, and to the analytical test capability for detonators and general HE surveillance activities.

**FY 2020 Accomplishments**

- Achieved CD-2/3 for the High Explosive Science and Engineering facility.
- Redefined the machining parameters for NNSA Explosive Safety Committee review to decrease machining times.
- Achieved CD-0 approval for the Energetic Materials Characterization (EMC) facility, continued supporting Analysis of Alternatives activities.
- Reduced identified risks to supply chains by completing third party testing to enable permanent shipping authorization of TKP-OP, TKP-IP, and THKP in support of W80-4 actuator production.
- Made significant progress towards reestablishing synthesis formulation of key IHE material components to be used in future Life Extension Programs (LEP).
- Obtained approval from the proponent organizations for revisions to IHE material and IHE subassembly qualification test description and criteria.
- Supported the procurement and installation of a stainless-steel filter press at the Holston Army Ammunition Plant to enable higher levels of production within EPA limits and provide the correct gradation of TATB material required for NNSA specifications.
- Coordinated the return of LX-17 machine cutting from Holston Army Ammunition Plant as a means of ensuring a viable mitigation plan for the W87-1 main charge material requirements.
- Completed the Development Lot N1 of PBX 9502, consisting of 4,500 lbs total, at Holston Army Ammunition Plant, and LANL received the first shipment of 1,500 lbs.
- Completed an independent review to inform the implementation of a new capability for IHE qualification to hostile impulse requirements at full scale.
- Coordinated the shipping of HE materials and timely delivery of LX-04 with the Ministry of Defense.
- Supported Joint Working Group (JOWOG) 9 activity in planning for HMX storage and delivery and provided programmatic interface between LLNL and the Atomic Weapons Establishment.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **High Explosives and Energetics $67,370,000** | **High Explosives and Energetics $68,785,000** | **High Explosives and Energetics +$1,415,000** |
| • Consolidate the supply chain and procurements of high explosives and energetics to be managed by one program.<br>• Facilitate modernization of the high explosive and energetics infrastructure across the nuclear security enterprise.<br>• Establish a modern and robust production and manufacturing capability.<br>• Enhance Mark Quality production for next generation explosive components and materials at SNL.<br>• Provide guidance for energetics surveillance, weapon response, transportation, containers, and explosive/electrical environments.<br>• Support OPCs for the HESE Line-Item Project.<br>• Support the JASONs Summer Study on High Explosives Manufacturing Science. | • Continue to facilitate modernization of the high explosive and energetics infrastructure across the nuclear security enterprise.<br>• Continue to establish a modern and robust production and manufacturing capability.<br>• Continue to enhance Mark Quality production for next generation explosive components and materials at SNL.<br>• Continue to provide guidance for energetics surveillance, weapon response, transportation, containers, and explosive/electrical environments.<br>• Establish main charge parameters for the W87-1 program, including main charge, detonator, and booster energetics requirements. | • Increase continues modernization of HE&E infrastructure and processing capabilities. |

## 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 nuclear security enterprise. 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 (formerly Uranium Sustainment); (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 75 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. 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 support the three current major items of equipment (MIE) and associated technology development efforts:

1. **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.
2. **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 to enable the shutdown of programmatic operations. The calciner, located in Building 9212, along with the electrorefining capability in Building 9215 (see above), will enable the shutdown of the current high hazard wet chemistry process in Building 9212.
3. **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. Uranium Modernization also implements a strategy to optimize limited space in the enriched uranium facilities to improve NNSA's responsiveness and resiliency for potential future production requirements.

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 2022 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:
  - Complete pre-operational testing and begin readiness assessment activities for the calciner in Building 9212 to process low equity uranium solutions and an electrorefining capability in Building 9215 to purify uranium metal.
  - Transition the direct chip melt front loading furnace to production in Building 9215 and advance the design of the direct chip melt bottom loading furnace.

    - Reestablish a uranium oxide to metal conversion capability.
- Continue material de-inventory efforts to reduce safety and security risks and optimize the material composition of the uranium inventory.
- Continue to implement a strategy to optimize limited space in enriched uranium facilities.
- 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 highly enriched uranium (HEU) feedstock quality before and during transition to the new and enduring facilities.

**FY 2020 Accomplishments**

- Removed a quantity of material from production areas and into storage.
- Completed the CD-2/3 package, which establishes the cost and schedule baseline, for the 9212 Calciner project.
- Completed integrated Factory Acceptance Testing of the Electrorefining process.
- Deactivated 20 out-of-service systems to prepare for transitioning operations out of facilities, including Building 9212.
- Began casting classified test parts using microwave technology to optimize parameters for casting procedures.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Uranium Sustainment $242,732,000** | **Uranium Sustainment $0** | **Uranium Sustainment -$242,732,000** |
| • Continuing 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.<br>• Producing five buttons with Production Operators utilizing the ER Development Glovebox system.<br>• Contracted for commercial solution to the uranium oxide to metal conversion capability gap.<br>• Producing purified enriched uranium feedstock to meet mission requirements.<br>• Establishing parameters for casting using microwave technology.<br>• Removing additional material from production areas and into storage.<br>• Deactivating additional systems to prepare for transitioning operations out of facilities, including Building 9212. | • No funding requested. | • Beginning in FY 2022, the Uranium Modernization Program funding combines Uranium Sustainment and Process Technology Development scope. |
| **Process Technology Development $63,957,000** | **Process Technology Development $0** | **Process Technology Development -$63,957,000** |
| • Beginning 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.<br>• Procuring and installing direct chip melt furnaces in Building 9215. | • No funding requested. | • Beginning in FY 2022, the Uranium Modernization Program funding combines Uranium Sustainment and Process Technology Development scope. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Uranium Modernization $0** | **Uranium Modernization $306,086,000** | **Uranium Modernization +$306,086,000** |
| • No funding. | • 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.<br>• Continue execution of the calciner and electrorefining projects by installing a calciner in Building 9212 to process low equity uranium solutions and an electrorefining capability in Building 9215 to purify uranium metal.<br>• Design direct chip melt bottom loading furnaces in Building 9215 in accordance with DOE O 413.3B<br>• Continue work to reestablish a uranium oxide to metal conversion capability.<br>• Continue material optimization efforts to reduce safety and security risks; achieve and maintain target working inventory levels and optimize the material composition of the uranium inventory.<br>• Improve existing manufacturing capabilities and optimize floor space for flexible production capacity in enriched uranium facilities.<br>• Extended the operational life of enduring enriched uranium facilities.<br>• Continue purified metal production and the processing and disposition of legacy materials to phase out mission dependency on Building 9212.<br>• Improve HEU feedstock quality before and during transition to the new and enduring facilities. | • This increase represents the consolidation of Uranium Sustainment and Process Technology Development. The overall program funding is a decrease of $603,000, reflecting steady state activities. |

## Secondary Capability Modernization
## Depleted Uranium Modernization

**Description**

The Depleted Uranium (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 DU and DU-niobium alloying and manufacturing capabilities, and investing in key new technologies. The capability to produce, process, and handle depleted uranium supports several 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-niobium 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, (aka, VIM- VAR-VAR) modernize the wrought manufacturing capability and machining, train operators, develop procedures, and assist with process qualification activities at LANL and LLNL.

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 near-net shape production process by significantly reducing the risks of current equipment failure, reducing material waste, and improving process efficiency. The DU 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 DU-niobium alloying process as well as the production of DU and DU-niobium alloyed components.

**Highlights of the FY 2022 Budget Request**

- Re-establish a reliable supply of high purity DU metal feedstock to meet mission requirements.
- Restart lapsed VIM-VAR-VAR capabilities and modernize the wrought process to reliably support current and future weapon systems.
- Support continued development and deployment activities for new technologies (including Direct Cast and Cold Hearth Melting) to improve alloying and component production efficiencies.
- Invest in DU storage capabilities and material modeling to ensure long-term availability of strategic materials.

**FY 2020 Accomplishments**

- Issued an updated NNSA DU Modernization Strategy.
- Initiated a DU Planning Study to evaluate infrastructure needs to support future DU capabilities.
- Significantly progressed planning to re-establish the high purity depleted uranium feedstock capability.
- Restarted the binary rolling capability at Y-12, a crucial step in the wrought process.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Depleted Uranium Modernization $110,915,000** | **Depleted Uranium Modernization $138,216,000** | **Depleted Uranium Modernization +$27,301,000** |
| • Re-established a reliable supply of high purity DU metal feedstock to meet mission requirements.<br>• Restarted lapsed alloying and manufacturing capabilities to support future weapon systems.<br>• Supported technologies for alloy and component production to reduce waste and costs.<br>• Invested in DU storage capabilities and material modeling to ensure long-term availability of strategic materials. | • Re-establish a reliable supply of high purity DU metal feedstock to meet mission requirements.<br>• Restart lapsed VIM-VAR-VAR and wrought capabilities to support current and future weapon systems.<br>• Support continued development and deployment activities for new technologies (including Direct Cast and Cold Hearth Melting) to improve alloying and component production efficiencies.<br>• Invest in DU storage capabilities and material modeling to ensure long-term availability of strategic materials.<br>• Support the execution of a $DUF_6$ to $DUF_4$ conversion line at Portsmouth to meet the demand for high purity DU.<br>• Support feedstock process development, including installing full-scale prototypes to reduce risk to technology insertion into production.<br>• Execute the newly developed radiation case bridging strategy to mitigate risks associated with the aging wrought process by meeting imminent mission requirements through FY 2035 and inserting advanced processing technologies where appropriate. | • Increase supports the execution of new scope to meet imminent mission requirements and support future weapon systems, including the new bridging strategy to mitigate risks associated with the aging wrought process.<br>• Increase starts execution of $DUF_6$ to $DUF_4$ conversion line at Portsmouth to meet the demand for high purity DU.<br>• Increase supports the uplift in FY 2022 to execute alloying restart activities, including the Production VAR, and completing VIM-VAR-VAR process prove-in. |

## 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 are well beyond their designed operational life.

The Lithium Modernization program 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 2022 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.

**FY 2020 Accomplishments**

- Completed all Lithium material deliverables on schedule.
- Updated and validated Lithium supply and demand model.
- Completed restart of select lithium salvage operations. Completed Lithium Processing Facility CD-1 package and transitioned to preliminary design activities.
- Completed Lithium Homogenization Technical Readiness Assessment (TRL)-6.
- Completed Lithium Thermal Decomposition and Distillation TRL-6.
- Developed Lithium Infrastructure Implementation Plan for recapitalization and risk reduction for Building 9204-2.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Lithium Modernization $39,400,000** | **Lithium Modernization $43,795,000** | **Lithium Modernization +$4,395,000** |
| • Continue Wet Chemistry and Material Conversion operations in support of requirements.<br>• Continue to process LiH and LiD in support of deliverables.<br>• Plan and begin executing additional recapitalization of process equipment to sustain process capabilities.<br>• Plan and execute activities to reduce risk to the facility and process equipment.<br>• Plan rapid response processes for most likely operational failure modes.<br>• Continue the maturation of technologies for near term use.<br>• Continue to support LPF capital acquisition. | • Complete Wet Chemistry and Material Conversion operations in support of requirements.<br>• Continue to process LiH and LiD in support of deliverables.<br>• Continue additional recapitalization of process equipment to sustain process capabilities.<br>• Continue to plan and execute activities to reduce risk to the facility and process equipment.<br>• Plan rapid response processes for most likely operational failure modes.<br>• Continue the maturation of technologies for near term use.<br>• Continue to support LPF capital acquisition. | • Increase 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 it is expanding capacity to meet increased national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating tritium-producing burnable absorber rods (TPBAR) 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, 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 national security. The DUE program provides unobligated, low-enriched uranium (LEU) for tritium production by managing existing uranium stocks and downblending highly enriched uranium (HEU) declared excess to national security needs. LEU inventories identified by the DUE program will sustain tritium production through 2044, at which point the United States 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 national security needs.

**Tritium and Domestic Uranium Enrichment**
**Tritium Sustainment and Modernization**

**Description**

The Tritium Sustainment and Modernization Program operates the national capability for producing tritium and it is expanding capacity to meet increased national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating TPBARs in the Watts Bar Nuclear Plant Unit 1 nuclear power reactor operated by the Tennessee Valley Authority (TVA), during normal 18-month operating cycles. The tritium inventory is required 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 2022 Budget Request**

- Execute additional component procurements and TPBAR assemblies to satisfy increased production requirements.
- Commence irradiation of 1,792 TPBARs in WBN1 Cycle 18, complete irradiation of 544 TPBARs in WBN2 Cycle 04, and commence irradiation of a minimum of 864 TPBARs in WBN2 Cycle 05.
- Proceed with implementation of tritium production assurance, including advanced mitigation planning for extended reactor outages.
- Conduct six extractions at the Tritium Extraction Facility (TEF), beginning the ramp-up to full operations mode.
- Maintain a purified tritium supply and enable delivery of tritium for national security needs.
- Disposition helium-3 byproduct for U.S. government needs.
- Execute process system sustainment plan (PSSP) to refurbish or replace tritium processing equipment.
- Execute research and development (R&D) activities supporting extraction, recycle and recovery, risk mitigation activities, and technology maturation efforts.
- Provide Other Project Cost (OPC) funding for the Tritium Finishing Facility line-item project.

**FY 2020 Accomplishments**

- Completed irradiation of 1,584 TPBARs in Cycle 16 in WBN1 reactor and commenced irradiation of 1,792 TPBARs in Cycle 17.
- Completed extraction of 300 TPBARs at the TEF, procured one waste cask, refurbished and leak tested a second waste cask, and dispositioned four extracted consolidation containers.
- Completed 90 percent design review for high-capacity TPBAR Transport Cask.
- Upgraded MTAGS 2.0 for coated cladding inspection equipment to increase throughput and certify coated cladding specifications.
- Complete production assurance report on program uncertainties and assessment of risk mitigation alternatives for long term reactor outages.
- Completed Post Irradiation Examination of two surveillance TPBARs, evaluating pellets from two suppliers.
- Began post-irradiation examination of TMIST-3A to characterize pellet materials.
- Led Tritium Science Program studies at multiple DOE labs.
- Recovered and recycled tritium to meet NNSA requirements and managed helium-3 byproduct to not impact Gas Transfer System (GTS) mission.
- Completed regeneration 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 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Tritium Modernization $312,109,000** | **Tritium Modernization $349,036,000** | **Tritium Modernization +$36,927,000** |
| • Address technical issues for increasing TPBAR production and NRC licensing actions. Support WBN core design and core performance analysis.<br>• Received NRC approval for the LAR to implement BELOCA evaluation methodology for Watts Bar Units 1 and 2 tritium production.<br>• Started fabrication of 1,792 TPBARs for WBN1 Cycle 18 and a minimum of 864 TPBARs for WBN2 Cycle 05.<br>• Continue Cycle 17 irradiation of 1,792 TPBARs and loaded 544 TPBARs at WBN2 for Cycle 04.<br>• Conducted five TPBAR shipments to the TEF<br>• Continue design of TPBAR transportation cask and finalize performance work statement for transportation services.<br>• Conduct five extractions at the TEF and procure additional waste casks.<br>• 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.<br>• Recover, recycle, and purify tritium and disposition helium-3 byproduct.<br>• Execute process system sustainment plan activities.<br>• Execute R&D activities to reduce and mitigate risk to extraction and recycle and recovery activities. | • Address technical issues for increasing TPBAR production and NRC licensing actions. Support WBN core design and core performance analysis.<br>• Complete fabrication of 1,792 TPBARs for WBN1 Cycle 18 and a minimum of 864 TPBARs for WBN2 Cycle 05.<br>• Complete Cycle 04 irradiation of 544 TPBARs and load 1,792 TPBARs at WBN1 for Cycle 18.<br>• Investigate the feasibility of using > 5.0% (GT5) enriched uranium fuel in WBN to enhance tritium production.<br>• Conduct five TPBAR shipments to the TEF. Ship low-level hardware waste to NNSS.<br>• Conduct six extractions at the TEF and continue preparations to staff full operations with cleared and trained staff.<br>• Procure additional TPBAR Extraction Furnace to ensure availability of a spare at TEF.<br>• 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.<br>• Maintain a purified tritium supply and enable delivery of tritium for national security needs.<br>• Disposition helium-3 byproduct for U.S. government needs.<br>• Execute process system sustainment plan (PSSP) activities.<br>• Execute research and development (R&D) activities supporting extraction, recycle and | • Fund component procurements and TPBAR assemblies to satisfy increased production requirements.<br>• Fund additional fuel and irradiation fees for the increased numbers of TPBARs.<br>• Implement Spent Fuel Pool critical investments to support increased numbers of TPBARs.<br>• Provide increased production assurance and implement preferred option(s) for low probability, but high consequence risks.<br>• Continue ramp-up to full operations at TEF by increasing number of operators, recapitalization, and maintenance activities. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | recovery, risk mitigation activities, and technology maturation efforts.<br>• Provides Other Project Cost (OPC) funding for the Tritium Finishing Facility line-item project. | |

## 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 supply of enriched uranium to meet long-term needs. First, NNSA seeks to ensure and extend availability of its unobligated LEU fuel supply, including down-blending HEU declared excess to national security needs to extend the need date for unobligated LEU fuel for tritium production to 2044. Second, DUE is preserving and advancing uranium enrichment expertise and technology to meet current and future U.S. government needs. Third, DUE is executing the acquisition process to re-establish a long-term supply of enriched uranium to support future U.S. national security needs.

**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 2022 Budget Request**

- Continue down-blending of highly enriched uranium (HEU) from the uranium inventory to provide low enriched uranium (LEU) fuel for tritium production.
- Continue to seek and secure additional sources of unobligated enriched uranium to support the tritium production mission.
- 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.

**FY 2020 Accomplishments**

- Continued down-blending campaign, which successfully delivered unobligated LEU on schedule.
- Secured additional unobligated LEU held at the Portsmouth, OH cleanup site, which provided an additional 1.5 reloads and extended the need date for LEU fuel for tritium production to 2044.
- Successfully tested a small centrifuge design at Oak Ridge National Laboratory in a demonstration cascade on uranium gas.
- 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 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Domestic Uranium Enrichment $70,000,000** | **Domestic Uranium Enrichment $139,981,000** | **Domestic Uranium Enrichment +$69,981,000** |
| • Continue down-blending campaign to extend the need date for LEU fuel for tritium production to 2044.<br>• Work to identify additional sources of unobligated enriched uranium to support the tritium production mission.<br>• Continue to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs.<br>• Continue the acquisition process for a domestic uranium enrichment capability. | • Continue down-blending campaign to extend the need date for LEU fuel for tritium production.<br>• Continue to seek and secure additional sources of unobligated enriched uranium to support the tritium production mission.<br>• Continue to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs.<br>• Continue the acquisition process for a domestic uranium enrichment capability.<br>• Begin design activities for an enrichment technology pilot plant, if appropriate. | • Reflects the consolidation of HEU Downblend funding under the Domestic Uranium Enrichment funding line in FY 2022. |

## Tritium and Domestic Uranium Enrichment
## HEU Downblend

**Description**

The HEU Downblend program is described under the previous section, Domestic Uranium Enrichment.

**Highlights of the FY 2022 Budget Request**

- HEU Downblend funding is requested under the Domestic Uranium Enrichment funding line in FY 2022.

**FY 2020 Accomplishments**

- Continued HEU Downblend campaign to extend the need date for LEU fuel for tritium production.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **HEU Downblend $90,000,000** | **HEU Downblend $0** | **HEU Downblend -$90,000,000** |
| • Continued HEU Downblend campaign to extend the need date for LEU fuel for tritium production. | • HEU Downblend funding requested under Domestic Uranium Enrichment budget line in FY 2022. | • HEU Downblend funding requested under the Domestic Uranium Enrichment funding line in FY 2022. |

## Tritium and Domestic Uranium Enrichment
## Uranium Reserve

**Description**

The Department of Energy, Office of Nuclear Energy (DOE/NE), in coordination with NNSA, is working to develop and implement the Uranium Reserve program in FY 2021. DOE/NE and NNSA are planning to establish a uranium reserve by procuring uranium and conversion services for that uranium, storing the domestically produced natural uranium hexafluoride ($UF_6$) at commercial facilities in the United States, and developing governance processes and criteria for the material's end use. No funds are requested for this program in FY 2022.

**Highlights of the FY 2022 Budget Request**

- Funding for the Uranium Reserve is not requested for FY 2022.

**FY 2020 Accomplishments**

- None. The Uranium Reserve was a new program in FY 2021.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Uranium Reserve $75,000,000** | **Uranium Reserve $0** | **Uranium Reserve -$75,000,000** |
| • As directed by Congress, NNSA is working with the DOE Office of Nuclear Energy to develop a plan for the Uranium Reserve. | • No funding requested for FY 2022. | • Funding for the Uranium Reserve is not requested for FY 2022. |

## 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 are a significant portion of the costs for the Life Extension Programs due to the number of parts, complexity, and testing of the warhead. 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 nuclear security enterprise to manufacture stockpile components in 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 and implementation of an assurance system model for COTS parts to avoid delays in weapons modernization programs.
7. Development of new materials and technologies to replace those at risk due to obsolescence, discontinuation, scarceness, unavailability, or usability issues.
8. Other Project Cost (OPC) activities for line items that will modernize production of non-nuclear components.

**Highlights of the FY 2022 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.
- Refurbish 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.
- Continue development and implementation of an assurance system model for COTS parts to avoid delays in weapons modernization programs.
- Implement an enterprise-wide effort for early identification of at-risk-materials and development of solutions to avoid mission supply chain interruptions.
- Develop thermal spray production capability needed for the W87-1 and future systems.

**FY 2020 Accomplishments**

- N/A: Non-Nuclear Capability Modernization was a new program in FY 2021.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Non-Nuclear Capability Modernization**<br>**$107,137,000** | **Non-Nuclear Capability Modernization**<br>**$144,563,000** | **Non-Nuclear Capability Modernization**<br>**+$37,426,000** |
| • Modernize environmental testing, power source production, and trusted radiation-hardened microelectronics capabilities at SNL.<br>• Study process improvements to reduce manufacturing costs across the enterprise.<br>• Expand manufacturing capability at KCNSC to address increased capacity needs due to increased LEP requirements.<br>• Develop and began implementation of an assurance system model for COTS parts to avoid delays in weapons modernization programs.<br>• Begin enterprise-wide efforts to identify and resolve materials-at-risk issues. | • Further expands manufacturing capability at KCNSC to address increased capacity needs due to increased LEP requirements.<br>• Adds OPC funding for the Heterogeneous Integration Facility line-item project.<br>• Continues OPC funding for the Non-Nuclear Component Capacity and the Power Source Capability projects.<br>• Adds funding to develop thermal spray production capability for the W87-1 and future systems.<br>• Continues to modernize environmental testing, power source development, and trusted radiation-hardened microelectronics capabilities at SNL.<br>• Continues studies of process improvements to reduce manufacturing costs across the enterprise.<br>• Continues implementation of an assurance system model for COTS parts to avoid delays in weapons modernization programs.<br>• Continues enterprise-wide efforts to identify and resolve materials-at-risk issues. | Increase is due to:<br>• Significant growth in equipment procurements at KCNSC.<br>• Added support to develop thermal spray production capability for the W87-1 and future systems.<br>• Added programmatic line item OPCs for the Heterogenous Integration Facility line-item project.<br>• Support for the Non-Nuclear Component Capacity and Power Sources Capability projects.<br>• Support for the at-risk materials efforts.<br>• Funding of equipment for the neutron generator and power sources facilities at SNL.<br>• Support for implementation of an assurance system model for COTS parts to avoid delays in weapons modernization programs. |

## Production Modernization
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 215,358 | 300,828 | 340,417 | +39,589 |
| Minor Construction | N/A | N/A | 24,173 | 65,625 | 36,377 | -29,248 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **239,531** | **366,453** | **376,794** | **+10,341** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 84,611 | 86,472 | 88,374 | +1,902 |
| TRU Waste Glovebox Project, LANL | 17,843 | 0 | 2,719 | 6,599 | 6,080 | -519 |
| Foundry Upgrades Parts Staging (Previously Foundry Upgrades Phase 3), LANL | 14,636 | 0 | 2,390 | 4,381 | 2,171 | -2,210 |
| Hot Inspection (Dimensional Inspection Box) (Previously Hot Inspection Phase 2), LANL | 7,085 | 2,602 | 2,000 | 1,000 | 1,483 | +483 |
| Final Machining #2 (Previously T-Base #1 Replacement), LANL | 14,355 | 0 | 1,870 | 2,833 | 4,171 | +1,338 |
| Subassembly Installation, LANL | 28,893 | 0 | 0 | 6,742 | 2,280 | -4,462 |
| Cleaning Line Installation, LANL | 18,547 | 0 | 0 | 3,824 | 1,917 | -1,907 |
| Machining XB (90%), LANL | 9,009 | 0 | 0 | 0 | 1,246 | +1,246 |
| Cold Assembly Phase I, LANL | 8,574 | 0 | 0 | 1,868 | 1,442 | -426 |
| Immersion Density, LANL | 6,020 | 3,423 | 0 | 1,586 | 1,011 | -575 |
| LW Expansion Phase II, LANL | 5,603 | 0 | 0 | 0 | 1,432 | +1,432 |
| AQ-Chloride Recovery Upgrades Phase 1, LANL | 28,629 | 3,000 | 0 | 1,246 | 2,917 | +1,671 |
| Metal Recovery System, LANL | 26,464 | 0 | 0 | 0 | 2,700 | +2,700 |
| Disassembly Lathe , LANL | 10,752 | 0 | 0 | 0 | 1,022 | +1,022 |
| Heat Treat (90%), LANL | 9,269 | 0 | 0 | 1,568 | 1,750 | +182 |
| Cold Assembly Phase 2, LANL | 24,075 | 0 | 0 | 0 | 3,501 | +3,501 |
| CNC Lathe (90%), LANL | 26,302 | 3,224 | 270 | 1,759 | 2,548 | +789 |
| Machining Parts Staging #1 (Previously Machining (Parts Staging)), LANL | 20,078 | 0 | 3,350 | 2,531 | 3,540 | +1,009 |
| Machining Parts Staging #2, LANL | 12,190 | 0 | 0 | 0 | 1,011 | +1,011 |
| Foundry Immersion Density, LANL | 8,389 | 0 | 2,436 | 1,394 | 2,065 | +671 |
| Coordinate Measurement Machine #2, LANL | 23,334 | 14,435 | 0 | 6,798 | 1,200 | -5,598 |
| Upgrade Drill & Press Operation and Glovebox (Previously Install new drill & press operation and glovebox), LANL | 6,954 | 0 | 691 | 807 | 1,271 | +464 |

| | (Dollars in Thousands) | | | | | |
|---|---|---|---|---|---|---|
| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
| Turnings Consolidation glovebox (Previously Install new turnings consolidation glovebox), LANL | 9,452 | 0 | 991 | 1,157 | 1,823 | +666 |
| Install Entry Hood transfer box for Pyro Line, LANL | 5,397 | 0 | 850 | 2,684 | 1,863 | -821 |
| Microscopy Upgrades Project (MUP) (Previously Microprobe - TA-55), LANL | 12,432 | 3,000 | 2,000 | 7,432 | 0 | -7,432 |
| Basement Radiography Upgrades, LANL | 6,830 | 0 | 1,400 | 4,419 | 1,011 | -3,408 |
| Aqueous Nitrate Evaporator Upgrades (Prevously AQ-Nitrate Upgrades), LANL | 8,012 | 0 | 0 | 1,049 | 1,079 | +30 |
| Aqueous Nitrate Cement Fixation Upgrades, LANL | 8,012 | 0 | 0 | 1,049 | 1,079 | +30 |
| PPCW (Positive Pressure Chilled Water Upgrades) (Previously Chilled Water and Compressed Air), LANL | 5,371 | 0 | 0 | 2,289 | 1,347 | -942 |
| Process Compressed Air Upgrades (PCA), LANL | 9,442 | 0 | 0 | 3,966 | 2,772 | -1,194 |
| Electron-Beam Welder #2, LANL | 19,094 | 0 | 0 | 0 | 2,917 | +2,917 |
| Second Downdraft Room, LANL | 22,669 | 0 | 0 | 2,833 | 3,058 | +225 |
| Cold Assembly Containment, LANL | 6,723 | 0 | 0 | 0 | 1,109 | +1,109 |
| TIMS #3 into RLUOB, LANL | 9,084 | 0 | 0 | 1,057 | 2,315 | +1,258 |
| DAF Glovebox Exhaust System, LLNL | 9,700 | 0 | 0 | 0 | 1,000 | +1,000 |
| Pit Certification support gloveboxes, LLNL | 7,100 | 0 | 0 | 0 | 1,100 | +1,100 |
| Electrical System Distribution Upgrades, LANL | 6,867 | 0 | 0 | 1,416 | 1,459 | +43 |
| Foundry Upgrades Phase 2 (GB#3), LANL | 9,573 | 0 | 0 | 1,700 | 2,334 | +634 |
| Room 126 MR&R Upgrade, LANL | 22,873 | 2,213 | 7,550 | 8,388 | 4,722 | -3,666 |
| Third Turning Center, LANL | 25,131 | 0 | 0 | 0 | 2,699 | +2,699 |
| PF-4 nuclear material vault storage upgrade, LANL | 6,500 | 0 | 1,000 | 3,000 | 2,500 | -500 |
| PF-4 Motor Control Center 611 & 612 Revitalization, LANL | 7,400 | 0 | 1,000 | 3,400 | 3,000 | -400 |
| AQ-Nitrate Recovery Upgrades (Previously Oxide Roast Glovebox), LANL | 6,000 | 750 | 850 | 1,300 | 2,000 | +700 |
| Environmental Test Capability, LANL | 21,388 | 0 | 0 | 0 | 797 | +797 |
| Size Reduction Press GB Installation, LANL | 13,815 | 0 | 0 | 2,355 | 1,460 | -895 |
| Electrorefining Line MC&A GB, LANL | 6,129 | 0 | 0 | 679 | 3,368 | +2,689 |
| New Pressure Test Glovebox, LANL | 5,001 | 0 | 563 | 638 | 975 | +337 |
| D&D Bostomatic, LANL | 8,000 | 1,405 | 1,980 | 3,300 | 1,315 | -1,985 |
| Manufacturing Modernization Project (MMP), LANL | 32,768 | 14,481 | 2,145 | 4,836 | 4,633 | -203 |
| Insensitive High Explosive Qualification Capability Recapitalization, LLNL | 8,441 | 0 | 0 | 3,473 | 3,700 | +227 |
| DUF4 Conversion Line, PPPO | 57,000 | 12,000 | 4,780 | 20,000 | 20,220 | +220 |
| Replace Three 5-Axis Mills, 12-121, PX | 14,870 | 0 | 3,000 | 6,870 | 5,000 | -1,870 |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| KLA2367 Bright Field Inspection Tool, SNL | 7,404 | 0 | 0 | 7,404 | 0 | -7,404 |
| Polymide Track & Oven (T&O), SNL | 5,000 | 0 | 0 | 5,000 | 0 | -5,000 |
| High Current Ion Implanter, SNL | 6,165 | 0 | 0 | 0 | 6,165 | +6,165 |
| Solvent Spray System, SNL | 6,260 | 0 | 0 | 0 | 6,260 | +6,260 |
| Rapid Thermal Annealing (RTA) Tool, SNL | 5,000 | 0 | 0 | 0 | 5,000 | +5,000 |
| Oxide CMP AMAT Mirra MESA, SNL | 5,220 | 0 | 0 | 0 | 1,000 | +1,000 |
| Production Plating System, SNL | 5,000 | 0 | 0 | 0 | 1,000 | +1,000 |
| SCREEN SU-2000 Backside Clean, SNL | 5,500 | 0 | 0 | 0 | 1,000 | +1,000 |
| Thermal Spray Research Lab Capability, SNL | 8,600 | 0 | 0 | 0 | 2,000 | +2,000 |
| Tritium Extraction Facility Spare Furnace, SRS | 24,000 | 0 | 0 | 0 | 24,000 | +24,000 |
| Calciner, Y-12 | 107,817 | 44,253 | 27,462 | 27,000 | 8,555 | -18,445 |
| Front Loading Furnace, Y12 (Formerly Machine Chip Processing Furnace 1), Y-12 | 20,200 | 13,300 | 3,900 | 3,000 | 0 | -3,000 |
| Bottom Loading Furnace, Y12[a] | 117,000 | 1,700 | 14,200 | 7,700 | 15,200 | +7,500 |
| Electrorefining, Y-12 | 101,000 | 59,507 | 29,934 | 10,421 | 1,138 | -9,283 |
| Rolling Mill Controller, Y-12 | 8,597 | 0 | 315 | 2,501 | 5,781 | +3,280 |
| Service Hood System, Y-12 | 7,645 | 3,000 | 4,000 | 645 | 0 | -645 |
| Bldg. 9998 Vacuum Induction Melt (VIM) Furnace, Y-12 | 11,670 | 0 | 2,286 | 6,715 | 1,566 | -5,149 |
| Direct Casting Production Furnace, Y-12 | 163,508 | 0 | 0 | 3,149 | 3,915 | +766 |
| Bldg. 9215 UCl3 STAR, Y-12 | 7,500 | 0 | 0 | 1,500 | 3,000 | +1,500 |
| Special Materials Production Initial Capability (Previously Special Materials Facility Initial Capability), Y-12 | 15,000 | 10,500 | 4,500 | 0 | 0 | 0 |
| Bldg. 9204-2E Break/Sample Capability, Y-12 | 6,500 | 0 | 0 | 2,500 | 4,000 | +1,500 |
| 2nd Large Vacuum Induction Melt (VIM) Furnace, Y-12 | 8,500 | 0 | 0 | 0 | 6,000 | +6,000 |
| DUM Foundry Nitric Acid Tank Installation, Y-12 | 15,500 | 0 | 0 | 0 | 5,500 | +5,500 |
| DUM A2 Wing New Weldbox Installation, Y-12 | 30,800 | 0 | 0 | 0 | 5,800 | +5,800 |
| DUM Rolling Mill Controller Installation, Y-12 | 9,306 | 0 | 315 | 2,595 | 2,500 | -95 |
| DUM Rolling Building 9215 High Temperature Salt Bath 350B Installation, Y-12 | 9,000 | 0 | 0 | 0 | 6,000 | +6,000 |
| DUM Rolling Annealing Furnace Installation, Y-12 | 16,250 | 0 | 0 | 0 | 1,250 | +1,250 |
| DUM Salt Pump System, Y-12 | 9,000 | 0 | 0 | 0 | 6,000 | +6,000 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **215,358** | **300,828** | **340,417** | **39,589** |

[a] This project was moved from Stockpile Research, Technology, and Engineering to Production Modernization in FY 2021.

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 10,059 | 10,280 | 10,506 | +226 |
| Establish IT Production Infrastructure @ TA-55, LANL | 6,500 | 0 | 1,000 | 1,500 | 2,000 | +500 |
| Shipping & Receiving (Exterior), LANL | 12,500 | 0 | 0 | 2,800 | 9,700 | +6,900 |
| Positive Personal Identity Verification (PPIV) Booth Capacity (East Entry Control Facility), LANL | 12,000 | 0 | 0 | 12,000 | 0 | -12,000 |
| DAF Deployment Project, NNSS | 6,378 | 0 | 0 | 2,984 | 3,394 | +410 |
| 12-64 Bays 11, 12 & 15 Replacement Facilities, PX | 5,283 | 0 | 0 | 0 | 1,300 | +1,300 |
| 12-44, Cell 8, PX | 8,000 | 0 | 1,150 | 3,873 | 2,977 | -896 |
| Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation, SNL | 12,000 | 0 | 1,100 | 10,900 | 0 | -10,900 |
| TCAP Restoration Column A, SR | 6,000 | 0 | 0 | 1,300 | 4,700 | +3,400 |
| PPtF Utility Upgrade (Previously Equipment Demolition and Removal Phase 2 9225-3), Y-12 | 9,000 | 0 | 0 | 9,000 | 0 | -9,000 |
| PPtF Demolition (Previously 9225-3 Process Support), Y-12 | 9,500 | 0 | 0 | 9,500 | 0 | -9,500 |
| 9212 Decon/ Sort & Seg Facility, Y-12 | 9,656 | 3,804 | 4,364 | 1,488 | 0 | -1,488 |
| Bldg. 9995 Uranium Area Project Room 159, Y-12 | 6,500 | 0 | 6,500 | 0 | 0 | 0 |
| Building 9215 Complex Integration with Bottom Loading Furnace, Y-12 | 18,400 | 0 | 0 | 0 | 1,800 | +1,800 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **24,173** | **65,625** | **36,377** | **-29,248** |
| **Total, Capital Summary** | **N/A** | **N/A** | **239,531** | **366,453** | **376,794** | **10,341** |

**Production Modernization**
**Construction Project Summary**

(Dollars in Thousands)

| | Total | Prior Years[a] | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **21-D-512, Plutonium Pit Production Project, LANL** | | | | | | |
| Total Estimated Cost (TEC) | 3,491,000 | 0 | 0 | 196,000 | 310,000 | +114,000 |
| Other Project Cost (OPC) | 404,000 | 5,000 | 55,000 | 30,000 | 40,000 | +10,000 |
| **Total Project Cost, 21-D-512, Plutonium Pit Production Project, LANL** | **3,895,000** | **5,000** | **55,000** | **226,000** | **350,000** | **+124,000** |
| **21-D-511, Savannah River Plutonium Processing Facility, SRS** | | | | | | |
| Total Estimated Cost (TEC) | 3,792,787 | 0 | 0 | 241,896 | 425,000 | +183,104 |
| Other Project Cost (OPC) | 797,213 | 91,313 | 219,900 | 110,000 | 50,000 | -60,000 |
| **Total Project Cost, 21-D-511, Savannah River Plutonium Processing Facility, SRS** | **4,590,000** | **91,313** | **219,900** | **351,896** | **475,000** | **+123,104** |
| **Total All Construction Projects** | | | | | | |
| Total Estimated Cost (TEC) | 3,792,787 | 0 | 0 | 437,896 | 735,000 | 114,000 |
| Other Project Cost (OPC) | 797,213 | 96,313 | 274,900 | 140,000 | 90,000 | +10,000 |
| **Total Project Cost (TPC) All Construction Projects** | **4,590,000** | **96.313** | **274,900** | **577,896** | **825,000** | **+247,104** |

[a] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.

**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 2022 request for the Los Alamos Plutonium Pit Production Project (LAP4) is $350,000K. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

LAP4 includes the procurement of equipment and systems to support a baseline production increase from 10 plutonium pits per year (ppy) at LANL to not less than 30 ppy, and to provide equipment and infrastructure necessary to support the reliable and timely provision of strategic weapons systems' primary components to strategic defense missions.

Critical Decision (CD)-1, Approve Alternative Selection and Cost Range, was approved April 27, 2021 with a cost range of $2.7B - $3.9B.

The project is supported by the Plutonium Pit Production Analysis of Alternatives (AoA), completed in October 2017, and the Plutonium Pit Production Engineering Assessment (EA), completed in April 2018.

**Significant Changes:**

The project established cost and schedule ranges during FY 2021. FY 2022 funds will be used to continue design, demolition and site preparation activities, and to execute long-lead equipment procurements.

A Federal Project Director has been assigned to the project.

**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 |
| FY 2022 | 11/25/2015 | 4Q FY2020 | 04/27/2021 | 2Q FY2023 | 1Q FY2023 | 2Q FY2023 | 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** – N/A
**CD-4** – Approve Start of Operations or Project Closeout

| Fiscal Year | Performance Baseline Validation | CD-3A |
|---|---|---|
| FY 2022 | 2Q FY2023 | 2Q FY2022 |

**CD-3A** – Approve Long-Lead Procurement[a]

**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 | N/A | 30,000 | 226,000[b] |
| FY 2022 | 456,000 | 3,035,000 | 3,491,000 | 404,000 | N/A | 404,000 | 3,895,000[c] |

**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 increases 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 a critical need for training infrastructure, which is included in this project. Increased ingress and egress of production personnel is also essential, and this project includes a new personnel access point/facility into Technical Area 55, which encloses the plutonium facilities. Other infrastructure upgrades necessary to support pit production goals have been identified, and will be acquired by other means, and are not be included in the LAP4 project.

The LAP4 project is composed of the three major scope initiatives below. The project will further identify and refine project scope and subproject strategies to optimize project schedule. The next version of this data sheet will reflect the planned use of subprojects for execution.

1) **D&D –** Deactivation and Decommissioning - Demolition and decontamination of enclosures and programmatic equipment in PF-4 in preparation for installation of pit production equipment
2) **Equipment –** LANL Pu Pit Production Project Equipment Installation for 30 ppy – PF-4 pit production enclosures and programmatic equipment procurement and installation to support pit production capacity of at least 30 ppy. Includes long-lead procurements.
3) **Infrastructure –** Site and Facilities for Training and TA-55 Access – A new pit production training facility containing cold lab, classrooms, auditorium, and office space in the vicinity of TA-55. A new Entry Control Facility along the west Perimeter Intrusion, Detection, Assessment, and Delay System (PIDADS) for increased personnel access to TA-55.

**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. An Analysis of Alternatives (AoA) was

[a] Long-lead procurements for planned subproject baselines will be defined and requested following the CD-1 approval.
[b] The project cost history amounts for FY 2021 reflected only funding requested in that budget year; TPC is not indicative of the total project cost.
[c] The TPC reflects the top of the CD-1 cost range.

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 Chairwoman of the Nuclear Weapons Council provided written certification to Congress regarding the NNSA's recommended alternative on May 4, 2018. 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 ppy.

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 independent reviews of design and construction for LAP4.

**Preliminary Key Performance Parameters (KPPs)**

The KPPs represent the minimum acceptable performance that the project must achieve. Preliminary Key Performance Parameters were developed as part of the CD-1 approval and will be finalized for CD-2 approval.

| Preliminary Key Performance Measures |
|---|
| PF-4 D&D: Complete turnover, to facility operations, of the space and infrastructure of D&D items in PF-4 identified in the LAP4 Program Requirement Document (PRD), Appendix B. |
| PF-4 D&D: Complete disposition and removal of decommissioned, demolished and removed equipment waste, from TA-55 under LAP4. |
| 30 ppy Base Equipment: Complete Equipment Hot Testing and turnover of 11 – 30 ppy equipment and systems necessary to achieve a 30 ppy base capacity in PF-4 and Sigma. |
| 30 ppy Reliable Equipment: Complete Equipment Hot Testing and turnover of all 30 ppy reliable equipment and systems identified in the LAP4 PRD, Appendix B, to Weapons Production for initiation of Process Prove-in activities. |
| LAP4 Infrastructure: Training and Development Center, and TA-55 Entry Control facilities will receive beneficial occupancy to allow operations. |

**3. Financial Schedule**

The TPC reflects the top of the CD-1 cost range.

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

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |

| | | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|---|
| | FY 2021 | 116,900 | 116,900 | 115,000 |
| | FY 2022 | 250,000 | 250,000 | 235,000 |
| | Outyears | 89,100 | 89,100 | 106,000 |
| | **Total Design** | **456,000** | **456,000** | **456,000** |
| | Construction | | | |
| | FY 2021 | 79,100 | 79,100 | 20,000 |
| | FY 2022 | 60,000 | 60,000 | 45,000 |
| | Outyears | 2,895,900 | 2,895,900 | 2,970,000 |
| | **Total Construction** | **3,035,000** | **3,035,000** | **3,035,000** |
| | **Total Estimated Costs (TEC)** | | | |
| | FY 2021 | 196,000 | 196,000 | 135,000 |
| | FY 2022 | 310,000 | 310,000 | 280,000 |
| | Outyears | 2,985,000 | 2,985,000 | 3,076,000 |
| | **Total TEC** | **3,491,000** | **3,491,000** | **3,491,000** |
| **Other Project Costs (OPC)** | | | | |
| | FY 2019 | 5,000 | 5,000 | 0 |
| | FY 2020 | 55,000[a] | 55,000 | 38,000 |
| | FY 2021 | 30,000 | 30,000 | 40,000 |
| | FY 2022 | 40,000 | 40,000 | 45,000 |
| | Outyears | 274,000 | 274,000 | 281,000 |
| | **Total OPC** | **404,000** | **404,000** | **404,000** |
| **Total Project Costs (TPC)** | | | | |
| | FY 2019 | 5,000 | 5,000 | 0 |
| | FY 2020 | 55,000 | 55,000 | 38,000 |
| | FY 2021 | 226,000 | 226,000 | 175,000 |
| | FY 2022 | 350,000 | 350,000 | 325,000 |
| | Outyears | 3,259,000 | 3,259,000 | 3,357,000 |
| **Grand Total** | | **3,895,000** | **3,895,000** | **3,895,000** |

[a] Includes funding from Plutonium Pit Production Project ($21,156K) and Plutonium Sustainment Operations ($33,844K).

**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 | 365,000 | TBD | N/A |
| Federal Design Support | 37,000 | TBD | N/A |
| Contingency | 54,000 | TBD | N/A |
| Total Design | 456,000 | TBD | N/A |
| Construction | | | |
| Site Preparation | 300,000 | TBD | N/A |
| Equipment | 154,000 | TBD | N/A |
| Construction | 2,100,000 | TBD | N/A |
| Federal Construction Support | 75,000 | TBD | N/A |
| Contingency | 406,000 | TBD | N/A |
| Total Construction | 3,035,000 | TBD | N/A |
| **Total Estimated Cost** | **3,491,000** | **TBD** | **N/A** |
| *Contingency, TEC* | *460,000* | *TBD* | *N/A* |
| **Other Project Cost (OPC)** | | | |
| OPC except D&D | | | |
| Conceptual Activities | 59,000 | TBD | N/A |
| Start-up | 294,000 | TBD | N/A |
| Contingency | 51,000 | TBD | N/A |
| **Total, OPC** | 404,000 | TBD | N/A |
| *Contingency, OPC* | *51,000* | *TBD* | *N/A* |
| **Total Project Cost** | **3,895,000** | **TBD** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | ***511,000*** | ***TBD*** | ***N/A*** |

**5. Schedule of Appropriations Requests**

(Dollars in Thousands)

| Request Year | Type | Prior Years | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Out Years | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 26,156 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,156 |
| FY 2021 | TEC | N/A | 196,000 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | OPC | N/A | 30,000 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | TPC | 26,156 | 226,000 | 350,000 | 500,000 | 450,000 | 200,000 | 200,000 | N/A | TBD |
| FY 2022 | TEC | 0 | 196,000 | 310,000 | TBD | TBD | TBD | TBD | 2,985,000 | 3,491,000 |
| | OPC | 60,000 | 30,000 | 40,000 | TBD | TBD | TBD | TBD | 274,000 | 404,000 |
| | TPC | 60,000 | 226,000 | 350,000 | TBD | TBD | TBD | TBD | 3,259,000 | 3,895,000 |

**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[a] | |
|---|---|---|---|---|
| | Previous Total Estimate | Current Total Estimate | Previous Total Estimate | Current Total Estimate |
| Operations and Maintenance | N/A | $88 | N/A | $9,800 |

**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**

Expansion of pit production capacity 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 this project. The LANL management and operating (M&O) contractor will execute design, and construction will be 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.

[a] Life cycle costs associated with this project were 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.

For infrastructure, non-nuclear design and construction will be executed via M&O-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.

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

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

**Summary**:
The FY 2022 Request for the Savannah River Plutonium Processing Facility project is $475,000K. Critical Decision (CD)-1 is expected to be approved in June 2021. 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 FY 2022 Request provides the first NNSA bottoms-up estimate aligning the scope, cost and schedule based on a 30% design complete. The final performance baseline will be established at 90% CD-2/3 approval in FY23-24. The FY 2021 Request utilized place-holder numbers that were generated for comparison purposes only for the Analysis of Alternatives (AoA).

The SRPPF project is supported by a Plutonium Pit Production 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 50 ppy by 2030. Based on information developed to support the CD-1 milestone, NNSA has determined that achieving the required 50 war reserve ppy production rate at the Savannah River Site in 2030 is not likely. Establishing required SRPPF pit production capacity as close as possible to 2030 remains a high priority and is required for sustaining the effectiveness of the Nation's nuclear deterrent. Further design activities conducted in support of CD-2 will identify multiple opportunities to achieve required production capacity closer to 2030.

The scope, cost and schedule estimates developed for the CD-1 approval package include an estimated high end of the cost range at $11.1B and a CD-4 schedule range of 1st Quarter FY 2032 to 4th Quarter FY 2035.

**Significant Changes:**
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2021 CPDS and is not a new start.
The most recent Department of Energy (DOE) approved Critical Decision (CD) for the project is CD-0. 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 Plutonium Modular Approach Mission Need Statement was revised in March 2019 for the now titled "Savannah River Plutonium Processing Facility (SRPPF)".

The FY 2021 request completed a conceptual design, began preliminary design, completed an Independent Cost Estimate and supported Independent Project Review teams. The FY 2022 request will continue design efforts that will commence following CD-1 approval. The SRPPF project will utilize lessons learned in acquisition and execution of similarly-sized nuclear projects. The SRPPF project includes:

- early long-lead and engineered procurements, including gloveboxes
- early site preparation, to include Demolition & Removal (D&R) required to prepare existing SRS facilities for SRPPF CD-2/3 design and construction activities, and
- phasing of appropriate SRPPF project work scope into smaller, related, complete and useable sub-projects, where individual "phased" sub-projects would be managed under the overall SRPPF CD-1 cost range and schedule range.

Preliminary planning has identified a multi-subproject construction execution approach. The acquisition approach will be refined as design matures. The specific scope, schedule and cost information for each sub-project will be defined in future submissions of this datasheet. Within each Subproject, where appropriate, a phasing approach will be applied that may include the following as necessary to optimize project schedule and cash flow:

- early site preparation and installation of temporary facilities / utilities necessary to enable construction mobilization, demolition and removal actions, long lead procurements, i.e., CD-3A;
- performance of independent and usable segments of Subproject scope utilizing a "phasing" tailoring strategy approach, i.e., a phased CD-2/3 and CD-4 for the independent and usable segment within the overall Subproject managed under the CD-1 cost and schedule range, prior to the final CD-2/3 and CD-4 for the overall Subproject;

Preliminary Subproject descriptions are included in Section 2. Changes in subproject and phasing strategy may be identified as design and acquisition plans mature. Initial subprojects are:

- Utilities, Site, and Infrastructure Subproject (21-D-511-01)
- Main Process Buildings Subproject (21-D-511-02)
- Administration Buildings Subproject (21-D-511-03)
- Safeguards and Security Subproject (21-D-511-04)
- Training and Operations Center Subproject (21-D-511-05)
- Long lead procurements and demolitions will be accomplished in phase CD-3A to optimize project schedule and cash flow.

In FY 2022, design and construction funding will support preliminary and final design efforts; D&R of equipment and installed commodities in 226-F; and, site preparation and installation for all temporary facilities, utilities (above and below ground) and other general temporary infrastructure necessary to support mobilization and onboarding of construction resources, storage / laydown of construction materials and equipment, shop / fabrication / work areas, etc., to support initiation of SRPPF construction activities.

Other Project Cost (OPC) funding for the Plutonium Sustainment Program was first appropriated in FY 2019 to fund continued preliminary planning. In FY 2021, OPCs were funded out of Savannah River Plutonium Operations. In FY 2022 and future requests, OPCs will be funded out of this line-item project.

A Federal Project Director has been assigned to this project.

**Critical Milestone History**

**Overall Project (21-D-511-01 through 21-D-511-05)**

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 2021 | 11/25/2015 | 4Q FY2020 | 2Q FY2021 | TBD | TBD | TBD | N/A | 4QFY2026-4Q FY2031[a] |
| FY 2022 | 11/25/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | 1QFY2032-4Q FY2035[b] |

[a] CD-4 range was based on the *Plutonium Pit Production Engineering Assessment.*

[b] CD-4 range was developed for the CD-1 package.

**Utilities, Site, and Infrastructure Subproject (21-D-511-01)**

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 2022 | 11/25/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | TBD |

**Main Process Buildings Subproject (21-D-511-02)**

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 2022 | 11/25/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | TBD |

**Administration Buildings Subproject (21-D-511-03)**

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 2022 | 11/25/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | TBD |

**Safeguards and Security Subproject (21-D-511-04)**

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 2022 | 11/25/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | TBD |

**Training and Operations Center Subproject (21-D-511-05)**

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 2022 | 11/15/2015 | 3Q FY2021 | 3Q FY2021 | TBD | TBD | TBD | N/A | TBD |

**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 | D&R CD-3A | Utilities CD-3A |
|---|---|---|
| FY 2022 | 3Q FY 2021 | 3Q FY 2021 |

**Main Process Building Subproject (21-D-511-02) Demolition and Removal (D&R) CD-3A –** Removal of equipment, partially installed commodities, and coatings from 226-F.

**Utilities, Site, and Infrastructure Subproject (21-D-511-01) CD-3A –** Site preparation and installation for all temporary facilities, utilities (above and below ground) and other general temporary infrastructure necessary to support mobilization and onboarding of construction resources, storage / laydown of construction materials and equipment, shop / fabrication / work areas, etc., to support initiation of SRPPF construction activities.

**Project Cost History**

**Overall Project (21-D-511-01 through 21-D-511-05)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2021 | $241,896 | $0 | $241,896 | $110,000 | TBD | $110,000 | $4,590,000 |
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | $11,100,000[a] |

**Utilities, Site, and Infrastructure Subproject (21-D-511-01)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

**Main Process Buildings Subproject (21-D-511-02)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

**Administration Buildings Subproject (21-D-511-03)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

**Safeguards and Security Subproject (21-D-511-04)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

**Training and Operations Center Subproject (21-D-511-05)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

**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

[a] TPC amount reflects the high end cost range developedfor the CD-1 package. Project Cost History and TEC / OPC totals will be updated following CD-1 approval.

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.

The SRPPF project has preliminarily identified the following subprojects:

**Utilities, Site, and Infrastructure Subproject (21-D-511-01**): This subproject will include: early preparation and installation for all temporary facilities, utilities (above and below ground) and other general temporary infrastructure necessary to support mobilization and onboarding of construction resources, storage / laydown of construction materials and equipment, shop / fabrication / work areas, etc., to support initiation of SRPPF construction activities; and, final site work including installation of buried utilities and a waste transfer line, demolition and removal of support buildings (temporary and some permanent), and final roadways and grading.

**Main Process Buildings Subproject (21-D-511-02):** The MPB includes design, procurement, 226-F construction, testing and start-up of structures, systems and components necessary to produce a minimum of 50 ppy.

**Administration Buildings Subproject (21-D-511-03):** The Administration Buildings Subproject will include two phased segments within the Subproject (with independent CD-2/3s and CD-4s) for design and construction of 1) a new administrative support building (ASB) and 2) a Maintenance and Construction support building, with final Subproject CD-2/3 and CD-4 being completed with design and construction of a cafeteria. This primary mission need is to provide office space for operational management and support personnel. The Administration Building will be constructed early in the project schedule to allow for housing the additional staff required to support construction. The ASB subproject will be integrated with the completion of the final phase of the Utilities, Site, and Infrastructure Subproject.

**Safeguards and Security Subproject (21-D-511-04)**: This subproject will include design and construction of entry control facilities, security fencing, and other security infrastructure.

**Training and Operations Center Subproject (21-D-511-05)**: The Training and Operations Center Subproject includes conversion of the 226-2F warehouse building into a high-fidelity training facility, both classroom and hands on equipment training.

**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.
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 selected alternative will 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. 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 independent 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] |
|---|
| **50 ppy Process and Equipment:** Complete successful Operational Readiness Review including completion of integrated Cold System Testing and turnover of all 50 ppy facility, systems and components identified in the SRPPF Program Requirements Document (PRD) to Weapons Production for initiation of hot operations Process Prove-in activities. |
| **Physical Safeguards and Security (S&S) Infrastructure:** Complete successful S&S integrated systems and components testing and project turnover in support of the 50 PPY SRPPF Process and Equipment Operational Readiness Review. |
| **Training and Operation Center (TOC):** Training and Development Center will receive beneficial occupancy approval to allow utilization by the Project for Technology maturation and operational preparations with ultimate turnover to Plutonium Operations |
| **SRPPF Infrastructure:** Administrative Support facilities will receive beneficial occupancy to support early project utilization and ultimate operations in accordance with the PRD. |

[a] These Preliminary Key Performance Parameters have been developed as part of the CD-1 package.

**3. Project Cost and Schedule**

**Financial Schedule**

SRPPF funding will be appropriated at the Overall Project level (21-D-511) and be allocated to the subprojects in the tables below.

**Overall Project (21-D-511-01 through 21-D-511-05)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | 216,896 | 216,896 | 216,896 |
| FY 2022 | 325,000 | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | 25,000[a] | 25,000 | 25,000 |
| FY 2022 | 120,000[b] | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | 241,896 | 241,896 | 241,896 |
| FY 2022 | 445,000 | TBD | TBD |
| Outyears | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |
| Other Project Costs (OPC) | | | |
| FY 2019 | 91,313 | 91,313 | 39,328 |
| FY 2020 | 219,900 | 219,900 | 143,744 |
| FY 2021 | 110,000 | 110,000 | 110,000 |
| FY 2022 | 30,000 | TBD | TBD |
| Outyears | TBD | TBD | TBD |
| **Total OPC** | **TBD** | **TBD** | **TBD** |
| **Total Project Costs (TPC)[c]** | | | |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 91,313 | 91,313 | 39, 328 |
| FY 2020 | 219,900[d] | 219,900 | 143,744 |

[a] FY 2021 Funds re-allocated from TEC design to TEC construction to support CD-3A starts in 4Q FY2021.

[b] FY 2022 TEC Design / TEC Construction split represents current best estimate and will be revised following CD-1 approval.

[c] TPC outyear funding profile is modeled after the proposed profile in the 2018 Plutonium Pit Production Engineering Assessment (EA). Outyear TEC/OPC splits represent current best estimate and will be revised following CD-1 approval.

[d] Appropriated funds shown for FY18, FY19 and FY20 were appropriated in the Plutonium Sustainment Program to support planning and design activities for the plutonium strategy.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2021 | 351,896 | 351,896[c] | 351,896[a] |
| FY 2022 | 475,000 | TBD | TBD |
| Outyears | 9,961,891 | TBD | TBD |
| **Grand Total** | **11,100,000**[b] | **TBD** | **TBD** |

**Utilities, Site, and Infrastructure Subproject (21-D-511-01)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |
| Other Project Costs (OPC) | | | |
| FY 2021 | TBD | TBD | TBD |
| Total OPC | TBD | TBD | TBD |
| **Total Project Costs (TPC)** | | | |
| FY 2021 | TBD | TBD | TBD |
| **Grand Total** | **TBD** | **TBD** | **TBD** |

[a] Values shown for FY 2021 are forecast. FY 2021 began under Continuing Resolution.

[b] This value does not represent the CD-1 approved high end of the range.

**Main Process Buildings (MEB) Subproject (21-D-511-02)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |
| Other Project Costs (OPC) | | | |
| FY 2021 | TBD | TBD | TBD |
| Total OPC | TBD | TBD | TBD |
| **Total Project Costs (TPC)** | | | |
| FY 2021 | TBD | TBD | TBD |
| **Grand Total** | **TBD** | **TBD** | **TBD** |

**Administration Buildings Subproject (21-D-511-03)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |
| Other Project Costs (OPC) | | | |
| FY 2021 | TBD | TBD | TBD |
| Total OPC | TBD | TBD | TBD |
| **Total Project Costs (TPC)** | | | |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2021 | TBD | TBD | TBD |
| **Grand Total** | **TBD** | **TBD** | **TBD** |

**Safeguards and Security Subproject (21-D-511-04)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |
| Other Project Costs (OPC) | | | |
| FY 2021 | TBD | TBD | TBD |
| Total OPC | TBD | TBD | TBD |
| **Total Project Costs (TPC)** | | | |
| FY 2021 | TBD | TBD | TBD |
| **Grand Total** | **TBD** | **TBD** | **TBD** |

**Training and Operations Center Subproject (21-D-511-05)**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Design | TBD | TBD | TBD |
| Construction | | | |
| FY 2021 | TBD | TBD | TBD |
| Total Construction | TBD | TBD | TBD |
| Total Estimated Costs (TEC) | | | |
| FY 2021 | TBD | TBD | TBD |
| **Total TEC** | **TBD** | **TBD** | **TBD** |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Other Project Costs (OPC) | | | |
| FY 2021 | TBD | TBD | TBD |
| Total OPC | TBD | TBD | TBD |
| **Total Project Costs (TPC)** | | | |
| FY 2021 | TBD | TBD | TBD |
| **Grand Total** | **TBD** | **TBD** | **TBD** |

**4. Details of Project Cost Estimate**

**Overall Project (21-D-511-01 through 21-D-511-05)**

(Budget Authority in Thousands of Dollars)

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

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| **Total, OPC** | **TBD** | **TBD** | **N/A** |
| *Contingency, OPC* | TBD | TBD | *N/A* |
| **Total Project Cost** | **$11,100,000[a]** | **$4,590,000** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | ***TBD*** | ***TBD*** | ***N/A*** |

**Utilities, Site, and Infrastructure Subproject (021-D-511-01)**

(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 |
| 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 |

[a] This value does not represent the CD-1 approved high end of the range.

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| 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*** |

**Main Process Buildings Subproject (21-D-511-02)**

(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 |
| 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 |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| **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*** |

**Administration Buildings Subproject (21-D-511-03)**

(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 |
| 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) | | | |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| 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*** |

**Safeguards and Security Subproject (21-D-511-04)**

(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 |
| 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 | | | |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| 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*** |

**Training and Operations Center Subproject (21-D-511-05)**

(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 |
| 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 |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| 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 | FY 2026 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2021 | TEC | 0 | 0 | 241,896 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| | OPC | 70,000 | 246,000 | 110,000 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| | TPC | 70,000 | 246,000 | 351,896 | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| FY2022 | TEC | 0 | 0 | 241,896 | 445,000 | TBD | TBD | TBD | TBD | TBD | TBD |
| | OPC | 91,313 | 219,900 | 110,000 | 30,000 | TBD | TBD | TBD | TBD | TBD | TBD |
| | TPC | 91,313 | 219,900 | 351,896 | 475,000 | TBD | TBD | TBD | TBD | 9,961,891 | 11,100,000[a] |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | 1Q FY2032 – 4Q FY2035 |
| O Expected Useful Life (number of years) | 50 |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | 4Q FY2085 |

[a] This value does not represent the CD-1 approved high end of the range.

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. Costs for demolition and removal of previously installed MOX equipment will be part of the Demolition and Removal Subproject.

**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 utilized a LANL subcontract with Merrick to provide the process conceptual design. The SR M&O entered into an affiliate sub-contract relationship with Fluor Inc., located in Greenville S.C., to provide design 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. The SR M&O will utilize Engineering, Procurement and Construction (EPC) sub-contractors to execute the design and construction to provide the greatest opportunity to meet program requirements. 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. 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. LANL will support the FDA by providing process requirements 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. The SR M&O contract will include Contract Line Item Numbers to execute NNSA capital line items at SR to align the applicable requirements and appropriate incentives to optimize the project execution and completion.

[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.

## Stockpile Research, Technology, and Engineering

**Overview**

The Stockpile Research, Technology, and Engineering 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; also balances the most pressing investments the nuclear security enterprise needs to meet Department of Defense warhead needs and schedules with the critical long-term research and development needed for a robust and responsive future stockpile.
2. Pursues Critical Decision-4 in FY 2025 for the Advanced Sources and Detectors Major Item of Equipment for the Enhanced Capabilities for Subcritical Experiments (ECSE) program. This is to meet the W80-4 design validation experiment as well as W87-1 program requirements for system certification with a subcritical experiment.
3. Delivers the Crossroads Phase 1 high-performance computing system for annual assessment, modernization programs, and safety and surety assessments in FY 2022; and finalizes deployment of improved Advanced Simulation and Computing software environment and computing infrastructure in FY 2022 as 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 with reduced systems costs.
5. Develops the next generation of highly-trained technical workforce able to support the National Nuclear Security Administration (NNSA) core mission, and ensures a strong academic 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 NNSA.

## Stockpile Research, Technology, and Engineering
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Stockpile Research, Technology, and Engineering** | | | | | |
| **Assessment Science** | **594,834** | **769,394** | **689,578** | **-79,816** | **-10.4%** |
| **Engineering and Integrated Assessments** | **325,134** | **337,404** | **336,766** | **-638** | **-0.2%** |
| **Inertial Confinement Fusion** | **556,508** | **575,000** | **529,000** | **-46,000** | **-8.0%** |
| **Advanced Simulation and Computing** | **767,849** | **732,014** | **747,012** | **+14,998** | **+2.0%** |
| **Weapon Technology and Manufacturing Maturation** | **222,302** | **297,965** | **292,630** | **-5,335** | **-1.8%** |
| **Academic Programs** | **86,492** | **101,912** | **95,645** | **-6,267** | **-6.1%** |
| **Total, Stockpile Research, Technology, and Engineering** | **2,553,119** | **2,813,689** | **2,690,631** | **-123,058** | **-4.4%** |

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

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Stockpile Research, Technology, and Engineering** | |
| **Assessment Science:** The decrease reflects a reallocation to higher priority NNSA programs and projects. This also includes a rebalancing within Primary Assessment Technologies to support a subcritical experiments (SCE) schedule that fully utilizes the investment in Enhanced Capabilities for Subcritical Experiments (ECSE). | **-79,616** |
| **Engineering and Integrated Assessments:** The decrease reflects the current schedule of survivability experiments supporting the FY 2023 Pegpost for Hostile Mitigation Capability and reduced high impact experiments in the Delivery Environments program. The decrease is offset by slight increases to qualification activities supporting improved methodologies, and the development of new approaches for designing, manufacturing, certification, and qualification to accelerate the nuclear weapons lifecycle process. | **-638** |
| **Inertial Confinement Fusion:** The decrease reflects the forward funding in FY 2021 for acceleration of FY 2022 scope. | **-46,000** |
| **Advanced Simulation and Computing:** The increase is based on pursuing new validated integrated design codes and advanced high-performance computing capabilities, including the El Capitan exascale system procurement. | **+14,998** |
| **Weapons Technology and Manufacturing Maturation:** The decrease reflects a reallocation to address higher priority NNSA programs and projects. The decrease to Surety Technologies and Weapon Technology Development is partially offset by an increase in Advanced Manufacturing Development to address material obsolescence and develop new manufacturing diagnostic tools, production methods, and manufacturing techniques. | **-5,335** |
| **Academic Programs:** The decrease mainly reflects a nonrecurring increase in FY 2021 to develop the National Laboratory Jobs ACCESS program. | **-6,267** |
| **Total, Stockpile Research, Technology, and Engineering** | **-123,058** |

## 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 life extension programs (LEPs), (2) the scientific insight necessary to inform our understanding of the impacts of surveillance findings to ensure 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, the development and qualification of modern materials and manufacturing processes, the exploration of concepts for component reuse, and the development of 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 security laboratories and nuclear weapons production facilities. 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 at the NNSA reside in this program. For example:

- Dynamic high- and low-Z material experiments [Z pulsed power facility (Z)]
- Hydrodynamic and subcritical experiments (Dual Axis Radiographic Hydrodynamic Test (DARHT), Contained Firing Facility (CFF), U1a Complex, proton radiography (pRad) capability at Los Alamos Neutron Science Center (LANSCE)
- Enhanced Capabilities for Subcritical Experiments (U1a Complex)
- High Energy Density (HED) experiments [National Ignition Facility (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 made up of six subprograms:

1. **Primary Assessment Technologies** provides capabilities essential for annual assessment of stockpile primaries, improvement of the nuclear explosive test modeling suite in the common model framework, 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 fundamental material behavior.

3. **Advanced Diagnostics** establishes revolutionary tools for delivering stockpile data by developing x-ray radiography and other diagnostics for future 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, validating weapons physics models through utilizing experimental platforms, improving models, expanding the nuclear explosive test modeling suite in the common model framework, and supporting evaluation of new manufacturing processes, replacement materials, and aged materials in the stockpile.
5. **Enhanced Capabilities for Subcritical Experiments** establishes a key test capability and closes a capability gap to evaluate the response of plutonium to aging, modern manufacturing techniques, modern materials, and evolving design philosophies. It also enables design certification of nuclear systems without the need for nuclear testing.
6. **Hydrodynamic and Subcritical Execution Support** provides the facilities and services required to maintain a robust testing capability that supplies critical data to weapon physicists and design engineers. This data allows assessments of potential impacts on weapon performance and safety due to design changes, material substitutions, or component changes associated with LEPs, alterations (Alts), or modifications (Mods).

**Assessment Science**
**Primary Assessment Technologies**

**Description**

Primary Assessment Technologies (PAT) provides capabilities essential for the 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 testing and revising the common framework models to quantify uncertainties. The main objective is to stress these 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 used 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 2022 and 2025, PAT will 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 to include Sub Critical Experiments (SCE), (2) experiments supporting burn studies for boost science, (3) Integrated performance and analysis focused on primary's design, construction, and function, (4) nuclear science measurements (e.g., fission cross-sections, fission yield, etc.), and (5) surface science experiments to assess corrosion phenomena.

**Highlights of the FY 2022 Budget**

- Support the design, assembly, and analysis of multiple SCEs necessary to understand the aging of plutonium relevant to ongoing modernization programs, as well as impacts of modifications and changes in materials.
- Support the development and use of platforms (Z, NIF, pRad) to enhance modeling 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 LANSCE pRad, which provides critical dynamic performance data for materials and components (new alloys, new manufacturing and processing, and aging studies). Plutonium at proton Radiography (Pu at pRad) will allow cost-effective and quick turn-around focused experiments in support of integrated experiments at Nevada National Security Site (NNSS).

**FY 2020 Accomplishments**

- Demonstrated the effect of plasma heterogeneity on bulk thermonuclear rates as part of the Marble HED campaign. The Marble experiments informed the weapons physics models and validated simulations on the effects of heterogeneous mix on thermonuclear burn.
- Implemented x-ray diffraction capability on Z, as part of 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.
- Acquired solid phase high-Z data at the highest pressure to-date using laser-compression platform on NIF to model behavior of primary materials and their responses. Data informs the common framework model and validates simulated response behavior to predict primary performance.
- Completed Resonant Ultrasound (RUS) measurements for newly cast, 10 year, and 30 year naturally aged plutonium to characterize real-time changes in the bulk and shear moduli as a function of age. The RUS data informed physical property models used in assessing the effects of plutonium aging on weapons performance.
- Developed the Kraken imager and observed ejecta collisions and resulting heating as well as heating of ejecta moving in a gas to build thermodynamic and motional mixing under relevant shock conditions at Special Technologies Laboratory

(STL). The Kraken imager will be utilized at pRad, the TA-55 and Joint Actinide Shock Physics Experimental Research (JASPER) Facility, STL, hydro firing sites, and may be considered for ECSE.

**Primary Assessment Technologies**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Primary Assessment Technologies $150,000,000** | **Primary Assessment Technologies $131,000,000** | **Primary Assessment Technologies -$19,000,000** |
| • Design and assemble experimental devices for the Nimble SCE series at U1a to advance our understanding of ejecta physics to inform material and manufacturing choices relevant to future LEPs.<br>• Conduct analysis on the complete Red Sage-Nightshade SCE series to validate new physics-based models of ejecta.<br>• Conduct experiments (2nd Flex shot, Los Alamos National Laboratory (LANL) - Sandia National Laboratories (SNL) collaboration) in support of boost science to improve the current understanding of primary performance via platforms for testing weapons design alterations.<br>• Pu at pRad: Begin hardware fabrication for IPCV final design for Pu experiments; deploy new ejecta physics diagnostics; Field High Pressure Hydrodynamics (HiPHy) implosion experiments, all to run more cost-effective, focused hydro experiments on Pu, rather than as SCE.<br>• Improve models for boost metrics through application of Deep Machine Learning, advanced radiographic analysis methods, and modeling vaporization in codes, all to better model boost. | • Develop the Montrose experimental platform for weapons physics applications.<br>• Assess the physics models for phase transition kinetics as factors in primary performance utilizing X-ray diffraction under dynamic material loading.<br>• Develop plasma transport models through a series of strongly coupled plasma experiments.<br>• Design, build prototypes, and evaluate inner containment vessel for future Pu at pRad experiments.<br>• Analyze 1$^{st}$ and 2$^{nd}$ Flex Shots for primary performance measures based on changed parameters between both.<br>• Evaluate and validate advanced ejecta physics models that include impact of defects, particle drag, and chemistry effects.<br>• Conduct HED experiments on radiation flow through rippled interface as part of ejecta studies. | • Decrease represents a reprioritization of resources to support higher priority NNSA programmatic efforts. |

## 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. 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 subprogram provides the experimental data and assessment of Special Nuclear Material (SNM), metals, conventional/insensitive high explosives (CHE/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), Aging and Lifetimes, Advanced Manufacturing Development, Plutonium Modernization, High Explosives and Energetics, DOE/Office of Science, and the Department of Defense (Joint DoD/DOE Munitions Program, (JMP)).

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 Efficient and Flexible Pit Production" and support the FY 2022 SCDS pegpost on "Assess Lifetimes and Mitigate Aging."

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 experiments on plutonium and other relevant materials, and (3) experiments on aged samples on various experimental platforms. Facilities and drivers to support experimental execution include NIF, Z, JASPER, TA-55 gas gun, High Explosives Applications Facility (HEAF), Dynamic Equations-of-State Facility (DEOS), Shock Thermodynamic Applied Research Facility (STAR), Dynamic Integrated Compression Experimental (DICE) Facility, High Pressure – Collaborative Access Team (HP-CAT), and the Dynamic Compression Sector (DCS). Additionally, for long-term certification needs, alternatives that include expanding x-ray light sources (e.g. Advanced Photon Source (APS)) to characterize high Z materials and high explosives *in situ* within appropriate physical regimes are being explored.

DMP activities include: (1) experimental execution (e.g. equation of state) on High Z materials (including actinides), (2) experiments of low Z materials (including polymers, foams, etc.), (3) experiments to qualify high explosives and energetics, (4) development of high pressure platforms and x-ray light sources to access and characterize materials at extreme conditions, and (5) advanced materials research that includes novel synthesis/formulation and processing methodologies leading to future manufacturing advances.

**Highlights of the FY 2022 Budget**

- Prioritize properties of aged Pu and replacement materials to increase confidence in stockpile performance and LEPs.
- Emphasize Tri-lab 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.
- Maintain and enhance capabilities on high pressure platforms to expand pressure, temperature, and strain rate regimes for high interest materials.
- Develop 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.

- Collaborate across Weapons Activities in areas such as aging, pit production and high explosives.
- Support SCDS pegposts in “Assess Lifetimes and Mitigate Aging” in FY 2022 and “Enabling Efficient and Flexible Pit production” in FY 2023.

**FY 2020 Accomplishments**

- Delivered plutonium data from JASPER, Z, and 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.
- Performed the first Design for Manufacturing/ Production science experiments on samples with high impurities, and sample surface defects supporting the SCDS pegpost in FY 2023. The experiments included characterization, material properties and gas gun testing.
- Executed a JASPER shock experiment on accelerated aged Pu greater than 200 years in equivalent age. JASPER continues to develop new shock-release and temperature measurement platforms, uniquely capable of measuring stockpile relevant Pu samples to assess aging and manufacturing issues.
- Delivered performance qualification data on CHE lots supporting LEPs to inform reactive burn models for the current and future stockpile.
- Performed the first stripline Pu shot on Z, achieving record pressure. The capability enables high peak pressure experiments with high accuracy measurements. This type of data is important for assessments and executing LEPs and ALTs.

**Dynamic Materials Properties**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Dynamic Materials Properties $130,981,000** | **Dynamic Materials Properties $103,075,000** | **Dynamic Materials Properties -$27,906,000** |
| • Conduct first experiments at Argonne's Advanced Photon Source (APS) under new classified operations model for future exploration of questions related to material aging and production science.<br>• 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.<br>• Pursue production science efforts in support of pit production including chemistry, defects, and casting.<br>• Develop and mature several high explosive options for the future stockpile.<br>• Conduct shock ramp and shock release experiments on plutonium at JASPER using 40 mm barrel in support of material aging.<br>• 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.<br>• Use HE pilot plant at LLNL to create batches of promising new IHE molecules and characterize performance.<br>• Additional pre-heating capabilities for Pu Experiments on Z-machine; improve containment to enable higher pressures on Z-machine, and enable access to weapons-relevant regimes to inform physics modeling. | • Execute experiment supporting aging pegpost via multiple platforms, including updating age-dependent density models and measuring equation of state of aged samples at HP-CAT.<br>• Prioritize DCS and HP-CAT operations over APS-Upgrade transition. DCS and HP-CAT are needed to provide a unique capability to interrogate high pressure/shocked materials for developing advanced material models.<br>• Provide calibration data on lots of PBX 9502 and perform scale up-synthesis of novel IHE; which allows for identifying scalable and qualified HE formulation options.<br>• Execute multi-phase strength experiments on metals to support multi-phase strength model development using multiple high-pressure platforms.<br>• Continue conducting production science experiments in chemistry and defects to evaluate performance impacts to varied parameters for pit production pegpost.<br>• Assess strength and damage models of DoD/DOE metals with experiments to support JMP model development.<br>• Demonstrate high-Z material diffraction on Z-Machine to determine material phase which leads to future improvement of EOS and aging models. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

## Assessment Science
## Advanced Diagnostics

**Description**

The Advanced Diagnostics (AD) subprogram establishes revolutionary tools for delivering stockpile data by developing x-ray radiography and other diagnostics for future 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 the Los Alamos and Lawrence Livermore National Laboratories (LANL and LLNL), by the weapons system stewardship activities, including life extension programs (LEPs), and by other subprograms in ICF and Assessment Science Programs.

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 revolutionary 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 revolutionary technologies improve the quality and reliability of scientific results at many NNSA experimental facilities at the national security laboratories and sites. These include the DARHT, the flash x-ray machine (FXR) at the CFF, the Z pulsed power facility, Cygnus at the U1a Complex, and the pRad at the LANSCE.

**Highlights of the FY 2022 Budget**

- Design and test a single stage for the prototype pulser, start linear induction accelerator (LIA) transport studies on FXR, and continue target and radiographic model development as a part of the overall maturation of the technologies 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.
- Continue to mature 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.
- Validate power flow codes on Z using the improved plasma discharge cleaning technology demonstrated and assessed in FY 2021. If this work 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 fundamental, focused, and integrated experiments, including hydrodynamic and subcritical experiments. Additionally, the Radiographic Futures Study, completed in FY 2021, will guide next generation radiography development especially since radiography continues to be a key diagnostic for weapon physics experiments. These next-generation technologies can significantly impact the development and validation of new models of materials and of physical processes by exploring new regimes and conditions not accessible with current diagnostics and through highly sensitive measurements, delivering better quality and quantity of data.

**FY 2020 Accomplishments**

- Demonstrated steady progress on diagnostics exploring power flow in high-current transmission lines, including two "first ever demonstrated" measurements. These measurements will enable validation of simulations of high current coupling for Z and for next generation high current drivers that could be used to support creation of physical environments required for the Weapons Program needs.
- Qualified the MJOLNIR pulsed power system for full stored energy. Four anodes were tested with all towers discharging into a dynamic load. The MJOLNIR experiment is a dense plasma focus neutron source used to prototype a flash neutron radiography capability that could be used for the imaging of dynamic experiments such as plutonium aging or reactivity measurements.
- Applied deep machine learning (DML) techniques to infer performance metrics from hydrodynamic and subcritical experiment radiographic data, assessing the role DML may play in the future of radiographic analysis. Modern diagnostics tied with sophisticated analysis tools, such as those employing DML, produce quality data that provide vital weapons code validation that can directly influence calculations that support assessments and certification.
- Completed bench testing for a new concept for radiographic imaging which can provide a "near continuous imaging" capability for fundamental, focused, and integral radiographic experiments. Delivery of better quality and quantity of data can significantly impact the development and validation of weapons design codes and help reduce uncertainty in the models.
- Developed a digital time-resolved spot-size diagnostic, which can replace existing streak camera systems that struggle with signal level and limited availability and can support numerous multi-channel optical detector recording systems. Delivery of better-quality data can provide rigorous tests of models and codes used by the Weapons Program, leading to increased confidence in the predictive capability of the stockpile.

**Advanced Diagnostics**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Advanced Diagnostics $35,989,000** | **Advanced Diagnostics $30,375,000** | **Advanced Diagnostics -$5,614,000** |
| • Develop conceptual designs for technologies enabling cinematographic radiography which could provide high fidelity data for hydrodynamic and sub-critical experiments.<br>• 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.<br>• 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.<br>• Complete a Radiographic Futures Study for promising approaches to long term radiography to guide development.<br>• Research and develop next-generation diagnostics, radiography, and source technologies in support of the current and future stockpile which could provide vital weapons data and code validation supporting assessments and certification.<br>• Develop and improve modeling, simulation, and analysis which could help reduce measurement uncertainties and ensure better quality data from experiments. | • Design and test a single stage for prototype pulser, start LIA transport studies, and improve models to enable cinematographic radiography, which could provide high fidelity data for hydrodynamic and sub-critical experiments.<br>• Validate power flow codes on the Z machine using improved plasma discharge cleaning technologies. These efforts may help solve energy losses on large, pulsed power platforms.<br>• Mature 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.<br>• Develop next generation radiographic technologies and techniques in support of the current and future stockpile which could provide vital weapons data and code validation supporting assessments and certification. FY 2021 Radiographic Futures Study informs this work.<br>• Research and develop next-generation diagnostics, radiography, and source technologies desired by weapon laboratories and validated by NNSA to reduce uncertainty in weapon codes and to improve imaging capabilities at existing and future facilities/experiments.<br>• Develop and improve modeling, simulation, and analysis which could help reduce measurement uncertainties and ensure better quality data from experiments. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

**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. These efforts expand the domain of validity of modeling tools and the qualified experimental platforms can be quickly repurposed to meet the needs of life extension and modernization programs, enabling responsiveness. 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. Secondary Assessment Technologies has deliverables in FY 2022 that feed into two separate SCDS pegposts, the Special Materials pegpost and the Assess Lifetimes & Mitigate Aging pegpost.

The subprogram validates the weapons physics models supporting the LEPs and modernization programs, anticipates stockpile responsiveness needs, develops new experimental platforms, continues model improvements, and expands the nuclear explosive test modeling suite in the common model framework. 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 to develop HED platforms that produce sources to be used in support of weapon outputs, effects, and performance in hostile environments. The capability to address 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. SAT research supporting these goals 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 candidates and evolving stockpile technologies for radiation hardness.

SAT has strong programmatic coupling with PAT, ICF, Engineering and Integrated Assessments, Weapons Technology and Manufacturing Maturation, and ASC. SAT has significant coupling to advanced computing platforms and resources supported by the ASC Program and to the Nuclear Survivability and Aging & Lifetimes subprograms in the Engineering and Integrated Assessments program. SAT partners with Secondary Capability Modernization in executing experiments and relevant analyses supporting physics and engineering qualification of new materials and processes needed for the modernization of stockpile secondaries.

**Highlights of the FY 2022 Budget**

- Complete the FY 2022 SCDS pegpost on Special Materials through partnership with other programs, establishing physics properties, production requirements, and demonstration of prototype production.
- Demonstrate the technology and environmental testing for an advanced material option and understand physics bounds on performance, supporting the FY 2022 SCDS Assess Lifetimes & Mitigate Aging pegpost.
- 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.
- Develop new HED platforms and diagnostics and deliver constraining data using HED experimental facilities to reduce uncertainties and increase confidence in physics modeling. Validate a radiation transport platform and an assessment of high-pressure equation-of-state platforms.

- Continue opacity efforts at NIF, Z, and Orion and work to resolve discrepancies between experiment and theory. Establish reproducibility and quantify improvements to fidelity of iron opacity data from NIF and document progress toward time-resolved iron opacity measurements on Z.

**FY 2020 Accomplishments**

- Executed and analyzed the first series of small-scale experiments in support of the FY 2021 SCDS pegpost on physics qualification for direct cast depleted uranium.
- Developed a material processing technique and demonstrated capability for a special material in support of stockpile modernization needs. In collaboration with other programs, produced a technology maturation plan for the material.
- Continued developing new HED platforms that delivered physics data in support of stockpile modernization, including a new high-temperature source to study radiation transport, complex hydrodynamics experiments to study performance impacts, and plasma equation-of-state experiments probing highest pressures achievable in a laboratory.
- Provided the first data to conclusively demonstrate the effect of plasma heterogeneity on bulk thermonuclear rates, informing models on the effects of heterogeneous mix on thermonuclear burn, with PAT.
- Developed and demonstrated a new experimental method that precisely measured the gamma-ray branching ratios in the beta decay of long-lived fission products and provided sufficiently accurate uncertainties on fission-product yields for stockpile assessment applications.
- Completed and published a benchmark analysis of high-temperature opacity data collected on Z. Continued measurements of iron opacity at NIF and reductions in background noise in NIF opacity measurements.
- Demonstrated, with Weapons Survivability and Advanced Certification and Qualification, improved yields and reproducibility of warm x-ray sources at the Z pulsed power facility, reducing the uncertainty in experimental data related to hostile survivability studies. A new capability to recover irradiated objects for post-shot analysis was developed, enabling detailed materials characterization of samples after warm x-ray experiments. These advances expand our capability to test electrical systems and materials under different x-ray environment.

**Secondary Assessment Technologies**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Secondary Assessment Technologies $84,000,000** | **Secondary Assessment Technologies $71,952,000** | **Secondary Assessment Technologies -$12,048,000** |
| • Complete the FY 2021 SCDS pegpost on Direct Cast material, execute final set of experiments, complete analyses, and report results, with Secondary Capability Modernization.<br>• Expand weapon science validation basis using studies of relevant nuclear explosive test data and off-nominal and non-stockpile designs to advance the understanding of relevant physics processes, increase confidence, and support stockpile assessments and modernization.<br>• Execute simulation studies and investigate CSA component repair, enabling refurbishment options supporting the FY 2022 SCDS Assess Lifetimes and Mitigate Aging pegpost.<br>• Advance platform design and diagnostic capabilities, and conduct experiments to address secondary performance physics questions including refining understanding of the impact of features on performance, radiation flow, opacity, and HED burn, reducing uncertainties and increase confidence in modeling.<br>• Continue developing a low-energy-density platform enabling physics assessments to aid in LEP and production modernization efforts.<br>• 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.<br>• Deliver advanced warm x-ray sources for survivability assessments and the streamline | • Complete the FY 2022 SCDS pegpost to establish physics properties and production requirements for special materials and demonstrate prototype production, with Secondary Capability Modernization.<br>• Demonstrate technology and environmental testing for advanced material options, supporting the FY 2022 SCDS Assess Lifetimes & Mitigate Aging pegpost.<br>• Advance HED platforms to address secondary performance physics questions, including an assessment of high-pressure equation-of-state platforms and experimentally validating the drive on a radiation transport platform.<br>• Launch inter-laboratory calibration effort of extinct and long-lived isotopes using historic samples. Complete initial sample exchange and measurements from at least one event.<br>• Continue opacity efforts at NIF, Z, and Orion and work to resolve discrepancies between experiment and theory.<br>• Continue analysis of fission product yield data for inclusion in nuclear data evaluations.<br>• Begin analysis of existing data and development of theoretical and numerical studies to inform development of x-ray source scaling at higher current, either at Z or for a future facility.<br>• Support experiments to assess survivability of new advanced materials needed for stockpile modernization. | • Decrease represents a reprioritization of resources to support higher priority NNSA programmatic efforts. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| outputs calculation capabilities to inform 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, 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, 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.

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) ECSE 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. Other Project Costs (OPCs) for the U1a Complex Enhancements Project are funded from the ECSE subprogram.

ASD, managed under DOE O 413.3B, designs and installs a large, multi-pulse accelerator system that will generate radiographs 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 Stockpile Stewardship Management Plan, 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 2022 Budget**

- Supports FY 2025 delivery of the ECSE capabilities. This timeline supports the W80-4 confirmation experiment and W87-1 program certification requirements.
- Continues demolition, tunneling, and installation of support services for ECSE expended subcritical experiment entombments at the U1a Complex.
- Refurbishes the U1a.03 Test Bed to support subcritical experiments that establishes a new capability in the U1a Complex to perform dynamic NDSE measurements in 6' confinement vessels.
- Procures ASD Long Lead Procurements (forgings, metglas, electronic components) and approves ASD CD-2/3, Approval of Performance Management Baseline (PMB).

**FY 2020 Accomplishments**

- Designed, tested, and successfully qualified solid-state pulsers at full voltage for ASD.
- Qualified and delivered pulsed power modules in support of the U1a.03 NDSE Dense Plasma Focus diagnostic for NDSE.
- Established the Entombment project team and aligned project deliverables with UCEP.
- Initiated engineering contract for design and construction of the U1a Complex 03 Test Bed. Preliminary designs completed that include shielding elements, vessel movement, NDSE detector system, NDSE DPF source, radiation calculations, and entombment.
- Coupled the solid-state pulsers coupled to the ASD Prototype Injector Inductive Voltage Adder (PIIVA) cell to measure performance and to evaluate cell reaction to applied magnetic field of the magnetic core in the induction cell.

**Enhanced Capabilities for Subcritical Experiments**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Enhanced Capabilities for Subcritical Experiments**<br>**$215,579,000** | **Enhanced Capabilities for Subcritical Experiments**<br>**$215,579,000** | **Enhanced Capabilities for Subcritical Experiments**<br>**$0** |
| • Approve ASD CD-3A to execute long lead procurements.<br>• Continue and refine ASD design in conjunction with UCEP 020 design.<br>• Optimize manufacturability of injector and accelerator cells.<br>• Continue testing and characterization of the NDSE neutron source using a deuterium-tritium gas fill for future installation into the U1a.03 Test Bed.<br>• Complete design and started refurbishment of the U1a.03 Test Bed to enable installation of the U1a NDSE system that consists of a DPF neutron source, large area gamma-ray detector, and shielding.<br>• Start tunneling activities in the U1a Complex for expended subcritical experiment entombment. | • Support FY 2025 delivery of the ECSE capabilities. This timeline supports the W80-4 confirmation experiment and W87-1 program certification requirements.<br>• Continue demolition, tunneling, and installation of support services for ECSE expended subcritical experiment entombments at the U1a Complex.<br>• Refurbish the U1a.03 Test Bed to support subcritical experiments that establishes a new capability in the U1a Complex to perform dynamic NDSE measurements in 6’ confinement vessels.<br>• Procure ASD Long Lead Procurements (forgings, metglas, electronic components) and approves ASD CD-2/3, Approval of Performance Management Baseline (PMB). | • No change. |

**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 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.

Individual programs determine the need for integral hydrodynamic experiments (hydros) and are responsible for the design, fabrication, and assembly of the test device as well as the post experiment detailed data analysis that inform the physics models and weapon codes. The HSEES subprogram funds the fielding, diagnostics, execution, initial data analyses, and the disposition/cleanup of the expended hydro experiments. Many of the hydros are conducted in specialized steel containers (known as impulsively loaded steel vessels) that confine the high explosives and hazardous material byproducts. For surrogate material hydros (those experiments that do not contain special nuclear material), these vessels undergo a lengthy requalification process post experiment that entails clean out, weld repair, and inspections. For plutonium experiments executed at the U1a Complex, also known as subcritical experiments, the vessels are entombed underground and removed from inventory.

Through interaction with the Department of Defense, the future nuclear weapon stockpile continues to evolve resulting in a high demand for hydro data from weapon physicists and design engineers. Surrogate hydros are conducted at LANL and LLNL facilities while subcritical experiments are conducted at the NNSS U1a Complex. Enhanced Capabilities for Subcritical Experiments will establish new test beds in the U1a Complex that will require HSEES funding once the construction is complete and the test beds are operational.

**Highlights of the FY 2022 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, lifetime extensions and modernization programs, and global security.
- Procure, assemble, and field impulsively loaded steel vessels in support of integrated weapon experiments hydrodynamic tests.
- Provide experimental diagnostics to firing sites such as DARHT, CFF/FXR, U1a Complex, BEEF, 851, DAF, R306, and Lower Slobbovia.

**FY 2020 Accomplishments**

- Executed W80-4 Life Extension Program hydro experiment that provided data to validate the hydrodynamic behavior of an essential design feature for the W80-4, enabling design decisions needed for the LEP to move forward.
- Executed the first optical based hydro for the B61 in a Hesco house with a broad suite of optical diagnostics that included Broadband Laser Ranging (BLR), High Power PDV (for the BLR), MPDV Gen 2 & 3, Multiplexed Based Ranging (MBR), Jump Off PDV (JOPDV), CFBG, plus SNL fielding LiNbO3 and PDVF diagnostics
- Completed design, prototype assembly and alignment of Variable Field of View (VFV) DARHT downstream transport regions of the accelerator and final assembly of the entire VFV system on the DARHT firing point, as part of the post-Weather Enclosure DARHT restoration.
- Developed a two-pulse capability at CFF/FXR.
- Executed focused experiments to evaluate high explosive drive and diagnostic performance leading up the Nimble subcritical experiment (SCE) test series.

**Hydrodynamic and Subcritical Experiment Execution Support**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Hydrodynamic and Subcritical Experiment Execution Support $152,845,000** | **Hydrodynamic and Subcritical Experiment Execution Support $137,597,000** | **Hydrodynamic and Subcritical Experiment Execution Support -$15,248,000** |
| • Execute hydrodynamic experiments essential to meet requirements for both the W80-4 and W87-1 programs.<br>• 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.<br>• Facilitate the testing and commissioning of new accelerator technologies in support of hydrodynamic and subcritical experiments needs.<br>• Procure 3' and 6' vessels required to support and execute NHP and SCE program schedules.<br>• Complete Red Sage Series to validate new physics-based models of ejecta for stockpile stewardship applications.<br>• 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.<br>• Maintain/update DSA documentation in support of subcritical experiments. | • Sustain the DARHT accelerators, downstream transport regions, and safety basis to field and execute hydros to enable the collection of a comprehensive suite of dynamic data for the W80-4, W87-1, Advanced Certification, and Global Security.<br>• Initiate fabrication procurements to vendors, based on first article tests, for 3' and 6' vessels to enable fielding and execution of LEP, ALT, SFI, Advanced Certification and Global Security related hydros and subcritical experiments.<br>• Complete the Twin Peaks experiment, the first SCE in the Nimble series to provide data on the behavior of ejecta physics and legacy materials subjected to multiple shocks.<br>• Demonstrate the Small-Scale Dynamic Vessel Experiments (SSDVE) capability at the Device Assembly Facility (DAF) in support of ongoing stockpile stewardship activities; allows for recovery of material for subsequent analysis and testing. | • Decrease represents a reprioritization of resources to support higher priority missions within the NNSA. |

**Stockpile Research, Technology, and Engineering**
**Engineering and Integrated Assessments**

**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 life extension programs and major alterations;
- Developing and demonstrating capabilities to shorten design, certification, and manufacturing cycles to minimize time and costs leading to engineering prototype and production, and
- Preserving historical knowledge, records, and data related to U.S. nuclear testing and Stockpile Stewardship efforts and making the archives accessible to the nuclear security enterprise workforce.

The Engineering and Integrated Assessments Program is made up of seven subprograms:

1. **Archiving and Support** preserves and maintains historic knowledge, records, and data related to U.S nuclear weapons testing and Stockpile Stewardship, and provides targeted studies, multi-system assessments, and independent reviews that support the annual assessment of the stockpile.
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** 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.
5. **Aging and Lifetimes** 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. These efforts do not include the actual production or deployment of a stockpile weapon system, nor do they 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. This is done 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 is responsible for preserving and maintaining relevant historic records, data, and knowledge related to U.S. nuclear weapons testing and Stockpile Stewardship and providing targeted studies, independent reviews, and multi-system assessments that support the annual assessment process.

**Archiving and Support activities include:**
**Archiving and Data Management (ADAM) –** Preserves knowledge and 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. Data from the ADAM program is primarily used to maintain and assess the current stockpile, support stockpile modernization, and train the next generation of weapons scientists and engineers that have no nuclear testing experience.

**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 one-to-two 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 2022 Budget**
The Archiving and Support program continues to directly support 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, films, and other media.
  - 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, the National Security Research Center (NSRC) at Los Alamos, and the Livermore archives.
- Enables the Cycle 27 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).
- Maintains and upgrades the R&D infrastructure that supports R&D capabilities and activities:
  - 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 Nuclear-Test-Ban Treaty.
  - Upgrades and purchases new equipment used to digitize unique and critical archives dating back to the Manhattan Project.

**FY 2020 Accomplishments**

- **Archiving and Data Management**
  - Initiated a 6-month pilot program at LANL to introduce artificial intelligence/machine learning technologies into the cataloging and searching of their National Security Resource Center's (NSRC) digital collections. Less than 10% of the NSRC's collections have been digitized and less than 10% of those digitized collections have been cataloged. Without this artificial intelligence/machine learning system to catalog and search the digitized collections, the digitized files are very difficult, and sometimes impossible, to find.
  - Established six new accelerated digitization labs to digitize at-risk and high-priority media in the NSRC's collections.
  - Implemented a Continuing Professional Education program for NSRC staff to ensure they maintain and enhance the knowledge and skills you need to deliver a professional service to our customers.
  - Created a digitizing equipment certification program to guarantee all staff know how to operate the new high-speed digitizing equipment and the relevant digitizing standards to use.
  - Developed a 5-year strategic plan to help guide the activities of the NSRC.
  - Expanded the neurodiversity intern program at LLNL to focus on scanning and archiving activities. Established offsite scanning and optimized the file transfer process to increase throughput and flexibility during telework and shelter-in-place events.
  - Continued film scanning and analysis work at LLNL; established remote learning capability to help facilitate remote work, collaborations, and general education about films and fireball physics.
  - Began improving and expanding keyword and subject categories to better manage and organize LLNL data.
  - Completed scanning Environmental Measurements Laboratory (EML) records (159 cubic feet – paper records).
  - Scanned 142 reels of microfilm (complete rolls) and 31,574 Aperture cards at Nevada.
  - Processed and completed over 814 requests for information at the Nuclear Testing Archive in Nevada.
  - Digitized data stores of the Vulnerability Capability Unit at Sandia.
  - Digitized 100% of records for Active Ceramics, 63 ft3 of unclassified records, 9 ft3 of classified records, and four 400-page volumes of bound Clevite Reports (critical reports only available in a single bound copy).

- **Assessments and Targets Studies**
  - Supported Cycle 25 Annual Assessment activities and completed all planned INWAP studies.
  - The INWAP project at Sandia resulted in the incorporation of aeroshell pyrolysis physics from the reentry code SPARC into the SIERRA thermal code Aria; this adds important physics to modeling of nuclear weapon systems and the resulting models have found subsequent use in both Fire and Reentry.
  - Performed analysis to compare Miranda models with film data from above ground tests.
  - Began restoration of expertise in an important Test Readiness diagnostic.
  - Resumed radchem laboratory work in support of upcoming milestones to explore the value of long-lived/stable nuclides as diagnostics.
  - The 828/T403 encapsulation material was developed along with five others to be a toolbox for encapsulants for nuclear weapon use; it will be used for stronglink solenoid encapsulation.
  - Conducted an assessment on glass to metal seals to determine the cause of cracking due to unexpected strain states; confirmed that localized enrichment of Phosphorus in pins causes partial melting in glass to metal seals resulting in a higher stress state that leaves the seals prone to cracking.
  - Completed study into the cause of film formation on pins submerged in PDMS fluid indicating that that the resulting film will not have negative impact on most affected components.
  - Fabricated, loaded, and shipped 12 additive manufactured detonation systems for a collaborative test series with LANL using the proton radiography (pRad) facility; this test series is intended to evaluate, improve, and/or validate code capabilities for unusual detonation systems and their associated engineering features.
  - 

**Archiving and Support**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Archiving and Support $45,760,000** | **Archiving and Support $45,760,000** | **Archiving and Support $0** |
| • Support Cycle 26 Annual Assessment activities; complete all planned Cycle 26 INWAP activities.<br>• Perform targeted studies identified in the Cycle 25 annual assessment for the nuclear stockpile.<br>• Continue to permanently archive critical weapon testing information to ensure availability for future stockpile stewards.<br>• Activities such as those listed below are key elements of this effort.<br>  ○ Continue acceleration and uploading of records into GRANTA.<br>  ○ Continue ongoing support of Engineering Analysis Baseline Models.<br>  ○ Continue film digitization efforts at LLNL.<br>  ○ Begin preliminary investments in artificial intelligence and machine learning.<br>  ○ Support ongoing digitization of paper, film, microfiche, microfilm, aperture cards, and other media.<br>  ○ Collect and catalog metadata.<br>  ○ Fund the USGS Core Library and Data Center and seismic monitoring stations.<br>  ○ Continue support for the Nuclear Testing Archives at Nevada and the National Security Research Center (NSRC) at Los Alamos.<br>  ○ Provide librarians at LANL and LLNL. | • Support Cycle 27 Annual Assessment activities and complete all scheduled INWAP activities in accordance with the INWAP Implementation Plan.<br>• Identify and conduct targeted multi-system studies and assessments identified during the Cycle 26 Annual Assessment process.<br>• Perform stockpile studies that improve physical models for assessments and improve modeling methodology.<br>• Support development of physics baseline common model framework.<br>• Develop capability to assess the value of long lived and stable isotopes.<br>• Support the Capabilities for Nuclear Intelligence (CNI) Practicum.<br>• Support the Nuclear Testing Archives and the National Security Research Center (NSRC).<br>• Perform ongoing digitization of paper, film, microfiche, microfilm, aperture cards, and other media and collect and catalog metadata.<br>• Continue analysis of archival test cores to generate new data used to support LEPs and Annual Assessment.<br>• Continue acceleration efforts to increase digitization speed and efficiency.<br>• Continue early investments in machine learning for metadata collection.<br>• Support digitization, storage, indexing, and librarian services relative to nuclear security materials. | • Funding level remains unchanged. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ○ Fund computer licensing and equipment upgrades; purchase high end scanners and digitization equipment.<br>○ Provide M&O detail support at headquarters.<br>• Revitalize radiochemical analyses of historical core samples by analyzing archival test cores to generate new data to support LEPs and Annual Assessment.<br>• Support the Test Capability Assessment - a framework and process to facilitate agile management of weapons test capabilities focused on stockpile demands.<br>• Continue support of the U.S. Geological Survey, Seismic monitoring, risk reduction, and maintain compliance with FFACO.<br>• Engineering Support/IT/Personnel: Support infrastructure and IT costs such as IT procurements, vault support, training, etc.<br>• Obtain and maintain licenses for PDMLink, GRANTA, and ABACUS. | • Maintain electronic repositories for existing and new digitized nuclear security materials.<br>• Capture legacy test data in GRANTA.<br>• Maintain PDM Link, and Abacus licensing as needed to support multi-system assessment work and the archives.<br>• Support the U.S. Geological Survey, seismic monitoring, risk reduction, and maintaining compliance with Federal Facility Agreement and Consent Order (FFACO).<br>• Maintain computer licensing and equipment upgrades; purchase digitization equipment to support acceleration activities.<br>• Provide M&O detail support at headquarters. | |

**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 2022 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 Survivability for Reentry Environments Pegpost.

**FY 2020 Accomplishments**
- Successfully completed the joint DoD/NNSA studies on delivery and threat environments supported in the FY 2020 NNSA/Air Force Research Laboratory (AFRL) Joint Milestone. The FY 2021 Joint Milestone will continue these activities to the next stage in development and include partnerships with the Office of Advanced Simulation and Computing as well.
- Conducted a preliminary test related to combined environments. This Program executed this work in partnership with Technology Maturation, where test combined acceleration, spin, and vibration on non-nuclear weapon components.
- 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.
- Finalized preliminary reentry computational predictive methods for future platforms and environments in preparation for validation. This will support the FY 2021 Joint NNSA/AFRL Milestone.

**Delivery Environments**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Delivery Environments $39,235,000** | **Delivery Environments $39,235,000** | **Delivery Environments $0** |
| • Engineer prototypes and subsystems for the future weapons systems essential to understanding system performance in normal and abnormal environments, with some of this work impacting the W87-1, W80-4, and W-93.<br>• Perform combined environments experiments for higher confidence in safety assessment of behavior in abnormal environments.<br>• Advance two prototypes for future delivery platforms and conducted preliminary tests on future survivability requirements.<br>• Revise and update the joint roadmap with Department of Defense branches for future Stockpile-to-Target Sequence environment requirements.<br>• Continue the joint Delivery Environments/Stockpile Responsiveness Program sled tests supporting future delivery platforms (LLNL & SNL CA partnership).<br>• Integrate flight trajectory results from current mod/sim tests with engineering of future delivery prototype (LANL & SNL NM partnership).<br>• Establish combined environment (i.e., combinations of normal, and abnormal environments) engineering foundation to meet emerging environmental challenges informed by DoD.<br>• Maintain and develop diagnostics for future Stockpile-to-Target Sequence measurements, analyses, and quantitative capability gaps. | • Conduct combined environments experiments for higher confidence in safety assessment of behavior in abnormal environments with higher fidelity.<br>• Mature combined environment engineering foundation to meet emerging environmental challenges informed by DoD.<br>• Steward the evolving joint Delivery Environments/Stockpile Responsiveness Program sled tests supporting future delivery platforms (LLNL & SNL CA partnership).<br>• Prepare to engineer and test two prototypes for future delivery platforms and conduct preliminary tests on future survivability requirements.<br>• Continue joint roadmap with Department of Defense branches for future Stockpile-to-Target Sequence environment requirements.<br>• Maintain and developed diagnostics for future Stockpile-to-Target Sequence measurements, analyses, and quantitative capability gaps. | • Funding level remains unchanged. |

**Engineering and Integrated Assessments**
**Weapons Survivability**

**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, gamma, and high-power EM sources can induce detrimental responses to nuclear and non-nuclear electrical components of the warhead. A particular effect of concern is System Generated Electromagnetic Pulse (SGEMP), whereby photons with sufficient energy to penetrate and interact with materials inside the weapon produce energetic electrons generating large currents within the weapon. Cable SGEMP and Box Internal Electromagnetic Pulse (EMP) are variations associated with cables and components. Understanding SGEMP (and its various counterparts) requires knowledge of physical phenomena, including radiation transport across complex material interfaces; photo 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 radiation drive, the properties of the materials undergoing irradiation, and the coupling between subsystems.

Related to this is the production of EMP environments driven in the atmosphere whereby x-rays and high energy gamma rays dissociate the atmosphere, produce conductivity, which drives currents and high frequency electromagnetic pulses. These environments can induce detrimental responses inside the weapon, depending on Reentry Vehicle (RV) / Reentry Body (RB) shielding effectiveness.

This effort has a strong focus on developing experimental platforms for physics discovery and code validation 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 that allows creation of relevant high-fidelity (real or surrogate) environments.

**Effects of X-Rays and Air Blast on Materials** – This effort includes all activities related to material and structural responses driven by x-rays and air blast. The effort is relevant to the 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 require knowledge of high energy (14 mega-electron volts [MeV]) neutron effects.

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** – This 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. 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 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 that were validated using underground test data were exclusively used. These legacy tools are reaching the end of their lives, so this effort supports the process for modernizing and improving 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 accomplished using a combination of underground test data and above ground 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 understanding margins and providing 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.

**Combined Environments** – 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, assessments of combined environments 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. It also supports the development and validation of modeling and simulation capabilities based on modern codes.

**Highlights of the FY 2022 Budget Request**

- Execute research and development and qualification capability development shots on high energy density (NIF and Z) and radiation environment (Saturn, Hermes, ACRR, etc.) machines and facilities.
- Develop laboratory weapon qualification platforms that reproduce the extreme environments characteristics of hostile nuclear encounters.
- Develop experimental capabilities for delivery systems that enable development of mitigation mechanisms capable of addressing current and future hostile threats.
- Provide experimental tools and advances in simulation capabilities to qualify the behavior of new electronics in radiation environments.
- Deliver new blast impulse experimental capability at the NIF.

**FY 2020 Accomplishments**

- Established capability at LANL to perform repeat intrinsic radiation measurements on weapon components.
- Completed the Combined Radiation Effects for Survivability Testing (CREST) Analysis of Alternatives.
- Began collaboration with UK to develop capability to assess systems survivability under a non-ideal air blast.

- Designed new optics assembly with Advanced Certification and Qualification to improve accuracy in characterizing the shock response of heterogeneous materials.
- Began design of a calorimeter assembly and containment chamber to house experiments on the Gamble II electron beam at Naval Research Laboratory (NRL).
- Installed a remote operations turntable in the Detonator Electromagnetic Response Chamber at LANL to support EM testing on surrogate and live detonators.
- Conducted simulations of an underground impulse experiment to compare the results from different equation of state models for binary alloy material.
- Initiated collaboration with INL's TREAT facility to assess ability to use facility to perform hostile environments testing.
- Generated simulations to apply a new measurement technique to power metal-oxide-semiconductor field-effect transistor (MOSFET) to determine if radiation response can be estimated prior to radiation testing of devices that may have potential applications throughout the stockpile.
- Began work that investigates the use of alternate experimental methods to study the effects of x-rays on non-metallic materials.

**Weapons Survivability**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Weapons Survivability $59,500,000** | **Weapons Survivability $59,500,000** | **Weapons Survivability $0** |
| • 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.<br>• 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.<br>• Continue development of Joint cold x-ray surrogate test capabilities.<br>• Support research, development, testing, and engineering to develop capabilities to assess combined and hostile/normal environments for current and future stockpile systems. | • Continue support of research, development, and engineering for x-ray radiation environment testing (Saturn) recapitalization.<br>• Advance emerging threat and mitigation analyses and quantify capability gaps between current and future systems and make comparisons with adversarial defenses.<br>• Continue the SCDS FY 2023 Pegpost for Hostile Mitigation capability.<br>• Further combined environment capabilities (e.g., experiments, modeling, simulation, diagnostics) to meet DOD future survivability requirements.<br>• Advance capabilities to determine margin-to-failure for key components in hostile environments.<br>• Conduct experimental and modeling/simulation effort to explore radiation effects and damage thresholds in electronics such as complementary metal-oxide-semiconductor (CMOS) & III-V devices used in major components of weapons systems. | • Funding level remains unchanged. |

**Engineering and Integrated Assessments**
**Aging and Lifetimes**

**Description**
Aging and Lifetimes develops diagnostics and funds 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 to minimize their impact on the effectiveness of the deterrent.

**Aging and Lifetimes activities include:**
**Non-Nuclear Components and Materials** – Addresses aging related phenomena of non-nuclear 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 2022 Budget Request**
- Conduct studies to investigate plutonium aging phenomena and determine impacts from corrosion contributing to assessments on pit lifetime.
- 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 2020 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 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.
- 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.

**Aging and Lifetimes**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Aging and Lifetimes $62,260,000** | **Aging and Lifetimes $61,941,000** | **Aging and Lifetimes -$319,000** |
| • Develop advanced imaging systems for detecting the precursors of harmful weapon aging.<br>• Provide predictive capabilities for extrapolating the effects of corrosion and other aging phenomena.<br>• Promulgate stockpile aging and lifetime assessment reports.<br>• Deploy full-scale Multi-Mass Leak Detector to Production and Core Surveillance to improve operations at the production plants.<br>• Qualify and deploy new scintillators for CoLOSSIS I and II to improve imaging of aging materials.<br>• Validate acoustic sensor for flight environments to better understand and model component performance.<br>• Update and publish aging and lifetime predictions used to assess the lifetime of key weapon components.<br>• Conduct studies to investigate plutonium aging and determine impacts from corrosion.<br>• Conduct high explosive studies examining main charges and boosters used to detect aging-related changes in behavior.<br>• Support and evaluate improved methods of accelerated aging, particularly for advanced materials such as AM parts.<br>• Investigate aging phenomena to ensure an early warning of any significant impact to the effectiveness of the nuclear deterrent. | • Continue updating and circulating stockpile aging and lifetime assessments.<br>• Update and publish aging and lifetime predictions used to assess weapon component lifetimes.<br>• Provide predictive capabilities for extrapolating the effects of corrosion and other aging phenomena.<br>• Begin pit studies that investigate plutonium aging phenomena and support predictive performance modeling by developing an Accelerated Aging library.<br>• Continue high explosive studies examining main charges and boosters used to detect aging-related changes in behavior.<br>• Continue investigation of aging phenomena to ensure an early warning of any significant impact to the effectiveness of the nuclear deterrent.<br>• Continue the investigation of aging phenomena in new materials and components to enable safe modernization. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

## Engineering and Integrated Assessments
## Stockpile Responsiveness

**Description**

The Stockpile Responsiveness Program began operating with two initial 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, transfers knowledge and skills to the newer generation of nuclear weapon designers and engineers and strengthens 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 to multi-year multi-site 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 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 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 2022 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 STS environments compared to today's systems.

**FY 2020 Accomplishments**

- Supported the NWC 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.
- Executed Davis gun tests at White Sands Missile Range to validate simulations of penetrator mechanics and demonstrate novel shock mitigation technologies.
- Included the manufacturing plants in a range of new activities to accelerate transition from design to production and to accelerate qualification and acceptance testing.

**Stockpile Responsiveness**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Stockpile Responsiveness $70,000,000** | **Stockpile Responsiveness $70,000,000** | **Stockpile Responsiveness $0** |
| • Incorporate the production plants in a range of activities joint with the nuclear weapons laboratories to accelerate production, qualification, and acceptance testing<br>• Perform analysis of emerging threats and technological challenges.<br>• Continue design competition activities.<br>• Continue to explore new materials and production techniques.<br>• Complete experimental activities for delivery environment for HDBT defeat.<br>• Explore and developed high potential opportunities to accelerate production of future systems and components.<br>• Incorporate design for manufacturability exercises into challenge problem execution.<br>• Explore opportunities for flight testing prototype hardware of non-nuclear systems and components. | • Joint laboratory/production plant efforts to develop advanced manufacturing and production technologies that can accelerate the delivery of long lead time materials and components needed for testing and system development.<br>• Continue development of high tempo hydrotesting, flight testing, and environmental testing capabilities.<br>• Continue support for analyzing and developing approaches to addressing high priority future threat scenarios in consultation with the Department of Defense.<br>• Demonstrate alternative approaches to qualification and acceptance testing that can reduce costs and time frames as well as laboratory and production facility resources. | • Funding level remains unchanged. |

**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. Additionally, ACQ in collaboration with advanced manufacturing and SRP explores methods to accelerate the qualification of components and manufacturing processes and reduce costs and laboratory and plant facility requirements. In support of modernization initiatives, 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. ACQ is 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) 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, and (4) explores the certification challenges of advanced surety technologies.

In FY 2021 ACQ included KCNSC, Y12, and Pantex as partners to further the development of qualification methodologies to support advanced manufacturing methods.

**Highlights of the FY 2022 Budget**
- Develop certification approaches for systems and components responsive to stockpile modernization initiatives.
- Develop approaches to accelerating and streamlining qualification approaches for new manufacturing methods, materials, and components to reduce time and costs to introduce into the 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.
- Execute hydrodynamic tests to support improved technologies and raise technology and manufacturing readiness levels (TRLs and MRLs).
- Continue to assess the archive of nuclear tests, study of failure modes, and other advanced methods to facilitate use in certification of upcoming sustainment programs.
- Develop understanding of scaling and surrogacy to support the experimental basis for weapon assessments.
- Conduct experiments supporting product-based certification methods of components made with advanced manufacturing.
- Exercise the certifiability of reuse, surety, and hardening concepts, as well as concepts incorporating new manufacturing technologies.

**FY 2020 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.

**Advanced Certification and Qualification**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Advanced Certification and Qualification**<br>**$60,649,000** | **Advanced Certification and Qualification**<br>**$60,330,000** | **Advanced Certification and Qualification**<br>**-$319,000** |
| • Develop certification approaches for systems and components responsive to emerging threats.<br>• Execute hydrodynamic tests to support technology development as well as investigate ways to significantly reduce the cost of hydrodynamic tests.<br>• Assess nuclear tests, studies of failure modes, and other advanced methods to facilitate use in certification of upcoming sustainment programs.<br>• Study supporting understanding of scaling and surrogacy to support the experimental basis for weapon assessments.<br>• Experiment supporting product-based certification methods of components made with advanced manufacturing.<br>• Conduct an exercise on the certifiability of reuse, surety, and hardening concepts, as well as concepts incorporating new manufacturing technologies.<br>• 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.<br>• Include Pantex, Y12, and Kansas City in ACQ to develop improved methods for qualification and acceptance testing. | • Execute Hydrotests to explore qualification of components using advanced manufacturing methods.<br>• Understand implications of relaxed tolerances and materials specifications on reducing qualification timelines.<br>• Continue analysis of nuclear test data, studies of failure modes, and other advanced methods to ensure certification of upcoming sustainment programs.<br>• Gain detailed understanding of the qualification challenges and advantages of modular architectures.<br>• Explore faster and less burdensome methods for qualification and acceptance testing to reduce development time.<br>• Continue to study scaling and surrogacy to support the experimental basis for weapon assessments. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

**Stockpile Research, Technology, and Engineering**
**Inertial Confinement Fusion**

**Overview**

The Inertial Confinement Fusion (ICF) Program provides high energy density (HED) science capabilities and expertise that support research and testing across the breadth of the Stockpile Stewardship Program. Its two-fold mission is to meet immediate and emerging HED science needs to support the deterrent of today, and to advance the research and development (R&D) capabilities necessary to meet those needs for the deterrent of the future. The ICF program enables access to and study of the HED regime through (1) the design and execution of complex physics experiments to improve our fundamental science understanding, (2) the development of instrumentation to diagnose physics phenomena at the extreme temperature, pressure, and density conditions relevant to nuclear weapons performance, and (3) the development and operation of experimental facilities capable of reaching those conditions. The ICF program's flagship facilities, the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL), the Z pulsed power facility (Z) at Sandia National Laboratories (SNL), and the Omega Laser Facility (Omega) at the University of Rochester's Laboratory for Laser Energetics (LLE), represent a complementary set of capabilities designed to meet the diverse needs of weapons physics, the pursuit of ignition, and the exploration of fundamental HED science.

Because the majority of energy in a nuclear weapon is generated by matter in HED conditions, understanding the behavior of matter and energy in the HED regime is critical to understanding and predicting the performance of both nuclear weapon primaries and secondaries, as well as the response of weapon components to extreme hostile radiation environments. The ICF program leverages its experimental design expertise and computational modeling capabilities, diagnostic technology, target engineering and fabrication infrastructure, and national HED facilities to ensure high fidelity experimental capabilities and data are available to support a range of National Nuclear Security Administration (NNSA) missions. Its capabilities are used by partner programs to assess and certify the existing stockpile, inform design decisions for current life extension programs, investigate hostile nuclear environments, and support research by the Department of Defense and key international partners. The program represents the only experimental option available to address many of the weapons-relevant HED science challenges without a reversion to underground nuclear testing.

The ICF program supports NNSA's long-term R&D mission by developing the knowledge and capabilities necessary to reach controlled thermonuclear fusion in the laboratory. Reaching a burning plasma platform and eventually producing high fusion yield will open the door to a range of important weapons physics that has been unreachable since the cessation of underground nuclear testing. This is among NNSA's most high-risk, high-reward research efforts; not only does it attract and challenge some of the Nation's best physicists and engineers to the complex, but it also represents an important component of NNSA's preparation to meet the stockpile science challenges of the 2030s and beyond.

In fiscal year (FY) 2020, two important reviews of the ICF Program were completed. The first, an external congressionally-mandated study of the program by the JASON Defense Advisory Group, found that the program remains valuable to the stewardship mission and recommended several shifts in program strategy to optimize scientific progress over the next decade. The second, NNSA's internal ICF 2020 review, assessed the program's proximity and scaling to ignition, and concluded that the ignition threshold is likely beyond current experimental capabilities. It recommended a research program focused on resolving key gaps in physics understanding and acquiring information at the current scales to justify cost, scope, and schedule for any future investments in experimental capability.

A primary area of focus in FY 2022 will be the implementation of the highest priority recommendations from those reviews. Activities will be focused on:

- Maintaining the technical leadership and capabilities necessary to recruit, train, challenge, and retain the highest caliber of scientists and engineers to engage in stockpile stewardship.
- Exploring innovative and disruptive target designs, diagnostics, drivers, and other specialized technologies, simulation capabilities, and analytical tools to maintain leadership, challenge program scientists, and advance physics understanding to support the priorities of stockpile stewardship.
- Addressing key gaps and uncertainties in fundamental physics understanding of fusion target performance.

- Promoting cross-laboratory collaboration and external engagement to improve program efficiencies and ensure continued global leadership.

The FY 2022 Budget Request supports continued research and operations at NNSA's preeminent HED facilities, with research efforts focused on 1) maturing HED stockpile science concepts and platforms in support of the broader NNSA portfolio, and 2) advancing ignition science in keeping with the findings of internal and external FY 2020 reviews. Emphasis on improving operational efficiencies at the NIF, Z, and Omega, and on extending the lifetime of these facilities will continue.

The Inertial Confinement Fusion Program is made up of three subprograms:

1. **HED and Ignition Science for Stockpile Applications** develops and matures the tools to enable partner programs to investigate weapons physics phenomena for near-term applications and pursues controlled thermonuclear fusion to meet next generation stockpile science needs.
2. **ICF Diagnostics and Instrumentation** establishes new diagnostic capabilities and experimental support systems through the research and development of specialized technologies necessary to execute experiments studying matter under extreme HED conditions.
3. **Facility Operations** provides the support and services required to ensure the safe and efficient operations of the national HED facilities, including operations, maintenance, load and target consumables, and the research and engineering to sustain facility capabilities.

## Inertial Confinement Fusion
## HED and Ignition Science for Stockpile Applications

**Description**

This subprogram supports R&D in HED physics, including the study of thermonuclear fusion. 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 Stockpile Stewardship Program (SSP). The research supported in this subprogram develops and matures the tools that enable partner programs to investigate dynamic material properties, fluid and plasma hydrodynamics, hydrodynamic instability-induced mix, burn, boost, radiation transport and opacities, and yield applications relevant to nuclear weapon outputs, environments, and effects. This collection of capabilities, in combination with the national HED facilities and enabling diagnostics, provides NNSA's only access to many of these phenomena outside of underground nuclear testing.

This subprogram coordinates closely with the Assessment Science and nuclear modernization programs to conceive, mature, and provide platforms to execute experiments at all the national HED facilities to meet the near-term requirements of stockpile stewardship. These tools provide access to materials data at extreme conditions, allow the study of hostile radiation environments, and make it possible for NNSA, Department of Defense users, and key international partners to probe a variety of complex weapons physics phenomena in the absence of underground nuclear testing.

This subprogram's long-term focus is on R&D to achieve ignition, a burning plasma platform, and ultimately high fusion yield in the laboratory. When realized, these will provide a set of capabilities critical to the long-term viability of the SSP—particularly, the future qualification of nuclear components, the assessment and certification of the next generation of nuclear weapons in the full range of relevant HED regimes, and the investigation of a range of complex physics that has been out of experimental reach since the cessation of underground nuclear testing. HED and Ignition Science for Stockpile Applications pursues these capabilities through theory, experiments, modeling, design, and engineering. As part of this long-term effort, this subprogram includes three distinct approaches to ignition: laser indirect drive, laser direct drive, and magnetic direct drive. These approaches provide complementary physics insights and diversified technical risks, making use of the unique capabilities of each HED facility in the ICF portfolio.

In support of these short- and long-term efforts, this subprogram develops focused modeling capabilities and analytical methods to improve its predictive capability and maximize its use of experimental data across all mission areas. It also continues to explore and improve its ability to couple driver energy to targets in all experimental configurations to maximize the fidelity of weapons physics experiments and continue to improve the performance of integrated fusion experiments.

In FY 2020, HED and Ignition Science for Stockpile Applications was particularly focused on supporting both the internal assessment of its proximity to ignition and the external review by the JASON Defense Advisory Group to identify its long-term value to the broader stewardship mission. With the benefit of these reports, in FY 2022 this subprogram will continue to implement some high-priority findings and recommendations from both studies to optimize its contributions to SSP and its progress toward ignition.

**Highlights of the FY 2022 Budget Request**

- Maturing experimental platforms to execute HED experiments critical to supporting stockpile needs, including the generation of intense sources of x-rays and neutrons for survivability studies and the development of high-fidelity approaches to experimentally characterize materials at high pressure.
- Implement some high-priority findings and recommendations from the ICF 2020 and JASON reviews in support of stockpile stewardship, including:
  - Renew emphasis on the fundamental physics of ignition.
  - Balance inclusion of innovative and disruptive research across the program.
  - Demonstrate improved compression in laser-driven targets.

- Advance ability to understand and predict driver-target coupling through focused physics experiments and improved modeling.
- Develop understanding and planning for a future high yield capability.

**FY 2020 Accomplishments**

- Completed multi-year assessment of the program's proximity and scaling to ignition for all three approaches, identifying key remaining uncertainties and developing program plans to address them.
- Developed and demonstrated a range of new insights to support the assessment of proximity and scaling, including high fidelity 3D simulations of full National Ignition Facility (NIF) targets, theory of z-pinch implosion yield scaling, analysis of relevant historical data, and statistical and artificial intelligence models for design and data interpretation.
- Achieved record neutron yield from deuterium-tritium targets on NIF, demonstrating increased capsule absorbed energy and symmetry control. Ongoing work will build on this new design class to further improve efficiency and performance.
- Used new NIF neutron imaging diagnostic to produce first down scattered neutron image reconstruction on NIF, demonstrating a capability that will be important to address key remaining challenges in compression fusion targets.
- Performed first polar direct drive (PDD) experiments on Omega, laying the groundwork to advance PDD designs for survivability applications and potential future megajoule (MJ) fusion yield at NIF.
- Employed new experimental platforms at Omega to experimentally confirm longstanding theory of laser-plasma instabilities; these insights will make it possible to improve energy coupling and control of future ICF implosions.

**HED and Ignition Science for Stockpile Applications**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **HED and Ignition Science for Stockpile Applications**<br>**$114,792,000** | **HED and Ignition Science for Stockpile Applications**<br>**$104,960,000** | **HED and Ignition Science for Stockpile Applications**<br>**-$9,832,000** |
| • 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.<br>• Provide HED capabilities and platforms to reduce uncertainty in calculations of nuclear weapons performance in support of annual assessments, life extension programs (LEPs), and future modernization needs (e.g., W87-1), in keeping with the priorities of the Five-Year Plan for HED Experiments.<br>• Enable data collection on the properties of high-atomic-number materials, such as uranium and plutonium, to inform assessment and certification of the stockpile. | • Provide HED capabilities and platforms to support high-priority stewardship needs, including advancing source quality for nuclear survivability and fidelity of high-pressure material properties experiments.<br>• Implement critical high-priority findings and recommendations from the Inertial Confinement Fusion 2020 and JASON reviews in support of stockpile stewardship, including renewed focus on fundamental physics and the resolution of remaining uncertainties in laser-driven target performance. | • Decrease represents forward funding in FY 2021 for acceleration of FY 2022 scope. |

**Inertial Confinement Fusion**
**ICF Diagnostics and Instrumentation**

**Description**
The Inertial Confinement Fusion (ICF) Diagnostics and Instrumentation subprogram establishes new diagnostic capabilities and experimental support systems at the three national high energy density (HED) facilities through the research and development of specialized technologies necessary to execute experiments studying matter under extreme HED conditions. Diagnostics developed within 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 HED 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 useful information to be gained from each experiment which is used by Assessment Science, Advanced Simulation and Computing, Stockpile Management, and other stockpile programs for successful execution of their respective Stockpile Stewardship and Management Plan responsibilities.

Priority activities across this subprogram include: advancing new technologies through design and engineering of transformational diagnostics that provide unprecedented information from HED experiments and can be used across the HED facilities; fielding diagnostics based on known technologies to address local needs and to achieve programmatic deliverables at each HED facility; and meeting HED experimental requirements through new experimental capabilities and operationally efficient support systems. Efforts to advance these activities also include development of experimental platforms that expand the performance range of the advanced laser- and pulsed-power facilities, new cryogenics capabilities such as improved handling and positioning systems or improved control layer quality system, and new experimental capabilities such as improved laser diagnostics for accuracy or beam balancing. Many of these developments, particularly the transformational diagnostics, are advanced through coordinating efforts and sharing expertise across the HED facilities.

**Highlights of the FY 2022 Budget Request**
- Research and develop transformational diagnostics at the three national HED facilities to improve the fidelity of data for studying physical phenomena relevant to stockpile work. This includes work on next-generation high-resolution velocimeters to measure material properties at extreme conditions, spectrometers to discriminate deep ultraviolet Thomson scattering, and three-dimensional photon and neutron imagers to fully reconstruct non-symmetric implosions.
- Improve, field, and maintain required local diagnostics and associated support systems to effectively execute experimental activities by capturing key data that will validate physics codes and reduce uncertainties in assessing nuclear weapons performance. This includes work on x-ray detectors and imagers, optical and nuclear diagnostics.
- Develop new experimental capabilities and diagnostic support systems to include work on target systems and infrastructure support capabilities, techniques to mitigate optical damage, and improvements on laser accuracy.

**FY 2020 Accomplishments**
- Developed and implemented three new x-ray diagnostics for Z to provide multi-dimensional constraints on the performance and scaling of magnetically-driven implosions. Improve measurements from these diagnostics will reduce uncertainties in target performance and improve confidence in weapons codes used to assess stockpile questions.
- Demonstrated mitigation of Stimulated Brillouin scattering (SBS) with the new National Ignition Facility's (NIF) 4-color capability, opening greater parameter space for ignition designs. Mitigating SBS is a crucial component of the ICF scaling argument and estimations show that without mitigation techniques, some of the current low gas-fill designs would exceed the damage threshold of the optical materials if scaled to higher energies.
- Produced the first down-scattered neutron reconstructed image of a compressed deuterium-tritium ice layer at NIF using the new active neutron imaging system. These images will help to characterize the fuel assembly to guide target and model development for the ICF program.

**ICF Diagnostics and Instrumentation**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **ICF Diagnostics and Instrumentation**<br>**$73,014,000** | **ICF Diagnostics and Instrumentation**<br>**$60,920.000** | **ICF Diagnostics and Instrumentation**<br>**-$12,094,000** |
| • Implement the National Diagnostic Plan by developing transformational diagnostics and any associated technologies or support systems to ensure high fidelity data of key physics phenomena relevant to stockpile work. This includes work on next-generation fast, efficient, high resolution x-ray detectors; new time-resolved x-ray platforms, to understand the evolution of material structure and strength at high pressure; three-dimensional photon and neutron imaging, to fully reconstruct non-symmetric implosions; and diagnostics to obtain data on the properties of high-atomic-weight materials in new weapon-relevant high energy density (HED) regimes, to support annual assessment and life extension activities.<br>• Deploy new local diagnostics required by HED facilities to effectively support execution of experimental activities by capturing key data that will validate physics codes and reduce uncertainties in assessing nuclear weapons performance. | • Develop transformational diagnostics at the three national HED facilities to improve the fidelity of data for studying physical phenomena relevant to stockpile work. This includes work on next-generation high-resolution velocimeters to measure material properties at extreme conditions; spectrometers to discriminate deep ultraviolet Thomson scattering; and three-dimensional photon and neutron imagers to fully reconstruct non-symmetric implosions.<br>• Deploy critical local diagnostics at three national HED facilities to ensure that high fidelity data can be obtained to support to stockpile work such as the annual assessments and life extension activities. This includes work on x-ray detectors and imagers and optical and nuclear diagnostics.<br>• Mature novel experimental capabilities and diagnostic support systems that provide improved efficiency and better performance. This includes work on target systems and infrastructure support capabilities; techniques to mitigate optical damage; and improvements on laser accuracy. | • Decrease represents forward funding in FY 2021 for acceleration of FY 2022 scope. |

**Inertial Confinement Fusion**
**Facility Operations**

**Description**

This subprogram supports the suite of ICF experimental and design facilities which provide high energy density (HED) capabilities and platforms for weapons physics and development of next generation capabilities. The NIF, Z, and Omega HED facilities as well as advanced target design facilities at LANL play a critical role in exploring material properties, hydrodynamics, weapon output, effects, and survivability, platform and diagnostics development, ignition, and high yield. The NNSA ICF facilities, remaining best-in class facilities, serve to attract and challenge some of the nation's best physicists and engineers to the nuclear security enterprise.

ICF Facility Operations provides the facilities, targets, and diagnostic calibration required to ensure the safe and efficient operations of the national HED facilities, including operations, maintenance, load and target consumables, and the research and engineering to sustain the facility capabilities.

- **Operations:** Operation of the ICF facilities includes executing a shot or preparing for and/or recovering from a shot as well as the facility preparation and pre-/post-shot reviews necessary to assure that shots are machine-safe and optimized to achieve the user's goals. Advanced target facilities at LANL also provide unique access to new regimes of programmatic relevance.
- **Maintenance:** Each of these precision ICF facilities require a high level of maintenance, including the categories of preventative maintenance, reactive maintenance, and reliability/efficiency improvements. Preventative maintenance is routine maintenance that's intended to keep a system working properly. Reactive maintenance describes work to fix things that are broken or impaired, including deferred maintenance. Reliability/Efficiency improvements incorporates minor system improvements that enhance reliability and/or efficiency but does not include significant improvements or new capabilities.
- **Loads/target consumables:** The loads and targets for experiments at ICF facilities require careful preparation and construction for each. These include the consumables of experimental campaigns as well as refurbishments necessary for key load/target hardware which is routinely refurbished or repaired.
- **Sustaining capabilities:** Assuring continued high performance and reliability, is key to optimal scientific output. Each of the ICF facilities is over 10 years old and requires ongoing refurbishment including replacing obsolete and unmaintainable systems with updated equipment that utilizes technology improvements and implement reliability and efficiency upgrades to improve facility productivity. Independent of improvements to energy and power, the NIF, Z, Omega and LANL facilities require a range of sustainment investments that the program is in the process of prioritizing. Such updates will be required to enable another decade of stockpile science on ICF facilities.

Assessment Science, Advanced Simulation and Computing, Stockpile Management, and other stockpile program elements are informed by and benefit from the capabilities developed by this subprogram.

**Highlights of the FY 2022 Budget Request**

- Provide operational facilities to obtain the key data that reduces uncertainty in calculations of nuclear weapons performance.
- Obtain 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.
- Continue safe and efficient operation of all NNSA-funded national HED facilities in accordance with their Governance Plans.
- Advance unique target design and development capabilities at LANL.
- 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.
- Explore technology to support future facility investments, such as new approaches to energy balance, laser plasma instabilities (LPI), and improved energy coupling.

**FY 2020 Accomplishments**

- **Experiments executed on the NNSA's HED facilities:**
  - NIF Experiments: 385; Z Facility Experiments: 104; Omega Experiments: 2,320 (estimated FY 2020 shots, based on experimental plans).
- **High-impact stockpile stewardship experiments:**
  - A record 14 MeV neutron yield of $2.0 \times 10^{16}$ was created from a deuterium-tritium fusion experiment on NIF.
  - NIF provided nuclear survivability tests examining cold x-ray response of materials under a range of different fluences was critical to a collaboration between AWE, the UK MoD, the US Navy, DTRA, NRL, and LLNL. In addition to measuring the response of 2D coupons, new this year was the first measurement on the x-ray response of a complex, three-dimensional, scaled test object.
- **New or improved capabilities developed on HED facilities:**
  - A new 4-color capability on NIF demonstrated mitigation of stimulated brilloun scattering (SBS) as predicted, opening greater parameter space for ignition designs.
  - A High Density Carbon (HDC) capsule coating and polishing capability commissioned at LLNL will allow for research and development of mitigations to HDC capsule imperfections.
  - Testbed laser experiments demonstrated Fourth-generation Lasers for Ultra-broadband eXperiments (FLUX) technology which has applications to mitigate LPI and provide improved beam smoothing for direct-drive ICF.

**Facility Operations**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Facility Operations $387,194,000** | **Facility Operations $363,120,000** | **Facility Operations -$24,074,000** |
| • Maintain safe and efficient operations at all the national HED facilities: NIF, Z, and Omega.<br>• Emphasize experiments in direct support of the stockpile and implementation of the findings and recommendations of ICF 2020 and JASON reviews. | • Provide operational facilities to obtain the key data that reduces uncertainty in calculations of nuclear weapons performance.<br>• Obtain 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.<br>• Advance unique target design and development capabilities at LANL<br>• Continue safe and efficient operation of all NNSA-funded national HED facilities in accordance with their Governance Plans.<br>• 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.<br>• Explore technology to support future facility investments, such as new approaches to energy balance, laser plasma interactions, and improved energy coupling. | • Decrease represents forward funding in FY 2021 for acceleration of FY 2022 scope. |

## 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 underground nuclear 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. 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 National Nuclear Security Administration (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 new, 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. To continue to increase computing power for general consumer markets, industry has evolved beyond that technology paradigm. ASC must maintain currency with the computing industry to ensure continued performance of the IDCs on the next-generation compute platforms, as required to maintain a credible nuclear deterrent and address potentially 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, currently underway, was established to determine the limitations and scaling potential of our current assessment capabilities. This initiative assesses the potential of current platforms, codes, and qualified personnel by exploring physics calculations that are impractical for regular assessment capabilities due to job sizes, time length of the code runs, or a combination of the two. The initiative pushes the national security laboratories to look beyond current computing abilities to make today's hero calculations those of routine business for a variety of NNSA missions. Another effort is the Advanced Machine Learning Initiative (AMLI), which aims to increase the use of commercially available artificial intelligence hardware and further develop machine learning algorithms to add to the ASC physics-informed simulation portfolio. 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 when new errors are introduced. Another initiative across the national security laboratories is quantum computing (QC), which seeks to develop new methods and expertise in algorithm development and hardware evaluations to develop promising QC technologies suitable for nuclear weapon applications. The ASC program aims to drive efficiencies into the manufacturing process through ASC's Production Simulation Initiative (PSI). Efforts such as the Simulation First initiative at Kansas City National Security Campus (KCNSC) incorporates physics-based simulation into production operations to optimize solutions.

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

1. **Integrated Codes** produces large-scale, 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.
4. **Advanced Technology Development and Mitigation** addresses the need to build new IDCs that are more aligned with emerging next-generation computing architectures and to develop next-generation computing technologies and software.
5. **Computational Systems and Software Environment** builds integrated, balanced, and scalable computational capabilities, including high-performance computing systems and requisite user environments.
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, IDCs that enable 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. These 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 select 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 experimental data obtained from facilities, such as the Z pulsed power facility and National Ignition Facility (NIF). In this way, IC serves an integrating tool for activities across 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 current and future ASC computing platforms. 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 the Office of Experimental Sciences. The IC subprogram will prepare for the more complex and heterogeneous node architecture of upcoming HPC platforms through the advances achieved by the Advanced Technology Development and Mitigation (ATDM) subprogram.

**Highlights of the FY 2022 Budget Request**

- Continue to provide weapons code capabilities to the NNSA nuclear security enterprise 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 El Capitan early access system-3 (EAS-3) nodes, which will have one-generation-earlier graphics processing units (GPUs) than what will be deployed in the final system.
- Support production agencies using ASC codes and computing resources as part of the PSI.

**FY 2020 Accomplishments**

- Maintained full baselines for all stockpile systems and used these baselines to improve the fidelity of annual stockpile assessments.
- 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 HPC architectures and migrate current design and safety codes to run efficiently on heterogeneous computing architectures.

**Integrated Codes**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Integrated Codes $137,956,000** | **Integrated Codes $146,767,000** | **Integrated Codes +$8,811,000** |
| • 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.<br>• Migrate current design and safety codes to run efficiently on heterogeneous architectures.<br>• Support KCNSC's on-going use of ASC codes and computing resources to solve production manufacturing problems.<br>• Continue with code builds and ports, testing and bug fixes. | • 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.<br>• Migrate current design and safety codes to run efficiently on heterogeneous architectures.<br>• Support production agencies using ASC codes and computing resources as part of PSI.<br>• Continue with routine code builds and ports, testing and bug fixes supporting analysts and designers. | • Increase provides support for ATDM simulation technology transition to IC. |

**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 2022 Budget Request**

- Support survivability and hostile environment modeling across current and future HPC systems.
- Revamp foundational materials modeling infrastructure to fully support and utilize next-generation architectures.
- 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.
- Continue to improve and deploy modeling capabilities to positively impact production requirements as part of PSI.

**FY 2020 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.
- 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.

**Physics and Engineering Models**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Physics and Engineering Models $77,967,000** | **Physics and Engineering Models $80,003,000** | **Physics and Engineering Models +$2,036,000** |
| • Revamp and further develop material models and infrastructure to fully support and utilize El Capitan.<br>• Further refine and improve the credibility of predictive models for manufacturing processes, including pre-production and post-production processes.<br>• Develop machine learning toolkits to enable physics models in areas such as strength/damage and nuclear data.<br>• Further refine models to enable assessments of future stockpile options<br>• Support production agencies in the use of ASC models to solve production manufacturing problems.<br>• Develop mission-relevant quantum simulation algorithms. | • Continue to refine, improve, and deploy predictive models for production process as part of PSI.<br>• Further develop machine learning toolkits to enable physics models.<br>• Develop and deploy refined models to enable assessments of future stockpile options.<br>• Continue to develop material models and infrastructure to fully support and utilize El Capitan.<br>• Refine mission-relevant quantum simulation algorithms. | • Increased modeling support to production agencies.<br>• Hostile environment modeling support for follow-on SCDS efforts in FY 2023. |

**Advanced Simulation and Computing**
**Verification and Validation**

**Description**

The Verification and Validation (V&V) subprogram provides evidence that the models in the codes produce mathematically credible answers that reflect physical reality. V&V focuses on establishing soundness in integrated simulation capabilities by collecting evidence that the numerical methods and simulation models are being solved correctly, and whether the simulation results from mathematical and computational models implemented into the codes are in alignment with real-world observations. 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.

V&V brings the IC and PEM subprograms together with other RDT&E activities to evaluate the capability of the 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 the simulations of high-consequence nuclear stockpile problems.

V&V 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. This capability will provide the tools and methods necessary for evaluation of new PEM models and IDC versions. Where possible, V&V 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 2022 Budget Request**

- Extend the verification and validation infrastructure to include next-generation integrated design codes.
- Advance V&V and Uncertainty Quantification suites to support the current stockpile integration of common modeling workflows.
- Integrate test suites into existing workflows for supporting a broad customer base.
- Demonstrate improved and validated nuclear data from machine learning techniques demonstrated into material response and plasma models.
- Implementation of the Engineering Common Model Framework to enhance common modeling techniques for ASC capabilities.

**FY 2020 Accomplishments**

- Completed the assessment of primary performance sensitivity to uncertainties in equation of state and nuclear data.
- 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.
- Utilized 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.

**Verification and Validation**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Verification and Validation $61,676,000** | **Verification and Validation $61,676,000** | **Verification and Validation $0** |
| • Continue to verify and validate improvements in nuclear performance and safety codes to address multi-point safety issues.<br>• Validate improvements to physics and material models.<br>• Validate improvements in engineering codes for normal, abnormal, and hostile environments.<br>• Adopt new V&V protocols for algorithms running on heterogeneous HPC architectures.<br>• Advance predictive capability of codes and models.<br>• Improve existing and developed new primary and secondary common models.<br>• Provide training on the use of UQ tools, aided by initial advanced machine learning techniques<br>• Implement quality assurance controls to ensure material and nuclear databases are correctly updated and maintained. | • Verify improvement in nuclear performance and safety codes to address multi-point safety issues.<br>• Validate improvements to physics and material models.<br>• Validate improvements in engineering codes for normal, abnormal, and hostile environments.<br>• Enhance V&V protocols for algorithms running on hybrid HPC architectures.<br>• Assess predictive capability as improvements to codes and models, including new nuclear material data, are made available.<br>• Refine the primary and secondary common models.<br>• Provide training on the use of UQ tools.<br>• Implement quality assurance controls to ensure material and nuclear databases are correctly updated and maintained.<br>• Improve necessary next-generation verification and validation techniques to continue support in methods, assessments, and data archiving.<br>• Advance V&V and Uncertainty Quantification suites to support the current stockpile integration of common modeling workflows.<br>• Support for FY 2022 SCDS Assess Lifetimes and Mitigate Aging pegpost through enhancement of V&V/UQ test suites. | • Funding remains unchanged. |

**Advanced Simulation and Computing**
**Advanced Technology Development and Mitigation**

**Description**

The Advanced Technology Development and Mitigation (ATDM) subprogram is transitioning laboratory code and computer engineering/science projects, supporting long-term simulation and computing goals relevant to both exascale computing and the broad national security missions of the NNSA, to the other ASC subprograms as these tools and capabilities productionize. This subprogram addressed the need to build new IDCs that are more aligned with emerging technologies and to engage in co-design collaborations with industry to evolve the HPC operating systems and development software so that next-generation weapons codes will perform well on future HPC systems.

The current ASC simulation capabilities are encountering a computing paradigm change as HPC technologies evolve to radically different and more complex (many-core or heterogeneous) architectures. This subprogram addresses three major challenges: 1) the radical shift in computer system architectures; 2) maintaining current IDCs that took more than a decade to develop and validate; and 3) adapting current capabilities as evolving computing technologies become increasingly disruptive to the IDCs.

As the ATDM work scope is being transitioned to other ASC subprograms, it continues to pursue options for solving remaining issues associated with changing architectures to support the stockpile stewardship mission.

**Highlights of the FY 2022 Budget Request**

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

**FY 2020 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.

**Advanced Technology Development and Mitigation**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Advanced Technology Development and Mitigation**<br>**$40,000,000** | **Advanced Technology Development and Mitigation**<br>**$40,000,000** | **Advanced Technology Development and Mitigation**<br>**$0** |
| • Sustain ASC investment in the DOE Exascale Computing Project for (ECP) Application Development and Software Technology focus areas.<br>• Coordinate activities associated with transitioning next-gen simulation capabilities with IC, PEM, and V&V subprograms, and adoption of next-generation computer science technologies by CSSE.<br>• Continue Interagency CoDesign activities with National Cancer Institute and biomedical industry. | • Fund ongoing NNSA-specific ECP AD and ST projects.<br>• Continue transition of production-ready next-gen simulation capabilities to IC, PEM, and V&V subprogram, and next-generation computing technologies to CSSE.<br>• Continue Interagency CoDesign activities with National Cancer Institute and biomedical industry. | • Funding remains unchanged. |

## Advanced Simulation and Computing
## Computational Systems and Software Environment

**Description**

The Computational Systems and Software Environment (CSSE) subprogram builds a portfolio of integrated, balanced, and scalable computational capabilities to provide the needed computing environment stability to protect NNSA's investment in IDCs. In addition to 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, ranging from system software to input/output (I/O) services, storage and networking, post-processing (visualization and data analysis tools, and next-generation computing technologies. CSSE also examines possible future technologies beyond exascale, such as quantum, neuromorphic, and non-complementary metal-oxide-semiconductor (non-CMOS)-based computing techniques.

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

- Design, develop, and deploy usable computing systems. The CSSE subprogram will design and procure HPC systems required to support stockpile stewardship and broader nuclear security missions. These systems will include test beds and early access systems for evaluation and analysis of code performance issues on next-generation hardware, CT systems for most stockpile computing work, and AT systems for large-scale simulation workloads and predictive science advances.
- 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.

ASC will utilize Lease-to Own (LTO) funding vehicle for Commodity Technology System, Advanced Technology System, and computer storage system procurements in situations that make programmatic and financial sense.

**Highlights of the FY 2022 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.
- Accept and deploy Crossroad Phase 1 system for classified computing service.
- Transition mature ATDM next-generation computer science capabilities into CSSE's Next-Generation Computing Technologies product group.

**FY 2020 Accomplishments**

- Continued improving tri-lab software environment for ASC Sierra system.
- Transitioned the ASC Astra system into classified computing environment.
- Issued the ASC Crossroads system contract award.
- Initiated El Capitan non-recurrent engineering discussions with HPE and AMD, as a joint collaboration with ORNL.

**Computational Systems and Software Environment**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Computational Systems and Software Environment**<br>**$237,953,000** | **Computational Systems and Software Environment**<br>**$242,104,000** | **Computational Systems and Software Environment**<br>**+$4,151,000** |
| • Prepare software environment for ASC Crossroads system at LANL.<br>• Closely co-design with HPE on El Capitan's non-engineering (NRE) activities.<br>• Execute award for Vanguard-2 project which is an applied R&D collaboration with a computer company.<br>• Sign new contract for CTS-2 platforms for NNSA tri-labs.<br>• Prepare tri-lab computing environment for El Capitan.<br>• Deploy new quantum computing testbeds. | • Deploy ASC Crossroads Phase 1 system at LANL.<br>• Continue El Capitan NRE and system build activities.<br>• Accept El Capitan's early access system-3 (EAS-3) nodes for code development and porting evaluation.<br>• Deploy CTS-2 platforms at NNSA labs and KCNSC.<br>• Deploy tri-lab computing environment for El Capitan.<br>• Manage the Vanguard-2 contract.<br>• Continue evaluating applicability of quantum computing hardware for DP missions. | • Accept ASC Crossroads system at LANL and El Capitan Early Access systems for tri-lab code preparation. |

## 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 support nuclear weapons simulation workloads. 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.

The ASC program will utilize Lease-to-Own (LTO) funding vehicles for Commodity Technology System, Advanced Technology System, and computer storage system procurements in situations that make programmatic and financial sense.

**Highlights of the FY 2022 Budget**

- Prepare the ASC computing facilities at the NNSA Laboratories for the next-generation platforms.
- Initiate deployment of new CTS2 platforms at NNSA labs.
- Install, deploy, and operate ATS-3/Crossroads at LANL, including remote computing capabilities.

**FY 2020 Accomplishments**

- Successfully integrated Astra (Arm-based system) into SNL's classified environment.
- Installed, configured, and placed Vortex (a mini-Sierra platform) into production.
- Began construction of the CTS-2 Chilled Water cooling capability in the Strategic Computing Complex at LANL.
- Achieved early project close-out and start of operations/Critical Decision 4 (CD-4) for the Exascale Class Computer Cooling Equipment (EC3E) construction project.
- Received CD-2/3 for the Exascale Computing Facility Modernization (ECFM) construction project.
- Installed 1.5 MW of additional power capabilities and thermosyphons to serve the 725-E HPC facility at SNL for CTS-1 and CTS-2 systems.
- Completed final installation, integration, and testing of CTS-1 Magma system.
- Decommissioned the Sequoia, Vulcan, and Grove systems and storage clusters.
- Purchased equipment necessary for DISCOM 100-Gb upgrade and removed obstacle to secure code development in support of the tri-lab remote computing.

**Facility Operations and User Support**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Facility Operations and User Support**<br>**$176,462,000** | **Facility Operations and User Support**<br>**$176,462,000** | **Facility Operations and User Support**<br>**$0** |
| • Maintain full operation of CTS1 and CTS1+ systems.<br>• Improve tri-lab common computing environment to include more heterogeneous architectures in the CTS environment.<br>• Maintain maximum availability of computer cycles to end users.<br>• Document and implemented new best practices.<br>• Provide operational support for reliable and secure production computing environment.<br>• Prepare for insertion of next-generation architectures (systems and testbeds).<br>• Implement contingency response plans, as necessary.<br>• Improv and deploy the needed file system and archival storage technologies.<br>• Support execution of the LLNL Exascale Computing Facility Modernization project. | • Improve tri-lab common computing environment to include more heterogeneous architectures in the CTS environment.<br>• Maintain maximum availability of computer cycles to end users.<br>• Document and implement new best practices.<br>• Provide operational support for reliable and secure production computing environment.<br>• Prepare for insertion of next-generation architectures (systems and testbeds).<br>• Implement contingency response plans, as necessary.<br>• Improve and deploy needed file system and archival storage technologies.<br>• Support execution of ATS-4/El Capitan-related building preparation work, including the LLNL Exascale Computing Facility Modernization project.<br>• Initiate deployment and operation of ATS-3/Crossroads at LANL and CTS2 systems.<br>• Demonstrate remote computing capabilities across the tri-labs with ATS-3/Crossroads. | • Funding remains unchanged. |

**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:** Developing and modernizing stockpile technologies and processes so they are agile, assured, and responsive to change, shortening design, qualification, certification, and manufacturing cycles and timelines to improve future affordability.
- **Partnership with Stakeholders to Meet Stockpile and Customer Requirements:** Identifying, sustaining, enhancing, integrating, and continually exercising all capabilities, tools, and technologies across the science, engineering, design, certification, and manufacturing cycle, working together with the Department of Defense, national security laboratories, nuclear weapon production facilities, and other partners.
- **Qualification and Certification:** With other Defense Programs partners, conducting experiments and simulations to enable qualification and certification without nuclear explosive testing.
- **Skilled Technical Workforce and Enhanced Capabilities:** Maintaining 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;
- Leading technology and system demonstration efforts, with various mission partners, to speed development and improve acceptance of advanced technologies and processes into the stockpile and the nuclear security enterprise; and
- Improving agility, effectiveness, safety, and efficiency in the design and manufacture of war reserve components using advanced technologies and manufacturing processes.

The Weapon Technology and Manufacturing Maturation program is made up 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 processes that are responsive to the National Nuclear Security Administration (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 practical 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, 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 and ensure authorized use.

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

**Highlights of the FY 2022 Budget Request**
- Develop optical initiation systems and support the Optical Initiation Technology Realization Team, a collaborative effort between the labs and plants created to ensure the successful rapid maturation of optical initiation as that technology eventually transitions to production and insertion into the next weapons systems.
- Develop advanced safety mechanisms and demonstrate technologies on the next demonstrator.
- Develop improved safety architectures that minimize/eliminate issues with electrical transmission.
- Develop improved power management technologies tailored to modernized applications.

**FY 2020 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.
- 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 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.

**Surety Technologies**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Surety Technologies $54,365,000** | **Surety Technologies $52,537,000** | **Surety Technologies -$1,828,000** |
| • Resume development of optical initiation systems and firing set interface module.<br>• Develop improved safety architectures.<br>• Advance surety options availability for future weapons systems to meet threshold and objective surety requirements.<br>• Prove-in MPS material in a sub-system architecture for future security needs.<br>• Develop integrated use control and physical security subsystems for U.S. Air Force weapon storage by FY 2022. | • Advance surety options availability for future weapons systems to meet threshold and objective surety requirements.<br>• Develop optical initiation systems and support the Optical Initiation Technology Realization Team, a collaborative effort between the labs and plants created to ensure the successful rapid maturation of optical initiation as that technology eventually transitions to production and insertion into the next weapons systems.<br>• Develop advanced safety mechanisms and demonstrate technologies on the next demonstrator.<br>• Develop improved safety architectures that minimize/eliminate issues with electrical transmission.<br>• Develop improved power management technologies tailored to modernized applications.<br>• Mature optical initiation and firing set interface module.<br>• Develop CDU firing set as a backup.<br>• Complete integrated use control and physical security subsystems for U.S. Air Force weapon storage. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

## Weapon Technology and Manufacturing Maturation
## Weapon Technology Development

**Description**

Weapon Technology Development (WTD) 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. The focus of WTD is to improve existing capabilities, provide solutions for addressing capability gaps and shortfalls, evolve capabilities to meet emerging threats and changing policy, and utilize improved technologies and methods to reduce life-cycle costs.

In particular, WTD funds activities for the research, development, engineering, integration, and demonstration of technologies that enable the performance, reliability, safety, and responsiveness of current and future stockpile. This includes early-stage development and testing of weapon components targeted to replace sunset technologies and modernize subsystems. This is defined as components facing performance, aging, and/or security issues that can have negative impacts on the performance and safety of a weapon.

**Highlights of the FY 2022 Budget Request**

- Develop a distributed bus-based architecture (DBBA) to enable greater component re-use across the stockpile.
- Continue development of field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing, and other functions within nuclear weapons.
- Mature advanced power source technologies to support future tactical and strategic weapon system LEP insertions, including mature explosive materials, initiation systems, detonators, technologies, tools, and processes.
- Develop and improve Neutron Generator (NG) technologies to offset aging effects.
- Continue development efforts for long-life Gas Transfer System (GTS) design options.
- Continue the development and integration of an embedded sensors capability.
- Research and develop next-generation components and materials required to ensure safety, security, reliability, and performance of aging Nuclear Explosive Packages (NEPs).
- Continue efforts with the U.K. on JTD as a strategic collaboration focusing on design and development of new technologies.
- Collaborate with Navy SSP partners and others on future flight opportunities in realistic environments for the Reentry Experiments Development Initiative (REDI).
- 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.

**FY 2020 Accomplishments**

- The Joint Technology Demonstrator (JTD) Workstream 2 (WS2) Ground Test Unit (GTU) completed its final round of testing, a first-ever full system Superfuge test. Analysis and lessons learned have been completed in FY 2020 Q4.
- JTD Workstream 1 (WS1) has transitioned into a new system agnostic workstream. The system context currently is a ballistic design but will change over the course of the project in the future to remain applicable to all future systems.
- Fielded and performed Campaign 4 of the HOTSHOT program to demonstrate and mature technologies.
- Completed the primary Impedance-Matched Multi-Axis Test (IMMAT) testing objectives for JTD Ground Test 2 (GT2) using JTD system hardware, the first time this type of testing equipment/software has ever been used on system-level representative hardware, with the potential to significantly improve modeling of flight testing. Stationed production agency personnel at design agencies to facilitate technology transfer and reduce manufacturing risk early.
- Further developed thermal spray technologies as a potential option for the W87-1 program and other future systems.

**Weapon Technology Development**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Weapon Technology Development $131,692,000** | **Weapon Technology Development $125,093,000** | **Weapon Technology Development -$6,599,000** |
| • 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.<br>• 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.<br>• Continue development efforts for long-life GTS design options.<br>• Continue development and testing of conformal thermal batteries, abnormal launch accelerometers, and replacement inertia sensor technologies.<br>• Continue the development of a new warhead bus architecture and ELNG for future system insertion to enable reduced cost for future modifications.<br>• Continue the development of field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing, and other functions within nuclear weapons.<br>• Continue development of options for positional aware fuzing.<br>• Execute HOTSHOT sounding rocket flights to mature technologies.<br>• Continue to evaluate the effectiveness of sounding rockets and other platforms for the qualification of weapon components. | • 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.<br>• Develop a distributed bus-based architecture (DBBA) to enable greater component re-use across the stockpile.<br>• Continue development of field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing, and other functions within nuclear weapons.<br>• Continue development efforts for long-life GTS design options.<br>• Research and develop next-generation components and materials required to ensure safety, security, reliability, and performance of aging Nuclear Explosive Packages (NEPs).<br>• Continue development and testing of conformal thermal batteries, launch accelerometers, and replacement inertial sensor technologies.<br>• Continue the development of an electronic neutron generator (ELNG) for future system insertion to enable reduced costs. Continue development of options for positional aware fuzing.<br>• Continue to evaluate the effectiveness of sounding rockets and other platforms for the qualification of weapon components. | • Decrease represents a reprioritization of resources to higher priority programs and projects. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Continue the development and integration of embedded sensors capability.<br>• Continue development of major components of an improved firing set architecture for weapon system modernization program insertions.<br>• Continue evaluating integrated data instrumentation capabilities for future telemetry systems.<br>• Complete implementation of NEA and supply chain risk management for R&D activities.<br>• Continue development and integration of flight-ready payloads on a flight platform to demonstrate and mature technologies.<br>• Continue efforts with the U.K. on JTD as a strategic collaboration focusing on design and development of new technologies.<br>• Begin development of a methodology to reduce the number and duration of design-build-test cycles for technology maturation. | • Continue the development and integration of embedded sensors capability.<br>• Continue development of major components of an improved firing set architecture for weapon system modernization program insertions.<br>• Continue evaluation of integrated data instrumentation capabilities for future telemetry systems.<br>• Continue development and integration of flight-ready payloads on a flight platform to demonstrate and mature technologies.<br>• Continue efforts with the U.K. on JTD as a strategic collaboration focusing on design and development of new technologies.<br>• Continue development of a methodology to reduce the number and duration of design-build-test cycles for technology maturation.<br>• Continue integration and development of technologies for the joint U.S. Air Force – NNSA Demonstrator Initiative (ANDI) flight to reduce risks and test insertion options in relevant environments, execution of the flight and analysis of flight results.<br>• Collaborate with Navy SSP partners and others on future flight opportunities in realistic environments for the Re-entry Experiments Development Initiative (REDI). | |

**Weapon Technology and Manufacturing Maturation**
**Advanced Manufacturing Development**

**Description**
The Advanced Manufacturing Development (AMD) program directly affects 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 2022 Budget Request**
- Support key manufacturing technologies that are replacing obsolete materials and processes, as well as leverage scientific knowledge for new qualification and verification methods, on a timeline to support delivery of components for the W87-1 and future systems.
- Mature Direct Casting and Special Materials technologies to transition to Production Modernization.
- 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.
- Conduct testing to confirm components manufactured with new production methods improve performance margins.
- Develop material recyclability processes to reuse scrap material and reduce supply chain risk.
- Leverage advancements in AM topology optimization to enable higher fidelity data and rapid design cycles for current and future system flight tests
- Advance development of next generation CMOS8 trusted, strategically radiation hardened microelectronics manufacturing process technology.

**FY 2020 Accomplishments**
- Completed prototype of rapid mandrel machining project to significantly reduce lead time on classified tooling required for printing Direct Ink-Write (DIW) cushions and pads; rapid mandrel machining enables faster development cycles and design iterations by product realization teams.
- Completed fabrication of the first full flow microelectronics CMOS8 lot on 8-inch wafers at MESA and started initial electrical and radiation testing.
- Developed models for use by programs of record to predict contaminants, replace destructive testing, and determine material properties that are impossible, timely, or costly to get; models contribute to significant cost avoidance and potential schedule reduction.
- 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 and design optimization tools were shown to provide designers with new degrees of freedom to optimize structures for shearing stresses and properties at ground level.
- Completed all technology maturation deliverables for Direct Cast and achieved TRL 5; multi-zone VIM furnace contract awarded; 100% design reached, procurement award, Factory Acceptance Testing scheduled.
- At risk materials were released in the Granta Weapons Materials Specifications Database for cross-site sharing on the Enterprise Secure Network.
- Utilized a toluene-free amination high explosive precursor material that reduces environmental hazards and improves batch throughput over 50% for new, safer high explosive formulations.

**Advanced Manufacturing Development**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Advanced Manufacturing Development**<br>**$111,908,000** | **Advanced Manufacturing Development**<br>**$115,000,000** | **Advanced Manufacturing Development**<br>**+$3,092,000** |
| • Continue work in Design for Manufacturing.<br>• Continue to develop certification and qualification methods to widen the use of AM-produced parts in the active stockpile.<br>• Incorporate next generation digital manufacturing methods through use of computational simulations and model-based designs.<br>• Implement new strategically radiation-hardened microelectronics production capabilities to enable new systems architectures.<br>• Develop new energetic materials formulations that are safer to produce and replace legacy materials that are no longer commercially available.<br>• 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.<br>• Develop additively manufactured thermoset materials that have advantages in performance, cost, manufacturability, reliability, and supply chain security.<br>• Develop methodologies required to qualify and certify AM for metal lattices.<br>• Develop methodologies required to design and certify AM for printed electronics.<br>• Develop AM processes for stochastic coatings.<br>• Develop testing of advanced methods for high explosives manufacture with improved safety | • Continue work in Design for Manufacturing.<br>• Continue work on Direct Cast and Special Materials.<br>• Produce novel components using new materials.<br>• Advance certification and qualification methods to widen the use of AM-produced parts in the active stockpile.<br>• Continue to incorporate next generation digital manufacturing methods through use of computational simulations and model-based designs.<br>• Continue implementation of new strategically radiation-hardened microelectronics production capabilities to enable new systems architectures.<br>• Continue development of new energetic. materials formulations that are safer to produce and replace legacy materials that are no longer commercially available.<br>• Continue technology development for use of laser powder bed fusion technology to demonstrate the potential to supplement production capabilities for near term programs of record.<br>• Continue developing methodologies required to qualify and certify AM for metal lattices.<br>• Continue development of AM for printed electronics and identify new insertion opportunities.<br>• Continue development of AM processes for stochastic coatings. | • The increase reflects additional investments to:<br>○ Leverage embedded sensors to study long-term aging effects of AM materials and components.<br>○ Increase efforts to address materials obsolescence issues in the nuclear security enterprise.<br>○ Increase advancements in manufacturing diagnostic tools.<br>○ Increase development of advanced production methods.<br>○ Increase introduction of new manufacturing techniques into production lines and ensures that materials and components produced by novel manufacturing processes meet design requirements. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| margins over conventional HE and better performance than insensitive HE.<br>• Leverage polymer and metal AM topology optimization to improve high fidelity mechanical mock flight tests for current and future systems. | • Continue to develop testing of advanced methods for high explosives manufacture with improved safety margins over conventional HE and better performance than insensitive HE.<br>• Develop material recycling processes to create feedstock for AM.<br>• Leverage embedded sensors to study long-term aging effects of AM materials and components.<br>• Continue development of polymer and metal AM topology optimization to improve high fidelity mechanical mock flight tests and further tailor to future system requirements.<br>• Leverage advancements in AM topology optimization to enable higher fidelity data and rapid design cycles for current and future system flight tests.<br>• Advance development of next generation CMOS8 trusted, strategically radiation hardened microelectronics manufacturing process technology. | |

## 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. Academic Programs within Stockpile Research, Technology, and Engineering is designed to support investments in science and engineering disciplines of critical importance to the National Nuclear Security Administration's (NNSA's) nuclear security enterprise. This includes such disciplines as nuclear science, radiochemistry, materials at extreme conditions, high energy density science, advanced manufacturing, and high-performance computing. The program's grants, centers, fellowships, and other funding options offer an introduction to the mission and people in the national laboratories, establishing a workforce pipeline to strengthen the future enterprise. Academic Programs has three goals:

1) Develop the next generation of diverse, highly trained technical workers able to support NNSA's core missions;
2) Maintain technical expertise external to the nuclear security enterprise for providing valuable oversight, cross-check, and peer review; and
3) Enable innovation to enhance nuclear security enterprise missions to strengthen key fields of research relevant to the NNSA mission.

Academic Programs enables robust and diverse science, technology, engineering, and mathematics (STEM), and research for educational communities through a variety of methods of support. Investments in consortia and centers of excellence provide collaborative groups to tackle large questions through multi-disciplinary approaches, and they leverage preeminent scientists in relevant fields. Research grants and focused investigatory centers support individual principal investigators to foster a vibrant community that is 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 nuclear security enterprise sites. User facilities open opportunities for academic partners to use NNSA's cutting-edge research facilities and push frontiers of current scientific understanding. All Academic Programs focus on quality science through competitive award, connection with NNSA mission national security laboratory and nuclear weapons production facility work, and a view to future needs and opportunities of the nuclear security enterprise.

**Primary responsibilities of this program include:**

- Managing academic solicitations and competitive awards;
- Providing a vibrant technical expertise aligned with the nuclear security enterprise's current and future needs;
- Enabling connections between academic research communities and the nuclear security enterprise to foster understanding of the NNSA mission; and
- Attract and train a future workforce through on-site opportunities and personal connections with laboratory scientists and engineers.

Academic Programs was established in fiscal year (FY) 2021 to bring together similar activities across the Stockpile Research, Technology, and Engineering programs. By combining these activities, NNSA will gain coordination across programs, and leveraging strengths and integrating resources to address the needs of NNSA interactions with academic partners.

The Academic Programs is made up 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 Fellowship (CSGF)
5. Predictive Science Academic Alliance Program (PSAAP)

**Academic Programs**
**Stewardship Science Academic Alliance**

**Description**

The 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's nuclear security enterprise.

The 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 on technical fields critical to stewardship science, building a field of talented researchers and committed doctoral students sharing a common desire to advance science while contributing to 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 address complex science and engineering problems critical to stockpile stewardship.

**Highlights of the FY 2022 Budget Request**

- A funding opportunity announcement for SSAA university research grants will solicit scientific research in areas crucial to the stockpile stewardship program.
- Ongoing SSAA centers of excellence completing their third year of support 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, the JPHEDLP, and the National Laser User Facility (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 2020 Accomplishments**

- Established new Center researching materials at extreme conditions, awarded in July 2020 from a competitive funding opportunity announcement for SSAA centers of excellence.
- Awarded a five-year contract to begin September 1, 2020 for continued management of the SSGF and LRGF Fellowships through a competitive solicitation.

**Stewardship Science Academic Alliance**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Stewardship Science Academic Alliance**<br>**$31,212,000** | **Stewardship Science Academic Alliance**<br>**$24,300,000** | **Stewardship Science Academic Alliance**<br>**-$6,912,000** |
| • 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.<br>• Support Stewardship Science Graduate Fellowship (SSGF) and Laboratory Residency Graduate Fellowship (LRGF) programs, the fourth year of LRGF will bring the total LRGF fellows to the projected stable level of 16.<br>• Start the National Laboratory Jobs ACCESS program per Congressional direction. | • Support scientific research in areas crucial to the stockpile stewardship program.<br>• Support third year of SSAA Centers of Excellence.<br>• Continue to provide support and hands on training for graduate students in areas relevant to stockpile stewardship, through fellowship programs.<br>• Brings together research teams supported by the SSAA, the JPHEDLP, and the National Laser User Facility (NLUF) programs at the highly attended annual SSAA symposium. | • Decrease reflects the profile of planned investments among the Academic Programs. |

## Academic Programs
## Minority Serving Institution Partnership Program

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. MSIPP has direct alignment to the Executive Order on "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government" through its support to 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 nuclear security enterprise'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 nuclear security enterprise that increase interactions to provide minority and tribal serving institution's direct access to nuclear security enterprise 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 nuclear security enterprise.
(4) Increase the number of minority graduates and post-doctoral students hired into the nuclear security enterprise's technical and scientific workforce.

**Highlights of the FY 2022 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 nuclear security enterprise.
- Increase student engagement and internship opportunities and confirm the hiring of various minority students into the nuclear security enterprise that have matriculated through various STEM consortium pipelines.
- Continue existing partnerships with Minority Serving Institutions.
- Support 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.

**FY 2020 Accomplishments**

- The MSIPP program conducted its third competitive solicitation for consortium-based STEM grants. Five new grants were awarded for strategic partnerships between MSIs and the nuclear security enterprise which includes representation from HBCUs, HSIs, and TCUs.
- MSIPP awarded eight continuation applications.
- The Tribal Education Partnership Program released its first Funding Opportunity Announcement.

**Minority Serving Institution Partnership**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Minority Serving Institution Partnership**<br>**$35,000,000** | **Minority Serving Institution Partnership**<br>**$35,000,000** | **Minority Serving Institution Partnership**<br>**$0** |
| • Continue existing partnerships with Minority Serving Institutions.<br>• Support the MSIPP consortium-based model focused on capacity building, research, student education programs and internships in STEM.<br>• Support building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. | • Continue existing partnerships with Minority Serving Institutions.<br>• Continue 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 nuclear security enterprise.<br>• Increase student engagement and internship opportunities and confirm the hiring of various minority students into the nuclear security enterprise that have matriculated through various STEM consortium pipelines. | • No change. |
| *Tribal Education Partnership Program (TEPP)*<br>*$5,000,000* | *Tribal Education Partnership Program (TEPP)*<br>*$5,000,000* | *Tribal Education Partnership Program (TEPP)*<br>*$0* |
| • Continue existing partnerships with TCUs.<br>• Support the building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. | • Continue existing partnerships with TCUs.<br>• Continue building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. | • No Change. |

**Academic Programs**
**Joint Program in High Energy Density Laboratory Plasmas**

**Description**
High energy-density (HED) states are central to many aspects of nuclear weapons. 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 (NLUF) Program.

Individual investigator grants: NNSA's Office of Experimental Sciences partners with the DOE's Office of Fusion Energy Sciences in the Office of Science 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.

Research centers: The Joint Program in HEDLP funding also supports the HED centers of excellence selected under the competitive Stewardship Science Academic Alliance (SSAA) process. Centers of Excellence are an integrated multi-institutional collaborative effort focused on a central problem or theme. These centers work closely with nuclear security enterprise scientists and maintain a core set of academic expertise in key technical areas.

Facility access: Support broad scientific facility access to apply NNSA unique tools to accomplish cutting edge science. Hands-on research experience to academic and industrial researchers using the Omega and Omega EP lasers as tools for conducting basic research experiments. 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.

**Highlights of the FY 2022 Budget Request**
- Expand 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.
- Support academic research Centers of Excellence in HED science.
- Support academic research grants in HEDLP competitively awarded through annual HEDLP funding opportunity announcement (FOA) held jointly with the DOE-Office of Science, annual selection of NNSA supported awards will enhance flexibility, attract new researchers, and assure career opportunities.
- Support facility access and community development through HED summer schools, facility user workshops.

**FY 2020 Accomplishments**
- Executed a solicitation for new research grants, jointly managed with the Office of Science's Fusion Energy Science.
- OMEGA (including OMEGA EP) delivered a total of 1,825 target shots, 877 for LLE and 948 for non-LLE facility users.
- 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 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Joint Program in High Energy Density Laboratory Plasmas $8,700,000** | **Joint Program in High Energy Density Laboratory Plasmas $8,833,000** | **Joint Program in High Energy Density Laboratory Plasmas +$183,000** |
| • Support academic grants and cooperative agreements, including support for several research Centers of Excellence in high energy density (HED) science. | • Expand opportunities for national collaboration in HED science research through the enhancement of existing grants and cooperative agreements as well as the establishment of new financial assistance awards.<br>• Support academic research Centers of Excellence in HED science.<br>• Support academic research grants in HEDLP competitively awarded through annual HEDLP funding opportunity announcement held jointly with the DOE-Office of Science, annual selection of NNSA supported awards will enhance flexibility, attract new researchers, and assure career opportunities.<br>• Support facility access and community development through HED summer schools, facility user workshops. | • Increase supports additional HED Center activities. |

## 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 Directed Stockpile Work (DSW) missions through SRT&E'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.

The DOE CSGF fosters a community of enthusiastic and committed doctoral students, alumni, DOE laboratory staff and various scientists who desire to have an impact on national security and energy missions while advancing their research. It increases collaboration between NNSA security laboratories, the fellows and their universities by enhancing the fellows' research experience at the national laboratories via access to unclassified HPC systems and exposing them to the broader, multi-disciplinary research activities at the laboratories. The program also provides a yearly stipend, tuition fee coverage, and academic allowance.

**Highlights of the FY 2022 Budget Request**

- Collaborate with DOE Office of Science in funding new cohort of fellows to be trained as next-generation leaders in computational science.
- Foster a CSGF community of energetic and committed doctoral students, alumni, and DOE/NNSA laboratory staff who all together serve as a support system for the new and current fellows.

**FY 2020 Accomplishments**

- Selected a new cohort of fellows who are exceptional students and provided benefits in STEM 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 work performed during the year.

**Computational Science Graduate Fellowship**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Computational Science Graduate Fellowship** **$2,000,000** | **Computational Science Graduate Fellowship** **$2,000,000** | **Computational Science Graduate Fellowship** **$0** |
| • Support a new cohort of fellows.<br>• Fund NNSA commitment for CSGF to help ensure a supply of scientists and engineers trained to meet NNSA workforce needs in computational science. | • Support the next cohort of fellows in the CSGF Program.<br>• Support CSGF program to ensure a pipeline of scientists and engineers trained to meet DOE/NNSA workforce needs in computational science. | • No change. |

## Academic Programs
## Predictive Science Academic Alliance Program

**Description**

The PSAAP engages with leading U.S. universities, focusing on the development and demonstration of technologies and methodologies to solve open science and engineering application problems. The research performed by the universities in this program is discipline-focused to further predictive science and enabled by effective use of high performance computing (HPC). Predictive science is the aim of this program and is based on verification and validation and uncertainty quantification methodologies for large-scale simulations.

PSAAP consists of the following types of Centers: Multi-disciplinary Simulation Centers (MSCs), Single-Discipline Centers (SDCs), and Focused Investigatory Centers (FICs). MSCs focus on scalable application simulations, targeting large-scale, integrated multidisciplinary problems, while SDCs focus on scalable application simulation for targeting a broad single science or engineering discipline. FICs are tightly focused on a specific research topic of interest to NNSA's mission, in either a science/engineering discipline or an exascale-enabling technology.

PSAAP has a long-term goal to cultivate the next generation of scientists and engineers to support the ASC and DSW missions. The funded PSAAP Centers will help their institutions develop new academic programs, or strengthen existing efforts, for multidisciplinary, computational science and engineering research, while providing students and research staff very relevant code development and HPC experience through open science and engineering applications.

**Highlights of the FY 2022 Budget Request**

- Establish large-scale, multi-disciplinary, simulation-based "predictive science" as a major academic applied research program.
- Manage PSAAP III Academic Alliance Centers in their second project year to achieve annual milestone objectives.
- Develop and demonstrate technologies and methodologies to support effective exascale computing in the context of science/engineering applications.

**FY 2020 Accomplishments**

- Completed site visits for PSAAP III candidates after the FOA proposal response review held in August 2019.
- Finalized cooperative agreements for selected PSAAP III Centers to begin first year of awards in September 2020.
- Engaged with Predictive Science Academic Alliance Program centers on technical topics and staff recruitment.
- Executed one-year extensions for the PSAAP II Centers to successfully complete demonstration of performance on proposed technologies relevant to NNSA missions.
- Provided dedicated, appropriate ASC computing resources and user support to enable the PSAAP II Centers to achieve their annual simulation demonstration milestones.
- Promoted collaborations with universities involving training, recruiting, and working with top researchers in key disciplines through internship experiences with the NNSA laboratories.

**Predictive Science Academic Alliance Program**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Predictive Science Academic Alliance Program**<br>**$20,000,000** | **Predictive Science Academic Alliance Program**<br>**$20,462,000** | **Predictive Science Academic Alliance Program**<br>**+$462,000** |
| • Support the new PSAAP III centers in their first year to work on proposed research objectives relevant to NNSA missions.<br>• Provide dedicated, appropriate ASC computing resources and user support to enable the PSAAP Centers to achieve their annual simulation demonstration milestones.<br>• Promote collaborations with universities involving training, recruiting, and working with top researchers in key disciplines required by stockpile stewardship.<br>• Engage with U.S. academic community in making significant advances in predictive modeling and simulation technologies.<br>• Coordinate among academic programs to continue to foster more development in addressing objectives and collaboration among the cohort. | • Support the new PSAAP III centers in their second year to work on proposed research objectives relevant to NNSA missions.<br>• Increase collaborations between the universities and NNSA laboratories through technical reviews and campus/lab visits.<br>• Provide dedicated, appropriate ASC computing resources and user support to enable the PSAAP Centers to achieve their annual simulation demonstration milestones. | • Supports increased collaborations between the universities and NNSA laboratories through bi-annual reviews and campus/lab visits.<br>• Provides additional ASC computing resources to support the more compute-intensive, larger-scale simulation jobs the PSAAP III Centers will execute. |

## Stockpile Research, Technology, and Engineering
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 449,712 | 606,247 | 597,790 | -8,457 |
| Minor Construction | N/A | N/A | 13,296 | 30,813 | 23,132 | -7,681 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **463,008** | **637,060** | **620,922** | **-16,138** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 240,602 | 245,895 | 251,305 | +5,410 |
| NIF High Resolution, neutron-hardened VISAR, LLNL | 7,230 | 0 | 1,150 | 1,800 | 1,800 | 0 |
| Magnetized Targets, LLNL | 7,500 | 5,100 | 900 | 800 | 700 | -100 |
| NIS Equator 90-213, LLNL | 6,700 | 3,900 | 1,900 | 900 | 0 | -900 |
| Target LRU, LLNL | 6,900 | 400 | 1,500 | 2,500 | 1,500 | -1,000 |
| Sierra (ATS-2) System, LLNL | 170,500 | 161,500 | 6,800 | 2,200 | 0 | -2,200 |
| NIF Master Oscillator Recapitalization, LLNL | 10,900 | 0 | 1,500 | 9,400 | 0 | -9,400 |
| Time-resolved Material Diffraction Diagnostics on NIF, LLNL | 5,300 | 0 | 0 | 0 | 5,300 | 5,300 |
| Subnanosecond laser replacement, LLNL | 6,000 | 0 | 0 | 0 | 6,000 | 6,000 |
| Commodity Technology System (CTS) 2, LLNL (previously CTS-2) | 40,000 | 0 | 0 | 10,000 | 10,000 | 0 |
| El Capitan (ATS-4), LLNL | 600,000 | 30,000 | 45,000 | 100,000 | 125,000 | +25,000 |
| Advanced Sources and Detector, LANL | 939,655 | 112,895 | 112,160 | 179,752 | 174,685 | -5,067 |
| Trinity (ATS-1) system, LANL | 187,000 | 182,000 | 5,000 | 0 | 0 | 0 |
| Crossroads (ATS-3) System, LANL | 127,000 | 24,000 | 24,000 | 45,000 | 14,000 | -31,000 |
| Commodity Technology System (CTS) 1, SNL (previously CTS 1+) | 7,200 | 0 | 7,200 | 0 | 0 | 0 |
| Build & Test System, SNL | 5,000 | 0 | 0 | 0 | 2,500 | +2,500 |
| Vanguard Phase 2 Prototype System, SNL | 15,000 | 0 | 2,000 | 8,000 | 5,000 | -3,000 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **449,712** | **606,247** | **597,790** | **-8,457** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 5,296 | 5,413 | 10,532 | +5,119 |
| SCC Electrical Upgrades, LANL | 15,000 | 0 | 0 | 0 | 1,000 | +1,000 |
| B654 Expansion, LLNL | 18,000 | 0 | 0 | 0 | 1,000 | +1,000 |
| B654 Low Conductivity Water (LCW) Installation, LLNL | 5,000 | 0 | 4,000 | 1,000 | 0 | -1,000 |
| B453 El Capitan Site Infrastructure, LLNL | 18,000 | 0 | 0 | 18,000 | 0 | -18,000 |
| 725 Additional Power, SNL | 10,000 | 0 | 0 | 0 | 5,000 | +5,000 |
| U1a.03 Test Bed Facility Improvements, NNSS | 17,200 | 1,200 | 4,000 | 6,400 | 5,600 | -800 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **13,296** | **30,813** | **23,132** | **-7,681** |
| **Total, Capital Summary** | **N/A** | **N/A** | **463,008** | **637,060** | **620,922** | **-16,138** |

**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 FY 2022 Request for the ASD MIE is $191,100,000. The Critical Decision CD-1 cost range for this project is $500,000,000 - $1,100,000,000 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."

**Significant Changes:**

Revised the long lead procurement strategy to incorporate separate phased procurements of long lead equipment and optimize the project schedule. A Federal Project Director (FPD) 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-3C | 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 |
| FY 2022 | 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 – Scintillator components
**CD-3B** – Approve Long Lead Procurements – Pulsed power components
**CD-2** – Approve Performance Baseline
**Final Design Complete** – Estimated/Actual date the project design will be/was complete(d)
**CD-3C** – Approve Start of Fabrication
**CD-4** – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

| Fiscal Year | Performance Baseline Validation | CD-3A | CD-3B |
|---|---|---|---|
| FY 2020 | 4Q FY 2021 | 3Q FY 2021 | |
| FY 2021 | 4Q FY 2021 | 3Q FY 2021 | |
| FY 2022 | 4Q FY 2021 | 4/12/2021 | 1Q FY 2022 |

**Project Cost History**

(Dollars in Thousands)

| Fiscal Year | Total Cost |
|---|---|
| FY 2020 | 791,600 |
| FY 2021 | 1,061,355 |
| FY 2022 | 939,655 |

**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 JASON 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 | 85,700 |
| FY 2021 | 179,752 | 179,752 | 154,400 |
| FY 2022 | 191,100 | 191,100 | 219,200 |
| Outyears | 340,748 | 340,748 | 372,278 |
| **Grand Total** | **939,655** | **939,655** | **939,655** |

**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 | 80,800 | 85,600 |
| 1.02 | Radiographic System | 559,600 | 557,800 |
| 1.03 | System Engineering and Requirements | 13,200 | 14,100 |
| 1.04 | System Integration at U1a | 19,600 | 53,300 |
| 1.05 | System Testing and Qualification at U1a | 10,000 | 15,700 |
| | Management Reserve/Contingency | 256,455 | 334,855 |
| | **Total** | **939,655** | **1,061,355** |

**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. This management team structure encourages the full engagement of LANL, LLNL, SNL and NNSS enabling the NNSA to leverage unique capabilities of each laboratory. It also unifies the design to construction process which is especially important as the U1a Complex is an underground facility with limited access.

## 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 and the Capability Based Investments (CBI) subprogram, 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, real property purchases, capital equipment, planning, Other Project Costs (OPC) for Infrastructure and Operations funded mission enabling infrastructure, and deactivation and disposal of excess infrastructure.

NNSA uses a prioritization methodology for recapitalization investments that factors in sustainability. This prioritization methodology focuses NNSA's infrastructure recapitalization investments on reducing safety risk and mission risk (which incorporate climate risk) while improving sustainability and return on investment. As NNSA continues to mature its sustainability approach, the Site Sustainability Plans (SSP) will identify each site's respective contribution toward meeting the Department's sustainability and climate action goals.

**Line Item Construction**

Infrastructure and Operations line item construction projects and line item purchases 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 2022 Budget Request**

The FY 2022 Infrastructure and Operations Budget Request totals $3,586,436,000 which represents the long-term effort to modernize NNSA infrastructure. This request includes an increase to Maintenance and Repair of Facilities for transfer of the Waste Solidification Building at the Savannah River Site from the Material Management and Minimization's Material Disposition subprogram within Defense Nuclear Nonproliferation. The decrease to Recapitalization, Infrastructure and Safety program reflects a realignment to address higher priority NNSA activities, including plutonium pit production infrastructure investments funded in Production Modernization. The decrease to the Capability Based Investments subprogram reflects the transfer of Other Project Costs for Los Alamos National Laboratory's (LANL) TA-55 Reinvestment Project Phase III (TRP III) and Transuranic Liquid Waste Facility (TLWF) line item projects to Plutonium Modernization, and transfer of some Sandia National Laboratories (SNL) CBI project scope to the new Non-Nuclear Capability Modernization program.

The request also supports Programmatic Construction funding for the Uranium Processing Facility (UPF) to phase out mission dependency on the existing aged Y-12 facility. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project; the U1a Complex Enhancements Project (UCEP); the Lithium Processing Facility (LPF); the Tritium Finishing Facility (TFF); TA-55 Reinvestment Project Phase III (TRP III); HE Synthesis, Formulation, and Production (HESFP) project; and a new start for the Power Sources Capability (PSC) project. The request for Mission Enabling Construction is to support a new start for the Digital Infrastructure Capability Expansion project at Lawrence Livermore National Laboratory (LLNL).

**Infrastructure Modernization Initiative**

The FY 2018 National Defense Authorization Act (NDAA) directed the creation of the Infrastructure Modernization Initiative **(**IMI) program, which the NNSA Administrator created in December 2017. The goal of the IMI is to reduce Deferred Maintenance (DM) and Repair Needs (RN) by not less than 30 percent by 2025.

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 $4.5 billion). NNSA's new calculated RPV is $116.3 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 $5.8 billion as of FY 2020. The overall physical condition of NNSA's infrastructure did not decline. (Table 1).

**Table 1**

**NNSA Deferred Maintenance (DM) as a Percentage of Replacement Plant Value (RPV)**

| Metric | FY 2018 | FY 2019 | FY 2020 |
|---|---|---|---|
| RN | $5.1B | $8.9B | $9.4B |
| DM | $2.5B | $4.8B | $5.8B |
| RPV | $55B | $124.3B | $116.3B |
| RN/RPV Ratio | 9.27% | 7.16% | 8.08% |
| DM/RPV Ratio | 4.63% | 3.85% | 4.99% |

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, including a breakdown of that DM at different stages of facilities' design lives.

| Table 2 | | |
|---|---|---|
| **NNSA Deferred Maintenance (DM) as of FY 2020 (dollars in thousands)** | | **% of Total DM** |
| Total DM | 5,811,359 | 100% |
| DM on excess facilities | 29,722 | 0.51% |
| DM on facilities beyond their 40-year design life | 3,875,393 | 66.69% |
| DM on facilities within ten years of their 40-year design life | 1,425,987 | 24.54% |
| DM on facilities within the first 30 years of their 40-year design life | 480,257 | 8.26% |

Approximately 90 percent of NNSA DM is associated with facilities that are approaching or surpassed their 40-year design life. As part of a prudent investment strategy, NNSA will intentionally not perform some of the maintenance and repair on facilities with near-term replacement strategies or those that are or soon will become excess. NNSA is prioritizing its investments based on reducing mission risk, and it will take time and sustained investment in new construction to replace aged facilities and reverse operational risks from this legacy infrastructure.

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 | 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 2021 table included the Storage Building 9720-22 at Y-12, which was disposed of in August 2020.

[b] Facility contains radiological and/or hazardous contamination based on historical use.

## Infrastructure and Operations
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Infrastructure and Operations** | | | | | |
| **Operating** | | | | | |
| **Operations of Facilities** | **900,000** | **1,014,000** | **1,014,000** | **0** | **0%** |
| **Safety and Environmental Operations** | **130,970** | **165,354** | **165,354** | **0** | **0%** |
| **Maintenance and Repair of Facilities** | **456,000** | **667,000** | **670,000** | **+3,000** | **+0.4%** |
| **Recapitalization** | | | | | |
| Infrastructure and Safety | 447,657 | 573,717 | 508,664 | -65,053 | -11.3% |
| Capability Based Investments | 112,473 | 149,117 | 143,066 | -6,051 | -4.1% |
| Planning for Programmatic Construction (Pre-CD-1) | 0 | 10,000 | 0 | -10,000 | -100.0% |
| Subtotal, Recapitalization | **560,130** | **732,834** | **651,730** | **-81,104** | **-11.1%** |
| **Total, Operating** | **2,047,100** | **2,579,188** | **2,501,084** | **-78,104** | **-3.0%** |
| Construction | | | | | |
| Programmatic Construction | 1,137,444 | 1,386,319 | 1,077,352 | -308,967 | -22.3% |
| Mission Enabling Construction | 15,000 | 122,000 | 8,000 | -114,000 | -93.4% |
| **Total, Construction** | **1,152,444** | **1,508,319** | **1,085,352** | **-422,967** | **-28.0%** |
| **Total, Infrastructure and Operations** | **3,199,544** | **4,087,507** | **3,586,436** | **-501,071** | **-12.3%** |

**Infrastructure and Operations**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Infrastructure and Operations** | |
| **Operating** | |
| **Operations of Facilities:** No change. | **0** |
| **Safety and Environmental Operations:** No change. | **0** |
| **Maintenance and Repair of Facilities:** The increase reflects the transfer of the Waste Solidification Building at the Savannah River Site from the Material Management and Minimization's Material Disposition subprogram within Defense Nuclear Nonproliferation. | **+3,000** |
| **Recapitalization:** | |
| **Infrastructure and Safety:** The decrease reflects a realignment to address higher priority NNSA activities, such as plutonium pit production infrastructure investments funded in Production Modernization. | **-65,053** |
| **Capability Based Investments**: The decrease reflects the realignment of Other Project Costs scope and funding for LANL's TRP-III and TLWF line item projects to Plutonium Modernization, and the realignment of some SNL CBI project scope and funding to the Non-Nuclear Capability Modernization program. | **-6,051** |
| **Planning for Programmatic Construction (Pre-Critical Decision (CD)-1):** The decrease reflects a realignment to address higher NNSA priorities. | **-10,000** |
| **Total, Operating** | **-78,104** |
| **Construction** | |
| **Programmatic Construction**: Reflects the completion of funding for the HE Science and Engineering Facility, Transuranic Liquid Waste Facility (TLWF), and Exascale Computing Facility Modernization (ECFM) projects. Additionally, the reduction reflects the prioritization of funding for programmatic plutonium construction funded within Production Modernization, the beginning of the ramp down of funding for the Uranium Processing Facility project, and the use of carryover balances to fund work within the Chemistry and Metallurgy Research Replacement project. | **-308,967** |
| **Mission Enabling Construction**: Reflects a new start for the Digital Infrastructure Capability Expansion project at Lawrence Livermore National Laboratory (LLNL). The increase is offset by a reduction for the Nevada National Security Site (NNSS) 138kV Power | **-114,000** |

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| Transmission System Replacement project, and two Emergency Operations Centers (EOCs) at LLNL and Sandia National Laboratories (SNL), which all received full funding for construction activities in FY 2021. | |
| **Total, Construction** | **-422,967** |
| **Total, Infrastructure and Operations** | **-501,071** |

**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.

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.

FY 2020-FY 2022 site allocations for the Operations of Facilities program are provided in Table 4 below.

**Table 4**

| Site | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request |
|---|---|---|---|
| Kansas City National Security Campus | 78,000 | 107,000 | 110,000 |
| Lawrence Livermore National Laboratory | 75,000 | 79,000 | 80,000 |
| Los Alamos National Laboratory | 231,000 | 303,000 | 287,000 |
| Nevada National Security Site | 102,000 | 102,000 | 103,000 |
| Pantex Plant | 67,000 | 75,000 | 77,000 |
| Sandia National Laboratories | 130,000 | 125,000 | 126,000 |
| Savannah River Site | 93,000 | 92,000 | 94,000 |
| Y-12 National Security Complex | 99,000 | 101,000 | 103,000 |
| Headquarters* | 25,000 | 30,000 | 34,000 |
| **TOTAL** | **900,000** | **1,014,000** | **1,014,000** |

* The Operations of Facilities allocation under "Headquarters" includes funding for the Safety Analytics, Forecasting, Evaluation, and Reporting (SAFER) platform and to quickly respond to emergent unforeseeable issues. Funding is distributed to the sites during execution, which is consistent with industry best practices.

## Operations of Facilities
## Activities and Explanation of Changes

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Operations of Facilities $1,014,000,000** | **Operations of Facilities $1,014,000,000** | **Operations of Facilities $0** |
| Funding supports base facility operations at:<br>• Kansas City National Security Campus (KCNSC), supporting non-nuclear production.<br>• LLNL, supporting plutonium, tritium, and high explosive nuclear security enterprise missions.<br>• LANL, supporting plutonium production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations.<br>• NNSS, including experimental capabilities.<br>• Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the Life Extension Program (LEPs).<br>• SNL, including environmental testing and microelectronics technologies facilities.<br>• Savannah River Site (SRS), including tritium and other capabilities.<br>• Y-12, for enriched and depleted uranium, lithium, and other special material operations.<br>• Headquarters (HQ), the SAFER platform to support enterprise-wide risk management applications. | Funding supports base facility operations at:<br>• KCNSC, supporting non-nuclear production.<br>• LLNL, supporting plutonium, tritium and high explosive nuclear security enterprise missions.<br>• LANL, supporting plutonium production, including pit production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations.<br>• NNSS, including experimental capabilities.<br>• Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the LEPs.<br>• SNL, including environmental testing and microelectronics technologies facilities.<br>• SRS, including tritium and other capabilities.<br>• Y-12, for enriched and depleted uranium, lithium, and other special material operations.<br>• HQ, the SAFER platform to support enterprise-wide risk management applications. | • No change. |

**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 maintained 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, consolidates, 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 | | | |
|---|---|---|---|
| **Subprogram** | **FY 2020 Enacted** | **FY 2021 Enacted** | **FY 2022 Request** |
| Nuclear Criticality Safety Program | 28,474 | 29,126 | 29,387 |
| Nuclear Safety Research and Development | 4,954 | 3,704 | 3,726 |
| Packaging | 23,463 | 27,831 | 25,683 |
| Long Term Stewardship | 53,109 | 78,283 | 77,173 |
| Nuclear Materials Integration[a] | 20,970 | 26,410 | 29,385 |
| **TOTAL** | **130,970** | **165,354** | **165,354** |

[a] Nuclear Materials Integration was funded out of Strategic Materials Sustainment under Directed Stockpile Work in FY 2020.

**Safety and Environmental Operations**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Safety and Environmental Operations**<br>**$165,354,000** | **Safety and Environmental Operations**<br>**$165,354,000** | **Safety and Environmental Operations**<br>**$0** |
| **Nuclear Criticality Safety Program $29,126,000** | **Nuclear Criticality Safety Program $29,387,000** | **Nuclear Criticality Safety Program +$261,000** |
| • 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**<br>**$3,704,000** | **Nuclear Safety Research and Development**<br>**$3,726,000** | **Nuclear Safety Research and Development**<br>**+$22,000** |
| • 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. | • No significant changes. |
| **Packaging $27,831,000** | **Packaging $25,683,000** | **Packaging -$2,148,000** |
| • Refurbish, recondition, maintain, replace 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. | • The decrease reflects a small adjustment to continue to reduce uncosted balances. |
| **Long Term Stewardship $78,283,000** | **Long Term Stewardship $77,173,000** | **Long Term Stewardship -$1,110,000** |
| • Continue to support LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, SNL, and Y-12.<br>• LTS required activities include: treating contaminated ground water (including the Pantex offsite groundwater contamination | • Continue to support LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, SNL, and Y-12.<br>• LTS required activities include: treating contaminated ground water (including the Pantex offsite groundwater contamination | • No significant changes. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| 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. | 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. | |
| **Nuclear Materials Integration $26,410,000**<br>• Maintain and operated the NMMSS for the United States Government.<br>• Process sodium bonded fuels at Idaho National Laboratory (INL) originally used at SNL.<br>• Plan and implement activities to recover Pu-244 from the Mk-18a target assemblies at SRS.<br>• Treat, consolidate, and dispose of inactive actinides no longer needed for nuclear security missions at Oak Ridge National Laboratory (ORNL), LANL, and Y-12.<br>• Assume responsibility for ensuring program direction and management of nuclear materials is effectively executed at each of the site offices.<br>• Provide long-term forecasting, planning and analysis of materials.<br>• Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA nuclear security enterprise.<br>• Continue activities to remove plutonium-bearing mixed oxide fuel. | **Nuclear Materials Integration $29,385,000**<br>• Maintain and operate the NMMSS for the United States Government.<br>• Process sodium bonded fuels at INL originally used at SNL.<br>• Plan and implement activities to recover Pu-244 from the Mk-18a target assemblies at SRS.<br>• Treat, consolidate, and dispose of inactive actinides no longer needed for nuclear security missions at ORNL, LANL, and Y-12.<br>• Ensure program direction and management of nuclear materials is effectively executed at each of the site offices.<br>• Provide long-term forecasting, planning and analysis of materials.<br>• Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA nuclear security enterprise.<br>• Continue activities to remove plutonium-bearing mixed oxide fuel. | **Nuclear Materials Integration + 2,975,000**<br>• Increase reflects additional support for the Material Managers at the sites and a study to support analysis of the DOE nuclear materials processing and handling infrastructure. The study will be conducted to ensure that actionable disposition pathways are available for all materials. |

## Infrastructure and Operations
## Maintenance and Repair of Facilities

**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 2020-FY 2022 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**

| Site | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request |
|---|---|---|---|
| Kansas City National Security Campus | 24,000 | 28,000 | 30,000 |
| Lawrence Livermore National Laboratory | 16,000 | 35,483 | 34,000 |
| Los Alamos National Laboratory | 82,000 | 150,000 | 150,000 |
| Nevada National Security Site | 38,000 | 58,000 | 61,000 |
| Pantex Plant | 82,000 | 117,000 | 112,000 |
| Sandia National Laboratories | 19,000 | 19,000 | 24,000 |
| Savannah River Site | 31,000 | 40,000 | 43,000 |
| Y-12 National Security Complex | 95,000 | 119,000 | 117,000 |
| Enterprise Acquisitions* | 69,000 | 100,517 | 99,000 |
| **TOTAL** | **456,000** | **667,000** | **670,000** |

* 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.

**Maintenance and Repair of Facilities**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Maintenance and Repair of Facilities**<br>**$667,000,000** | **Maintenance and Repair of Facilities**<br>**$670,000,000** | **Maintenance and Repair of Facilities**<br>**+$3,000,000** |
| • KCNSC: maintenance of equipment and tenant improvement equipment.<br>• LLNL: maintenance activities at Contained Firing Facility, Superblock, High Explosive Application Facility (HEAF), machine shops, and waste management facilities.<br>• LANL: maintenance activities at Plutonium Facility 4 (PF-4), Chemistry and Metallurgy Research (CMR), Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT), Los Alamos Neutron Science Center (LANSCE), Beryllium, waste management, radiological laboratory, and tritium facilities.<br>• NNSS: fund maintenance of Joint Actinide Shock Physics Experimental Research (JASPER), Big Explosives Experimental Facility (BEEF), Device Assembly Facility (DAF), and U1a.<br>• Pantex: Bays and Cell maintenance, fund emerging requirements, and support high explosives activities.<br>• SNL: maintenance activities at Microsystems Engineering, Science and Applications (MESA), Major Environmental Test Facilities (METF), and Tonopah.<br>• SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems.<br>• Y-12: maintenance for uranium and lithium operations.<br>• Enterprise-wide: RAMP and CHAMP centralized procurement activities to increase buying power | • KCNSC: maintenance of equipment and tenant improvement equipment.<br>• LLNL: maintenance activities at Contained Firing Facility, Superblock, HEAF, machine shops, and waste management facilities.<br>• LANL: maintenance activities at PF-4, CMR, DARHT, LANSCE, Beryllium, waste management, radiological laboratory, and tritium facilities.<br>• NNSS: funded maintenance of JASPER, BEEF, DAF, and U1a.<br>• Pantex: Bays and Cell maintenance, emerging requirements, and support for high explosives activities.<br>• SNL: maintenance activities at MESA, METF, and Tonopah.<br>• SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems.<br>• Y-12: maintenance for uranium and lithium operations.<br>• 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.<br>• Provides for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition. | • The increase reflects the realignment of the Waste Solidification Building at the Savannah River Site from the Material Management and Minimization's Material Disposition subprogram within Defense Nuclear Nonproliferation. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| and accelerated repairs of systems/components that are common across the NNSA enterprise.<br>• Provide for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition. | | |

## Infrastructure and Operations
## Recapitalization

**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, real property purchases, 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, environment, and programs. Recapitalization projects incorporate energy conservation measures to the greatest extent practicable in support of sustainability and energy performance improvements.

NNSA established the Standard Acquisition and Recapitalization (STAR) initiative in May 2019 to develop streamlined, repeatable processes to standardize the design and construction of non-nuclear, low-risk facilities in order to lower cost and accelerate their delivery. Under the STAR initiative, NNSA has a growing library of designs for small office, light laboratory, parking, and fire station facilities that have been successfully built at various NNSA sites. Reusing designs from the library allows NNSA sites to reduce the time spent in design development, saving cost and up to several months in the overall implementation schedule.

NNSA is in the process of working with our Management and Operating (M&O) partners and an Architecture/Engineering firm to draft design standards for administrative buildings that will be common to all sites, similar to the Uniform Facility Criteria used across the Department of Defense. These standards are the predecessors to developing a standard, scalable core building design that will provide the flexibility needed to accommodate needs for new, commercial-like facilities while also simplifying the construction procurement process.

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 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.

Tables 7 and 8 show the plans for Recapitalization projects to be executed with FY 2022 funding based on the status of enterprise infrastructure as of May 2021. This plan may need to be updated before the FY 2022 execution year to respond to changing infrastructure conditions and requirements.

| Table 7 | | |
|---|---|---|
| **National Nuclear Security Administration<br>Infrastructure and Safety<br>Planned FY 2022 Recapitalization Projects - As of May 2021** | | |
| **Site** | **Project Name** | **FY 2022 Allocation ($K)** |
| KC | Building 2 Electrical Component Manufacturing Revitalization Portfolio (Minor Construction) | 2,496 |
| | Building 2 Mechanical Component Manufacturing Revitalization Portfolio (Minor Construction) | 1,895 |
| | Building 23 Tool Room & Model Shop Machining Operations Area Expansion Buildout (Minor Construction) | 9,237 |
| | Building 23 W80-4 Manufacturing Development Area Buildout (Minor Construction) | 12,988 |
| | Building 23 W87-1 Manufacturing Development Area Buildout (Minor Construction) | 13,006 |
| | New Parking Lot (Minor Construction) | 3,371 |
| **Subtotal, Kansas City National Security Campus** | | **42,993** |
| LLNL | Building 131 Weapons Engineering Facility HVAC Lead Duct Revitalization | 7,800 |
| | Building 132N Defense Programs Research Variable Air Control Replacement (Minor Construction) | 6,500 |
| | Building 191 HEAF Atrium Conversion to Shot-Ready Workspace (Minor Construction) | 12,300 |
| | Building 321A Radiological & Material Characterization Capabilities Revitalization (Minor Construction) | 10,000 |
| | Site 200 Compressed Air and Miscellaneous Valves Replacement | 2,900 |
| | Site 300 Water Supply Piping and Valve Zone 3 and Other Upgrades (Minor Construction) | 11,000 |
| | New Energetic Material Office Facility (STAR) (Minor Construction) | 19,400 |
| | New Experimental Science Office Facility (STAR) (Minor Construction) | 19,400 |
| **Subtotal, Lawrence Livermore National Laboratory** | | **89,300** |
| LANL | CMR Initial Preparation for Closure | 3,380 |
| | LANCSE Fire Suppression System Installation (Minor Construction) | 1,800 |
| | New TA-15 DARHT Hydro Vessel Repair Facility (Minor Construction) | 13,691 |
| | New TA-22 Detonator Storage Magazines (Minor Construction) – Design | 1,437 |
| | PF-4 Controls Systems Component Replacement | 17,445 |
| | PF-4 PC-3 Fire Suppression System Modifications – Design | 1,231 |
| | PF-4 Vacuum Services Replacement – Design | 711 |
| | RLWTF Two Concrete Effluent Storage Tanks Stabilization (N25K and S25K) | 6,002 |
| | TA-55 Fire Suppression Water Line Installation for Program Expansion within the PIDAS (Minor Construction) | 13,895 |
| **Subtotal, Los Alamos National Laboratory** | | **59,592** |
| NNSS | New U1a Operations Support Facility - 01-351 (STAR) (Minor Construction) | 18,500 |
| | Area 6 CP Hill to Fire Station Junction Water Line Upgrade (Minor Construction) | 5,500 |
| | DAF Sewage System Capacity Upgrade (Minor Construction) | 3,500 |
| | Land Purchase for Nevada North West Las Vegas Campus (Minor Construction) | 1,500 |
| | New DAF Operations Complex Site Preparations (Minor Construction) | 6,500 |
| | U1a Fire Detection and Alarm System Revitalization (Minor Construction) – Design | 450 |
| | U1a Underground Power Distribution Upgrade (Minor Construction) – Design | 1,500 |

| Table 7 | | |
|---|---|---|
| **National Nuclear Security Administration<br>Infrastructure and Safety<br>Planned FY 2022 Recapitalization Projects - As of May 2021** | | |
| | Tweezer Substation Upgrade (Minor Construction) -Design | 1,500 |
| | NNSS Disposition of 12 Buildings in Area 6 | 2,200 |
| **Subtotal, Nevada National Security Site** | | **41,150** |
| PX | Building 12-052 HVAC Replacement | 16,000 |
| | Bay & Cell RAMS, FDS, & Lead-in Replacements | 41,377 |
| | East Interconnect Replacement | 9,000 |
| **Subtotal, Pantex Plant** | | **66,377** |
| SNL | B890 HVAC Upgrade (Minor Construction) | 4,500 |
| | High G Surveillance Testing Capability Addition (WETL, Pantex) (Minor Construction) | 8,400 |
| | SNL/CA Electrical Substation 30 & 31 Replacement (Minor Construction) | 2,500 |
| | Substation 36 Upgrade (Minor Construction) | 10,000 |
| | TA-I Substation 35 Upgrade (Minor Construction) | 6,500 |
| | H Street 14" Water Line (from B755 to B887) Replacement (Minor Construction) | 3,750 |
| | TA-IV District Chilled Water Expansion (Minor Construction) | 16,750 |
| | TTR Main 13.8 kV Substation and West Feeder Upgrade (Minor Construction) - Design | 500 |
| | SNL-TTR Area 09 - Disposition of 4 Buildings | 300 |
| **Subtotal, Sandia National Laboratories** | | **53,200** |
| SRS | 233-H 50 ton Process Chiller Replacement | 4,555 |
| | 234-7H Exhaust Ventilation Portfolio (Minor Construction) | 8,413 |
| | 234-H Addition Side Electrical Load Reconfiguration – Design | 4,010 |
| | New Tritium Office Building (STAR) (Minor Construction) - Design | 1,750 |
| | HANM Obsolete Glovebox Oxygen Monitors Replacement Portfolio | 4,325 |
| | 234-7H Fire Suppression Installation in Hoods (Minor Construction) | 2,320 |
| **Subtotal, Savannah River Site** | | **25,373** |
| Y-12 | Building 9201-05N AJ-5714 HVAC Replacement (Minor Construction) | 5,413 |
| | Building 9995 198/222 Feeders Electrical Panel and Motor Control Center Replacement (Minor Construction) | 9,288 |
| | Building 9215 Spalling Concrete Ceiling Repairs & Risk Mitigation | 6,081 |
| | New West End Production Change House (Minor Construction) – Design | 1,284 |
| | Bldg. 9720-05 Supply and Exhaust Fans Replacement | 7,704 |
| | Buildings 9201-02, 9204-01, and 9401-01 Utility Reroutes | 9,450 |
| | Bldgs Alpha 5/Alpha 4 & 9401-3 Pipes & Chases Demolition | 5,700 |
| **Subtotal, Y-12 National Security Complex** | | **44,920** |
| | Planning, Assessments, & Infrastructure Management Tools | 61,420 |
| | Albuquerque Complex Demolition[a] | 21,726 |

[a] The Albuquerque Complex D&D scope is changing from 312k GSF to 286k GSF. The Office of Secure Transportation plans to retain building 20387 as an alternate Emergency Operations Center and the NNSA Office of Incident Response plans to retain buildings 20397 and 20401 to support the Radiological Assistance Program.

| Table 7 | | |
|---|---|---|
| **National Nuclear Security Administration<br>Infrastructure and Safety<br>Planned FY 2022 Recapitalization Projects - As of May 2021** | | |
| | Construction Other Project Costs (OPC) | 2,613 |
| **Grand Total, Infrastructure and Safety** | | **508,664** |

| Table 8 | | |
|---|---|---|
| **National Nuclear Security Administration<br>Capability Based Investments<br>Planned FY 2022 Recapitalization Projects - As of May 2021** | | |
| **Site** | **Project Name** | **FY 2022 Allocation ($K)** |
| KCNSC | Helium Ion Microscope | 2,950 |
| | MeV CT System | 2,300 |
| | Development Laboratory Modernization | 560 |
| | Special Application Machining Modernization | 1,400 |
| | Gas Transfer Systems Production Modernization | 1,100 |
| | Rubber & Plastics Production Modernization | 1,550 |
| | Analytic Lab Equipment | 940 |
| | Assembly and Electrical Fabrication Equipment | 2,700 |
| **Subtotal, Kansas City National Security Campus** | | **13,500** |
| LLNL | Applied Material Engineering Consolidation | 9,100 |
| | LEP Equipment Capabilities Replacement Project | 10,500 |
| | Stockpile to Target Sequence Environmental Capabilities | 3,200 |
| | Detonation and Dynamic Diagnostic Deployment | 1,500 |
| | Site 300 Firing and Control System Modernization | 1,700 |
| **Subtotal, Lawrence Livermore National Laboratory** | | **26,000** |
| LANL | Uranium Foundry Modernization | 2,000 |
| | Fabricate pRad Outer Vessel | 1,050 |
| | Firing Site MPDV Equipment | 750 |
| | PF-4 Trolley Bucket Replacement | 2,500 |
| | NCERC Controls Replacement | 5,000 |
| | Forming and Fabrication Equipment Upgrades at Sigma (New Press) | 2,900 |
| | TRU Waste Glovebox Field Installation | 1,800 |
| **Subtotal, Los Alamos National Laboratory** | | **16,000** |
| NNSS | ECSE Test Stand Capabilities | 1,000 |
| | New High-Torque Horizontal Mill | 4,000 |
| | U1a Diagnostics Control Connectivity | 1,500 |
| | Digital Recorders for Subcritical Experiments (SCEs) | 1,000 |
| | U1a Truck Mounted Mine Rescue Hoist | 2,000 |
| | NLV Capability Mobilization | 1,500 |
| **Subtotal, Nevada National Security Site** | | **11,000** |
| PX | Production Tooling: Heat Treat Oven | 1,500 |
| | Production Tooling: Mazak Nexus Mill | 1,000 |
| | Replace 4 Environmental Chambers, Skids and Controllers, 12-94 | 2,000 |
| | Paint Booth, 12-141 | 1,500 |
| **Subtotal, Pantex Plant** | | **6,000** |

| Table 8 | | |
|---|---|---|
| **National Nuclear Security Administration<br>Capability Based Investments<br>Planned FY 2022 Recapitalization Projects - As of May 2021** | | |
| **Site** | **Project Name** | **FY 2022 Allocation ($K)** |
| SNL | Major Environmental Test Facilities (METF) Refurbishments and Upgrades | 5,730 |
| | Electromagnetics Amp Suite | 1,300 |
| | Accelerators Equipment and Upgrades | 4,670 |
| | Primary Standards Lab (PSL) Equipment Upgrades | 500 |
| | High-G Surveillance Testing Centrifuge (WETL, at Pantex) | 3,900 |
| | Reactor Equipment (ACRR) | 400 |
| **Subtotal, Sandia National Laboratories** | | **16,500** |
| SRS | Function Test Station Laser Replacement | 1,850 |
| | FTS Programmable Controller System Upgrade | 1,050 |
| **Subtotal, Savannah River Site** | | **2,900** |
| Y-12 | Nuclear Magnetic Resonance (NMR) Equipment | 2,700 |
| | Vapor Degreasing/Ultrasonic Cleaning Station | 6,000 |
| | Debonding Equipment | 16,000 |
| **Subtotal, Y-12 National Security Complex** | | **24,700** |
| | Corporate Reserves, Taxes and Assessments | 3,576 |
| | CBI Planning, Design, Program Management | 22,890 |
| **Grand Total, Capability Based Investments** | | **143,066** |

## Recapitalization
## Activities and Explanation of Changes

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Recapitalization $732,834,000** | **Recapitalization $651,730,000** | **Recapitalization -$81,104,000** |
| **Infrastructure and Safety $573,717,000** | **Infrastructure and Safety $508,664,000** | **Infrastructure and Safety -$65,053,000** |
| • Provides funds for needed investments in obsolete/aging facilities and infrastructure to improve safety, reliability, and working conditions | • Table 7 contains the current FY 2022 project plan as of May 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. | • The decrease reflects a realignment to address higher priority NNSA activities, including plutonium pit production infrastructure investments funded in Production Modernization. |
| **Capability Based Investments $149,117,000** | **Capability Based Investments $143,066,000** | **Capability Based Investments -$6,051,000** |
| • CBI continues to provide targeted, strategic investments for life-extension and modernization of enduring requirements needed to sustain Defense Programs' capabilities.<br>• CBI funds OPCs for LANL's ongoing TRP III and TLWF line item construction projects. | • Table 8 contains the current FY 2022 project plan as of May 2021. 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. | • Other Project Costs for LANL's TRP III and TLWF line items were realigned to the Plutonium Modernization program.<br>• Some SNL CBI project scope was realigned to the new Non-Nuclear Capability Modernization funding program. |
| **Planning for Programmatic Construction (Pre-CD-1) $10,000,000** | **Planning for Programmatic Construction (Pre-CD-1) $0** | **Planning for Programmatic Construction (Pre-CD-1) -$10,000,000** |
| • Table lists the seven project proposals that have pre-CD-1 and pre-CD-0 planning activities performed in 2021. Note that only the Power Sources and Combined Radiation Effects Survivability Testing (CREST) project proposals are expected to reach CD-1 review in 2021. The other projects listed will perform pre-CD-0 activities with follow-on activities in future years.<br>• The NNSA evaluates project proposals to determine the best approach to support | • Funds were reallocated from Pre-CD-1 activities to fund higher NNSA priorities. | • Funds were realigned from Pre-CD-1 activities to fund higher NNSA priorities. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| modernization planning necessary to produce, develop, and test weapons materials and components. | | |

**Infrastructure and Operations**
**Construction**

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 and purchases within approved cost and schedule baselines. Table 9 shows the breakout of funding by line item.

UPF at the Y-12 National Security Complex supports phasing out mission dependency on Building 9212, a 70-year-old enriched uranium operations facility. It will provide the capability for casting, special oxides, and salvage of enriched uranium. The UPF project includes a Main Process Building (MPB), Salvage and Accountability Building (SAB), 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. UPF was baselined in March of 2018 for $6,500,000,000 with construction complete by the end of 2025. FY 2022 funding supports construction of the MPB, SAB, and PSF 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. In FY 2022, CMRR will have two active subprojects for equipment installation into Plutonium Facility 4 (PF-4) and the Radiological Laboratory and Utility Office Building (RLUOB), including associated infrastructure for related operations in and around the two facilities. Under the CMRR project, FY 2022 construction funding supports the PF-4 Equipment Installation, Phase 2 (PEI2) and the Re-categorization of RLUOB to Hazard Category 3 (RC3) subprojects. RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI1) subprojects are planned to complete in FY 2021.

FY 2022 funding for the TA-55 Reinvestment Project, Phase 3 (TRP-III) at LANL will be used to support the construction of the fire-alarm panels' replacement (PF)-4 post approval of the CD-1/2/3 in the third quarter of FY 2021. 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 2022 funding for the Tritium Finishing Facility (TFF) at the Savannah River Site will be used to continue process building preliminary design activities. 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 DOE/NNSA construction standards. TFF infrastructure is based on analyses of accidents/impacts of natural phenomena, such as tornadoes.

FY 2022 funding for the Lithium Processing Facility (LPF) at the Y-12 National Security Complex will be used to continue design activities, engineering, and preparation for long lead procurements and site preparation (CD-3A) approval. LPF replaces lithium operations capabilities currently performed in 9204-2, a Manhattan Project-era facility experiencing accelerated degradation and using process equipment past the end-of-life, increasing risk to mission requirements. LPF will include purification and processing operations in a new facility built to current standards, allowing lithium production operations in 9204-2 to conclude.

FY 2022 funding will 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 2022 funding will continue supporting the High Explosives Synthesis, Formulation, and Production (HESFP) Facility. The HESFP facility will replace WWII-era facilities at Pantex (average age of 60 years old) used for HE formulation and packaging operations. FY 2022 funding will also continue CD-2/3 activities for the HESFP Facility. Pantex maintains existing synthesis and formulation facilities to meet production and development schedules for current and future LEPs and to manufacture 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, and will hedge against current HE production and testing capability gaps.

FY 2022 funding will support design of the Power Sources Capability (PSC) Facility at SNL. When SNL began supporting the power source production mission in 2018, no facility specifically designed to carry out the mission existed at SNL. The power source production mission is carried out in the aging (now over almost 70 years old) shipping and receiving facility, Building 894. The building's maintenance issues and resulting down-time began seriously impeding operations in 2016, putting production capacities at significant risk. Building 894 was rated as "Inadequate" by a facility assessment conducted by NA-52 in 2017. The facility has an estimated $21 million of deferred maintenance. Consequently, SNL has had to move various portions of the power sources development and production work to several other facilities, creating significant inefficiencies. Successful completion of the power sources facility will enable NNSA to meet Power Source requirements through 2076, reduce Environmental, Safety, and Health (ES&H) risk associated with SNL Building 894, reduce mission dependence on an underdeveloped vendor base, and ensure flexibility and agility necessary to meet future mission needs.

Requested FY 2022 funding will support the design effort for the Digital Infrastructure Capability Expansion (DICE) project at LLNL. The project will provide the capability to support missions at LLNL with networking and communications services for the next 40 years. The existing networking and communications systems hub in Building 256 is at capacity without room for expansion. Digital transmission, or aggregate throughput, demand growth is projected to exceed current capacity.

50 US Code 2746 requires that if the estimated cost of completing 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 Non-Nuclear Components Capability (NNCC) at KCNSC and the Energetic Materials Characterization (EMC) at LANL will exceed the $5,000,000 threshold. The rough order of magnitude cost estimate to complete the conceptual design is between $7,000,000 and $10,000,000 for the NNCC project and $4,300,000 and $9,300,000 for the EMC project. Conceptual design for the NNCC project is funded in the Non-Nuclear Capability Modernization program, and conceptual design for the EMC project is funded in the High Explosives and Energetics Modernization program.

| Table 9 | | | |
|---|---|---|---|
| **Project** | **FY 2020 Enacted** | **FY 2021 Enacted** | **FY 2022 Request** |
| **Programmatic Construction** | | | |
| 22-D-513, Power Sources Capability, SNL | 0 | 0 | 13,827 |
| 21-D-510, HE Synthesis, Formulation, and Production, PX | 0 | 31,000 | 44,500 |
| 18-D-690, Lithium Processing Facility, Y-12 | 32,000 | 109,405 | 167,902 |
| 18-D-650, Tritium Finishing Facility, SRS | 27,000 | 27,000 | 27,000 |
| 18-D-620, Exascale Computing Facility Modernization Project, LLNL | 50,000 | 29,200 | 0 |
| 17-D-640, U1a Complex Enhancements Project, NNSS | 35,000 | 160,600 | 135,000 |
| 15-D-302, TA-55 Reinvestment Project, Phase 3, LANL | 0 | 30,000 | 27,000 |
| 15-D-301, HE Science & Engineering Facility, PX | 80,000 | 43,000 | 0 |
| 07-D-220-04, Transuranic Liquid Waste Facility, LANL | 0 | 36,687 | 0 |
| 06-D-141, Uranium Processing Facility, Y-12 | 745,000 | 750,000 | 524,000 |
| 04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL | 168,444 | 169,427 | 138,123 |
| **Subtotal, Programmatic Construction** | **1,137,444** | **1,386,319** | **1,077,352** |
| **Mission Enabling Construction** | | | |
| 22-D-514, Digital Infrastructure Capability Expansion, LLNL | 0 | 0 | 8,000 |
| 19-D-670, 138kV Power Transmission System Replacement, NNSS | 6,000 | 59,000 | 0 |
| 15-D-612, Emergency Operations Center, LLNL | 5,000 | 27,000 | 0 |
| 15-D-611, Emergency Operations Center, SNL | 4,000 | 36,000 | 0 |
| **Subtotal, Mission Enabling Construction** | **15,000** | **122,000** | **8,000** |
| **Total, Infrastructure and Operations: Construction** | **1,152,444** | **1,508,319** | **1,085,352** |

**Construction**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Construction $1,508,319,000** | **Construction $1,085,352,000** | **Construction -$422,967,000** |
| **Programmatic Construction $1,386,319,000** | **Programmatic Construction $1,077,352,000** | **Programmatic Construction -$308,967,000** |
| • Continue construction of the HESE at Pantex.<br>• Continue construction at U1a Complex Enhancements Project (UCEP) at NNSS, UPF at Y-12, CMRR at LANL, and Exascale Computing Facility Modernization at LLNL.<br>• Resume funding of the Transuranic Liquid Waste Facility (TLWF) and the TA-55 Reinvestments Project (TRP III) at LANL.<br>• Continue preliminary design activities for LPF at Y-12.<br>• Start final design of the HE Synthesis, Formulation & Production (HESFP) at Pantex.<br>• Continue preliminary design of TFF at SRS. | • Initiate preliminary design of the PSC facility at SNL.<br>• Initiated and continued CD-2/3 requirements, in accordance with DOE Order 413.3B, for HESFP at Pantex.<br>• Continue preliminary design activities and development of long lead procurements and site preparation (CD-3A) package for LPF at Y-12.<br>• Continue design of TFF at SRS.<br>• Continue construction activities for HESE at Pantex, CMRR, and TRP III at LANL. | • Decrease in funding is due to completion of funding for HESE, TLWF, and ECFM. In addition, UPF construction has passed its peak construction year; as a result, funding begins to decline. CMRR funding declines to accommodate the use of carryover balances. |
| **Mission Enabling Construction $122,000,000** | **Mission Enabling Construction $8,000,000** | **Mission Enabling Construction -$114,000,000** |
| • Start construction of the 138kV Power Transmission System Replacement project at NNSS and the EOCs at LLNL and SNL. | • Initiate design of the Digital Infrastructure Capability Expansion (DICE) project at LLNL. | • Reflects a new start for the DICE project at LLNL. The increase is offset by a reduction to the NNSS 138kV Power Transmission System Replacement project at NNSS, and two EOCs at LLNL and SNL, which all received full funding for construction activities in FY 2021. |

## Infrastructure and Operations
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 75,551 | 87,300 | 85,550 | -1,750 |
| Minor Construction | N/A | N/A | 249,384 | 364,128 | 276,084 | -88,044 |
| **Total, Capital Operating Expenses** | N/A | N/A | **324,935** | **451,428** | **361,634** | **-89,794** |
| | | | | | | |
| **Capability Based Investments** | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K) | N/A | N/A | 65,331 | 59,320 | 53,900 | -5,420 |
| Expanded Flash X-Ray System , LLNL | 5,200 | 0 | 3,000 | 2,200 | 0 | -2,200 |
| Fabricate pRad Outer Vessel, LANL | 9,050 | 0 | 3,920 | 4,080 | 1,050 | -3,030 |
| Forming & Fabrication Equipment Upgrades at Sigma (New Press), LANL | 8,300 | 0 | 0 | 0 | 2,900 | +2,900 |
| TRU Waste Glovebox Field Installation, LANL | 8,000 | 0 | 0 | 0 | 1,800 | +1,800 |
| High-G Surveillance Testing Centrifuge (WETL, Pantex), SNL | 9,700 | 0 | 0 | 4,800 | 3,900 | -900 |
| Electropolish Equipment (previously Establish Electropolishing Capability), Y-12 | 6,000 | 0 | 0 | 6,000 | 0 | -6,000 |
| Vapor Degreasing/Ultrasonic Cleaning Station, Y-12 | 6,000 | 0 | 0 | 0 | 6,000 | +6,000 |
| Debonding Equipment, Y-12 | 16,000 | 0 | 0 | 0 | 16,000 | +16,000 |
| 15 MeV Linatron, 9204-2E, Y-12 | 6,700 | 0 | 3,300 | 3,400 | 0 | -3,400 |
| Low Temperature Thermal Decomposition (LTTD) Oven, Y-12 | 7,500 | 0 | 0 | 7,500 | 0 | -7,500 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **75,551** | **87,300** | **85,550** | **-1,750** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Infrastructure and Safety** | | | | | | |
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (>$500K and <$5M) | N/A | N/A | 69,955 | 30,405 | 28,082 | -2,323 |
| Building 23 Tenant Improvements, KCNSC | 9,500 | 5,000 | 4,500 | 0 | 0 | 0 |
| Building 2 Assembly & Electrical Fabrication (AEF) & Machining Revitalization, KCNSC | 5,656 | 0 | 5,656 | 0 | 0 | 0 |
| Building 2 Low Humidity Production Revitalization, KCNSC | 11,365 | 0 | 11,365 | 0 | 0 | 0 |
| Building 23 Classified Space Conversion & Electrical Testing, Weld Lab, & Mechanical Assembly Buildout Portfolio, KCNSC | 19,119 | 0 | 728 | 18,391 | 0 | -18,391 |
| Building 2 Precision Cleanroom Upgrade, KCNSC | 6,505 | 703 | 5,802 | 0 | 0 | 0 |
| Building 23 Tool Room & Model Shop Machining Operations Area Expansion Buildout, KCNSC (formerly Building 23 Tool Room & Model Shop Machining Revitalization) | 10,042 | 0 | 0 | 805 | 9,237 | +8,432 |
| Building 23 W80-4 Manufacturing Development Area Buildout, KCNSC | 14,700 | 0 | 0 | 1,712 | 12,988 | +11,276 |
| Building 23 W87-1 Manufacturing Development Area Buildout, KCNSC | 13,006 | 0 | 0 | 0 | 13,006 | +13,006 |
| Building 151 High Level Radiochemistry Laboratories Revitalization Portfolio, LLNL | 15,050 | 8,250 | 6,800 | 0 | 0 | 0 |
| Building 321 Chiller Reliability & Safety Exhaust System Redundancy Revitalization, LLNL | 9,000 | 0 | 800 | 8,200 | 0 | -8,200 |
| Building 239 & 823 A/B High Energy X-ray Radiography Capability Revitalization, LLNL | 7,500 | 0 | 750 | 6,750 | 0 | -6,750 |
| New Manufacturing Science Facility Building 225, LLNL (previously New Joining Capabilities & Vapor Deposition Facility (Building 225), LLNL | 19,600 | 3,500 | 16,100 | 0 | 0 | 0 |
| New Nondestructive Evaluation Building, LLNL | 15,000 | 0 | 1,500 | 13,500 | 0 | -13,500 |
| Building 391 Sustainable Chilled Water & Heating Hot Water System Upgrade, LLNL | 6,400 | 0 | 6,400 | 0 | 0 | 0 |
| New Weapons LEP Office Building, LLNL | 17,940 | 0 | 1,790 | 16,150 | 0 | -16,150 |
| Building 321A Radiological & Material Characterization Capabilities Revitalization, LLNL | 11,500 | 0 | 0 | 1,500 | 10,000 | +8,500 |
| Building 832, 834, & 836 Environmental Test & Materials Storage Facilities Upgrades, LLNL | 8,200 | 0 | 820 | 7,380 | 0 | -7,380 |
| Building 321 Air Handling Unit & Electrical Upgrades, LLNL | 6,400 | 0 | 0 | 6,400 | 0 | -6,400 |
| New Building 226 Joining Capabilities & Vapor Deposition Facility (STAR), LLNL | 19,700 | 0 | 0 | 19,700 | 0 | -19,700 |
| Building 235 & Ancillary Synthesis Chemistry Laboratories Revitalization with Fume Hood Upgrades, LLNL | 5,400 | 858 | 4,542 | 0 | 0 | 0 |
| Building 132N Defense Programs Research Variable Air Control Replacement, LLNL | 6,500 | 0 | 0 | 0 | 6,500 | +6,500 |
| New Building 449 Design & Certification Science Office Facility (STAR), LLNL (previously New Building 266 Design & Certification Science Support Office Facility (STAR)) | 17,800 | 0 | 0 | 17,800 | 0 | -17,800 |
| Site 300 Water Supply Piping & Valve Zone 3 & Other Upgrades, LLNL | 11,000 | 0 | 0 | 0 | 11,000 | +11,000 |
| Building 191 HEAF Atrium Conversion to Shot-Ready Workspace, LLNL | 12,300 | 0 | 0 | 0 | 12,300 | +12,300 |
| New Energetic Material Office Facility (STAR), LLNL | 19,400 | 0 | 0 | 0 | 19,400 | +19,400 |
| New Experimental Science Office Facility (STAR), LLNL | 19,400 | 0 | 0 | 0 | 19,400 | +19,400 |

| | (Dollars in Thousands) | | | | | |
|---|---|---|---|---|---|---|
| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
| PF-4 Safety Systems Crit Safety (2 over 1) Upgrades, LANL | 10,400 | 0 | 10,400 | 0 | 0 | 0 |
| New TA-16 HE Shipping & Receiving Transfer Facility, LANL | 8,432 | 500 | 7,932 | 0 | 0 | 0 |
| TA-55 Building 400 RLUOB Secondary Fire Pump Installation, LANL | 6,143 | 870 | 5,273 | 0 | 0 | 0 |
| TA-16-260 Pressing, Machining & Testing Facility Upgrades & UPS Replacement, LANL | 15,700 | 1,960 | 13,740 | 0 | 0 | 0 |
| New TA-15 DARHT Hydro Vessel Repair Facility, LANL | 16,491 | 0 | 0 | 2,800 | 13,691 | +10,891 |
| PF-4 High Pressure Water Supply Feed Separation, LANL | 10,227 | 0 | 0 | 10,227 | 0 | -10,227 |
| TA-15 DARHT Electrical Circuit Upgrade, LANL | 13,908 | 0 | 1,968 | 11,940 | 0 | -11,940 |
| PF-4 Power & Communications Systems Upgrade, LANL | 16,000 | 0 | 5,287 | 10,713 | 0 | -10,713 |
| New TA-16 Fire Station 5 (STAR), LANL | 18,600 | 0 | 0 | 18,600 | 0 | -18,600 |
| New TA-15 Flight Instrumentation Test Laboratory (STAR), LANL | 19,472 | 0 | 0 | 19,472 | 0 | -19,472 |
| TA-55 Fire Suppression Water Line Installation for Program Expansion within the PIDAS, LANL | 13,895 | 0 | 0 | 0 | 13,895 | +13,895 |
| New TA-22 Detonator Storage Magazines, LANL | 11,137 | 0 | 0 | 0 | 1,437 | +1,437 |
| U1a Potable & Fire Water System Upgrade, NNSS | 9,000 | 0 | 9,000 | 0 | 0 | 0 |
| New Mercury Building 23-461, NNSS | 15,000 | 3,000 | 12,000 | 0 | 0 | 0 |
| DAF New Water Storage Tank, NNSS | 8,000 | 0 | 0 | 8,000 | 0 | -8,000 |
| U1a New Mission Technical Support Facility, NNSS | 16,500 | 950 | 0 | 15,550 | 0 | -15,550 |
| U1a New Refuge Station Build-out, NNSS | 6,000 | 0 | 0 | 6,000 | 0 | -6,000 |
| New DAF Operations Complex Site Preparations, NNSS | 6,500 | 0 | 0 | 0 | 6,500 | +6,500 |
| Area 6 CP Hill to Fire Station Junction Water Line Upgrade, NNSS | 5,500 | 0 | 0 | 0 | 5,500 | +5,500 |
| U1a Underground Power Distribution Upgrade, NNSS | 13,000 | 0 | 0 | 0 | 1,500 | +1,500 |
| New U1a Operations Support Facility 01-351 (STAR), NNSS | 19,500 | 0 | 0 | 1,000 | 18,500 | +17,500 |
| Tweezer Substation Upgrade, NNSS | 11,000 | 0 | 0 | 0 | 1,500 | +1,500 |
| New Advanced Fabrication Facility, PX | 17,000 | 0 | 1,000 | 16,000 | 0 | -16,000 |
| 234-7H Exhaust Ventilation System Installation, SRS | 18,413 | 10,000 | 0 | 0 | 8,413 | +8,413 |
| New Tritium Office Building (STAR), SRFO | 19,600 | 0 | 0 | 0 | 1,750 | +1,750 |
| Building 858N SiFab Bulk Chemical Distribution System Upgrade, SNL | 5,300 | 0 | 5,300 | 0 | 0 | 0 |
| New Explosives Manufacturing Science & Technology (EMSAT) Facility, SNL | 17,500 | 0 | 1,500 | 16,000 | 0 | -16,000 |
| SNL/CA Potable Water Distribution System Revitalization, SNL | 9,900 | 0 | 9,900 | 0 | 0 | 0 |
| New Radiation Protection Instrumentation Calibration Facility, SNL | 8,500 | 0 | 8,500 | 0 | 0 | 0 |
| Substation 36 Upgrade, SNL | 10,000 | 0 | 0 | 0 | 10,000 | +10,000 |
| TA-I Substation 35 Upgrade, SNL (previously TA-I Substation 35 Replacement) | 10,000 | 0 | 0 | 3,500 | 6,500 | +3,000 |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| High-G Surveillance Testing Capability Addition (WETL/Pantex), SNL | 9,000 | 0 | 0 | 600 | 8,400 | +7,800 |
| New SNL/CA Limited Area Multi-Program (LAMP) Secure High Bay Laboratory Facility, SNL | 19,500 | 0 | 1,900 | 17,600 | 0 | -17,600 |
| TA-IV District Chilled Water Expansion, SNL | 18,250 | 0 | 0 | 1,500 | 16,750 | +15,250 |
| TTR Main 13.8 kV Substation & West Feeder Upgrade, SNL | 12,000 | 0 | 0 | 0 | 500 | +500 |
| New Geosciences Laboratory (STAR), SNL | 18,500 | 0 | 0 | 18,500 | 0 | -18,500 |
| Building 9204-2E 815 MCC Replacement (NFEM), Y-12 | 5,975 | 175 | 5,800 | 0 | 0 | 0 |
| Building 9215 Switchgear & Transformer 253 Replacement, Y-12 | 5,886 | 0 | 5,886 | 0 | 0 | 0 |
| Building 9215 Supply Fan SF-205 Revitalization, Y-12 | 5,223 | 0 | 0 | 5,223 | 0 | -5,223 |
| Building 9204-2E Transformers 814 & 815 Replacement, Y-12 | 6,560 | 0 | 0 | 6,560 | 0 | -6,560 |
| Development Facility Acquisition & Modification, Y-12 (formerly Production Development Facility Acquisition and Revitalization Modification) | 16,000 | 0 | 0 | 16,000 | 0 | -16,000 |
| Building 9201-05N AJ-5714 HVAC Replacement, Y-12 | 5,413 | 0 | 0 | 0 | 5,413 | +5,413 |
| New West End Production Change House, Y-12 | 13,824 | 0 | 0 | 0 | 1,284 | +1,284 |
| Building 9995 198/222 Feeders Electrical Panel & Motor Control Center Replacement, Y-12 | 9,288 | 0 | 0 | 0 | 9,288 | +9,288 |
| **Total, Minor Construction Projects Infrastructure and Safety** | **N/A** | **N/A** | **242,894** | **354,478** | **272,734** | **-81,744** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Request | FY 2021 Request | FY 2022 Base Level | FY 2022 Base Level vs FY 2021 Request ($) |
|---|---|---|---|---|---|---|
| **Capability Based Investments** | | | | | | |
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (>$500K and <$5M) | N/A | N/A | 4,830 | 8,800 | 3,350 | -5,450 |
| Mock HE Mixer, 12-19, PX | 5,650 | 3,140 | 1,660 | 850 | 0 | -850 |
| **Total, Minor Construction Projects Capability Based Investments** | **N/A** | **N/A** | **6,490** | **9,650** | **3,350** | **-6,300** |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **249,384** | **364,128** | **276,084** | **-88,044** |
| **Total, Capital Summary** | **N/A** | **N/A** | **324,935** | **451,428** | **361,634** | **-89,794** |

## Construction Projects Summary

(Dollars in Thousands)

| | Total | Prior Years[a] | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Programmatic** | | | | | | |
| **22-D-513 Power Sources Capability, SNL** | | | | | | |
| TEC | 208,051 | 0 | 0 | 0 | 13,827 | +13,827 |
| OPC | 22,505 | 0 | 3,000 | 6,000 | 800 | -5,200 |
| **TPC, 22-D-513 Power Sources Capability, SNL** | **230,556** | **0** | **3,000** | **6,000** | **14,627** | **+8,627** |
| **21-D-510 HE Synthesis, Formulation, and Production, PX** | | | | | | |
| TEC | 702,876 | 0 | 0 | 30,600 | 44,500 | +13,900 |
| OPC | 30,600 | 3,700 | 3,093 | 400 | 0 | -400 |
| **TPC, 21-D-510 HE Synthesis, Formulation, and Production, PX** | **733,476** | **3,700** | **3,093** | **31,000** | **44,500** | **+13,500** |
| **18-D-690, Lithium Processing Facility, Y-12** | | | | | | |
| TEC | 1,545,000 | 19,000 | 32,000 | 99,405 | 164,902 | +65,497 |
| OPC[b] | 100,000 | 10,424 | 1,000 | 10,000 | 3,000 | -7,000 |
| **TPC, 18-D-690, Lithium Processing Facility, Y-12** | **1,645,000** | **29,424** | **33,000** | **109,405** | **167,902** | **+58,497** |
| **18-D-650, Tritium Finishing Facility, SRS** | | | | | | |
| TEC | 562,300 | 0 | 27,000 | 27,000 | 27,000 | 0 |
| OPC[c] | 77,700 | 7,700 | 2,000 | 2,000 | 2,000 | 0 |
| **TPC, 18-D-650, Tritium Finishing Facility, SRS** | **640,000** | **7,700** | **29,000** | **29,000** | **29,000** | **0** |
| **18-D-620, Exascale Computing Facility Modernization Project, LLNL** | | | | | | |
| TEC | 105,200 | 26,000 | 50,000 | 29,200 | 0 | -29,200 |
| OPC | 6,000 | 4,000 | 0 | 1,000 | 1,000 | 0 |
| **TPC, 18-D-620, Exascale Computing Facility Modernization Project, LLNL** | **111,200** | **30,000** | **50,000** | **30,200** | **1,000** | **-29,200** |

[a] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.

[b] Lithium Processing Facility OPCs are funded under Lithium Sustainment in FY 2020 and the prior years.

[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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **17-D-640, U1a Complex Enhancements Project, NNSS** | | | | | | |
| TEC | 507,200 | 53,600 | 35,000 | 160,600 | 135,000 | -25,600 |
| OPC[b] | 19,309 | 6,309 | 0 | 417 | 0 | -417 |
| **TPC, 17-D-640, U1a Complex Enhancements Project, NNSS** | **526,509** | **59,909** | **35,000** | **161,017** | **135,000** | **-26,017** |
| **15-D-302, TA-55 Reinvestment Project Phase III, LANL** | | | | | | |
| TEC | 188,887 | 34,437 | 0 | 30,000 | 27,000 | -3,000 |
| OPC | 47,143 | 11,088 | 0 | 2,000 | 5,000 | +3,000 |
| **TPC, 15-D-302, TA-55 Reinvestment Project Phase III, LANL** | **236,030** | **45,525** | **0** | **32,000** | **32,000** | **0** |
| **15-D-301, HE Science & Engineering Facility, PX** | | | | | | |
| TEC[c] | 135,272 | 12,272 | 80,000 | 43,000 | 0 | -43,000 |
| OPC | 64,920 | 2,740 | 130 | 3,750 | 0 | -3,750 |
| **TPC, 15-D-301, HE Science & Engineering Facility, PX** | **200,192** | **15,012** | **80,130** | **46,750** | **0** | **-46,750** |
| **07-D-220-04, Transuranic Liquid Waste Facility, LANL** | | | | | | |
| TEC[d] | 129,536 | 92,849 | 0 | 36,687 | 0 | -36,687 |
| OPC | 14,334 | 1,524 | 1,710 | 1,000 | 3,000 | +2,000 |
| **TPC, 07-D-220-04, Transuranic Liquid Waste Facility, LANL** | **143,870** | **94,373** | **1,710** | **37,687** | **3,000** | **-34,687** |

[a] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.
[b] U1a Complex Enhancements Project OPCs are funded under Enhanced Capabilities for Subcritical Experiments within the Science Program.
[c] Reflects recission 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.
[d] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.

(Dollars in Thousands)

| | Total | Prior Years[a] | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **06-D-141, Uranium Processing Facility, Y-12** | | | | | | |
| TEC | 6,121,337 | 3,824,748 | 740,000 | 718,500 | 470,500 | -248,000 |
| OPC | 378,663 | 95,663 | 5,000 | 31,500 | 53,500 | +22,000 |
| **TPC, 06-D-141, Uranium Processing Facility, Y-12** | **6,500,000** | **3,920,411** | **745,000** | **750,000** | **524,000** | **-226,000** |
| **04-D-125, Chemistry and Metallurgy Research Replacement, LANL** | | | | | | |
| TEC | 2,293,475 | 1,441,480 | 156,816 | 115,093 | 100,970 | -14,123 |
| OPC | 592,755 | 271,503 | 11,628 | 54,334 | 37,153 | -17,181 |
| **TPC, 04-D-125, Chemistry and Metallurgy Research Replacement, LANL** | **2,886,230** | **1,712,983** | **168,444** | **169,427** | **138,123** | **-31,304** |
| **Total, Programmatic** | | | | | | |
| TEC | 12,499,134 | 5,504,386 | 1,120,816 | 1,290,085 | 983,699 | -306,386 |
| OPC | 1,353,929 | 414,651 | 27,561 | 112,401 | 105,453 | -6,948 |
| **TPC, Programmatic** | **13,853,063** | **5,919,037** | **1,148,377** | **1,402,486** | **1,089,152** | **-313,334** |

[a] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.

| | (Dollars in Thousands) | | | | | |
|---|---|---|---|---|---|---|
| | Total | Prior Years[a] | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
| **Mission Enabling** | | | | | | |
| **22-D-514, Digital Infrastructure Capability Expansion, LLNL[b]** | | | | | | |
| TEC | 68,000 | 0 | 0 | 0 | 8,000 | +8,000 |
| OPC | 1,900 | 0 | 1,450 | 90 | 90 | 0 |
| **TPC, 22-D-514, Digital Infrastructure Capability Expansion, LLNL** | **69,900** | **0** | **1,450** | **90** | **8,090** | **+8,000** |
| **19-D-670, 138kV Power Transmission System Replacement, NNSS** | | | | | | |
| TEC | 65,000 | 0 | 6,000 | 59,000 | 0 | -59,000 |
| OPC | 2,180 | 1,714 | 466 | 0 | 0 | 0 |
| **TPC, 19-D-670, 138kV Power Transmission System Replacement, NNSS** | **67,180** | **1,714** | **6,466** | **59,000** | **0** | **-59,000** |
| **15-D-612, Emergency Operations Center, LLNL** | | | | | | |
| TEC | 32,000 | 0 | 5,000 | 27,000 | 0 | -27,000 |
| OPC | 3,200 | 2,200 | 400 | 0 | 600 | +600 |
| **TPC, 15-D-612, Emergency Operations Center, LLNL** | **35,200** | **2,200** | **5,400** | **27,000** | **600** | **-26,400** |
| **15-D-611, Emergency Operations Center, SNL** | | | | | | |
| TEC | 40,000 | 0 | 4,000 | 36,000 | 0 | -36,000 |
| OPC | 2,500 | 1,961 | 200 | 0 | 0 | 0 |
| **TPC, 15-D-611, Emergency Operations Center, SNL** | **42,500** | **1,961** | **4,200** | **36,000** | **0** | **-36,000** |
| **Total, Mission Enabling** | | | | | | |
| TEC | 205,000 | 0 | 15,000 | 122,000 | 8,000 | -114,000 |
| OPC | 9,780 | 5,875 | 2,516 | 90 | 690 | 600 |
| **TPC, Mission Enabling** | **214,780** | **5,875** | **17,516** | **122,090** | **8,690** | **-113,400** |
| **Total, All Construction Projects** | | | | | | |
| TEC | 12,704,134 | 5,504,386 | 1,135,816 | 1,412,085 | 991,699 | -420,386 |
| OPC | 1,363,709 | 420,526 | 30,077 | 112,491 | 106,143 | -6,348 |
| **TPC, All Construction Projects** | **14,067,843** | **5,924,912** | **1,165,893** | **1,524,576** | **1,097,842** | **-426,734** |

[a] Prior Year OPCs have been updated from the FY 2021 Congressional Justification Budget to reflect actuals.

[b] The Network Communication Center project, LLNL was renamed to Digital Infrastructure Capability Expansion, LLNL.

**22-D-514, Digital Infrastructure Capability Expansion**
**Lawrence Livermore National Laboratory (LLNL), Livermore, California**
**Project is for Design and Construction**

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

**Summary**: The FY 2022 Request for the Digital Infrastructure Capability Expansion (DICE) is $8,000,000. The project is currently funded at 95% of the current high-end total project cost (TPC) range based on 30% project definition (completed conceptual design). The project has completed the AoA and down selected an option. The current TPC range is $45,000,000 to $73,000,000 with a high-end schedule range of 4Q FY2025.

**Significant Changes:**
This project is a new start in FY 2022. The most recent DOE Order 413.3B critical decision (CD) is CD-0, Approve Mission Need, approved on July 9, 2020. The top end of the cost range is $89,000,000 with a projected CD-4 of 1Q FY 2026.

An Analysis of Alternatives was completed on November 23, 2020. The Project Management Executive selected Alternative 2, Construct New Digital Infrastructure Capability Enhancement leaving Building B256 as a supernode for legacy fiber and copper infrastructure during an approximate six to nine-year transition to the new facility. The Conceptual Design was completed on April 7, 2021.

A Federal Project Director (FPD) 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 2022 | 7/9/2020 | 4/7/2021 | 4Q FY2021 | 4Q FY2022 | 4Q FY2022 | 4Q FY2022 | N/A | 4Q FY2025 |

**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 | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | 8,000 | 60,000 | 68,000 | 1,900 | N/A | 1,900 | 69,900 |

## 2. Project Scope and Justification

**Scope**
An approximately 13,000-SF one-story facility with a basement vault and adjacent service yard, including equipment for approximately 35 new Information Technology / Telecommunication equipment racks. The basement vault is for connection to the existing LLNL campus fiber and copper infrastructure that is then routed up into the building for distribution and termination. The service yard will house facility electrical and mechanical equipment. Although the building will initially be

furnished with approximately 35 new IT/Telecommunication equipment racks, space and services for expansion of up to 80 equipment racks will be provided to accommodate future growth.
The project is preparing for CD-1, the cost and schedule range will be updated after CD-1.

**Justification**
The existing networking and communications systems hub in Building 256 (B256) is at capacity without room for expansion. Digital transmission, or aggregate throughput, demand growth is expected to exceed B256's capacity in the near future. Key assets such as the National Ignition Facility (NIF), Life Extension Programs (LEPs), and High Performance Computing activities would experience operational disruption if the facility's capacity is exceeded. An essential network capability upgrade scheduled for 2027 will put the entire network and site at risk of power outages or overheating, potentially resulting in loss of digital communications.

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.

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 |
|---|---|---|
| Digital Capacity | 1,900 Gigabytes per second (Gbps) with Expansion Capability to 3,700 Gbps | 2,000 Gbps with Expansion Capability to 4,000 Gbps |
| Availability (up time) | 99.982% | 99.995% |

**3. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2022 | 8,000 | 8,000 | 8,000 |
| Outyears | 0 | 0 | 0 |
| Total, Design | **8,000** | **8,000** | **8,000** |
| Construction | | | |
| Outyears | 60,000 | 60,000 | 60,000 |
| Total, Construction | **60,000** | **60,000** | **60,000** |
| Total Estimated Costs | | | |
| FY 2022 | 8,000 | 8,000 | 8,000 |
| Outyears | 60,000 | 60,000 | 60,000 |
| **Total, TEC** | **68,000** | **68,000** | **68,000** |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Other Project Costs (OPC)** | | | |
| OPC, except D&D | | | |
| FY 2020 | 1,450 | 100 | 100 |
| FY 2021 | 90 | 1,440 | 1,440 |
| FY 2022 | 90 | 90 | 90 |
| Outyears | 270 | 270 | 270 |
| Total OPC, except D&D | **1,900** | **1,900** | **1,900** |
| **Total Project Costs (TPC)** | | | |
| FY 2020 | 1,450 | 100 | 100 |
| FY 2021 | 90 | 1,440 | 1,440 |
| FY 2022 | 8,090 | 8,090 | 6,590 |
| Outyears | 60,270 | 60,270 | 60,270 |
| **Grand Total** | **69,900** | **69,900** | **69,900** |

**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 | 6,000 | -- | N/A |
| Contingency | 2,000 | -- | N/A |
| Total, Design | 8,000 | -- | N/A |
| Construction | | | |
| Site Work | 4,000 | -- | N/A |
| Equipment | 22,000 | -- | N/A |
| Construction | 22,500 | -- | N/A |
| Other, as needed | -- | -- | N/A |
| Contingency | 11,500 | -- | N/A |
| Total, Construction | 60,000 | -- | N/A |
| | | | |
| **Total Estimated Cost** | 68,000 | -- | N/A |
| *Contingency, TEC* | 13,500 | -- | N/A |
| Other Project Cost (OPC) | | | N/A |
| OPC except D&D | | | N/A |
| R&D | -- | -- | N/A |
| Conceptual Planning | 170 | -- | N/A |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Conceptual Design | 1,370 | -- | N/A |
| Other OPC Costs | 360 | -- | N/A |
| Contingency | 0 | -- | N/A |
| **Total, OPC** | 1,900 | -- | N/A |
| *Contingency, OPC* | 0 | -- | N/A |
| **Total Project Cost** | 69,900 | -- | N/A |
| ***Total Contingency (TEC+OPC)*** | 13,500 | -- | N/A |

**5. Schedule of Appropriations Requests**

(Dollars in Thousands)

| Request Year | Type | Prior Years | FY 2020 | FY 2021 | FY 2022 | Outyears | Total |
|---|---|---|---|---|---|---|---|
| FY 2022 | TEC | -- | -- | -- | 8,000 | 60,000 | 68,000 |
| | OPC | -- | 1,450 | 90 | 90 | 270 | 1,900 |
| | TPC | -- | 1,450 | 90 | 8,090 | 60,270 | 69,900 |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | 4Q FY 2025 |
| Expected Useful Life (number of years) | 40 |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | 4Q FY 2065 |

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 | -- | 6.22 | -- | 274.1 |

**7. D&D Information**

The new area being constructed in this project is not replacing existing facilities. LLNL will D&D an offsetting amount of space in accordance with their current facility plan.

| | Square Feet |
|---|---|
| New area being constructed by this project at LLNL | 13,000 |
| Area of D&D in this project at LLNL | NA |
| Area at LLNL to be transferred, sold, and/or D&D outside the project, including area previously "banked" | 13,000 |
| Area of D&D in this project at other sites | NA |

**8. Acquisition Approach**

The acquisition approach will be determined at Critical Decision 1, *Approve Alternative Selection and Cost Range*, in accordance with DOE Order 413.3B.

**22-D-513 Power Sources Capability (PSC) Facility**
**Sandia National Laboratories, Albuquerque, New Mexico**
**Project is for Design and Construction**

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

**Summary:** The FY 2022 Request for the Power Sources Capability (PSC) is $13,827K. Plans for the project will be revised upon the completion of the conceptual design and the development of the Critical Decision-1 (CD-1) cost range in accordance with DOE Order 413.3B. The cost range for the project at CD-0 was $80,000K to $320,000K. CD-1 review/approval is scheduled for 1Q FY 2022.

**Significant Changes:**
This project is a new start for the FY 2022 budget year. The most recent DOE O 413.3B approved Critical Decision is CD-0, *Approve Mission Need*, which was approved on July 10, 2019, with a Rough Order of Magnitude cost range of $80,000K to $320,000K and a CD-4 date of 4Q FY 2026. As required by DOE Order 413.3B, an independent Analysis of Alternatives (AoA) was completed and approved on April 6, 2020. Based on the results, the Department Project Management Executive, with concurrence from the AoA Steering Committee, selected Sandia National Laboratories (SNL), Albuquerque to be the location for a newly constructed facility with the following traits:

- Sized to be consistent with the make-to-buy ratio contained in the AoA;
- Including space for emerging requirements; and
- Including expanded utilities and site infrastructure in case addition is needed in the future.

The Conceptual Design and CD-1 Schedule and Cost Range are in development, with an Independent Project Review scheduled for 4Q FY 2021 to support a 1Q FY 2022 CD-1 Approval. FY 2022 funding will be used for preliminary design and the initiation of the final design phase for the project.

A Federal Project Director has been assigned and has reviewed and 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 | CD-4 |
|---|---|---|---|---|---|---|---|---|
| FY 2022 | 07/10/2019 | 4Q FY 2021 | 1Q FY 2022 | 4Q FY 2023 | 1Q FY 2023 | 4Q FY 2023 | N/A | 4Q FY 2026 |

**CD-0** – Approve Mission Need for a construction project with a conceptual scope and cost range
**Conceptual Design Complete** – Estimated date the conceptual design will be 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**[a]

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | 27,000 | 261,000 | 288,000 | 32,000 | N/A | 32,000 | 320,000 |

**2. Project Scope and Justification**

**Scope**

The PSC facility will be a new, Leadership in Energy and Environmental Design (LEED) Certified, modern facility where Power Sources personnel and equipment will be consolidated and where operations will be conducted.

The PSC facility will consist of approximately 150,000 gross square feet of offices, laboratories, and support areas. The size of the facility will be refined throughout the established design process.

The new PSC facility will include the following high-level capabilities:

- A 50-year operating life
- Collocated all office, general use, and specialized laboratory space in one facility
- All operational and physical security controls for all space types
- Infrastructure to lab areas to support local exhaust ventilation, grounding and static dissipative controls, and other activity specific engineering controls for operations
- Controls and requirements for the varying chemicals throughout the facility, which include water reactive materials, compressed gasses (inert, oxygen, inert/5% hydrogen, etc.)
- Expanded utilities and site infrastructure in case a building addition is needed in the future
- LEED certification

**Justification**

When SNL began supporting the power source production mission, no facility specifically designed to carry out the mission existed at SNL. The power source production mission was carried out in Building 894, a 71-year-old shipping and receiving facility not designed to handle the environments necessary for the mission. The building's maintenance issues began impeding operations at an increasing rate by 2016, thus putting production capacities at significant risk. Building 894 was rated as "Poor" (Building Condition Index Score of 56) by facility and system assessments conducted in 2020. The facility has $26M in deferred maintenance.

Successful completion of the power sources facility will:

- Enable the NNSA to meet power source requirements through 2076;
- Reduce risks to the programs associated with SNL Building 894, including environmental safety and health risks;
- Reduce the risk of mission dependence on an underdeveloped vendor base;
- Ensure the availability of capabilities to complete all RDT&E activities; and,
- Ensure the flexibility and agility necessary to meet future mission needs.

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 requested 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. Amounts in the table below represent a rough-order-of-magnitude, parametric estimate for the project and will be revised following completion of conceptual design.

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. Initial values were developed prior to CD-0 approval and were revised prior to CD-1.

| # | Requirement | Threshold Value | Objective Value | Unit |
|---|---|---|---|---|
| **M-1** | The approach must meet the demands for production primary batteries.[a] | 783 | 3,770 | Starts/Year |
| **M-2** | The approach must meet the demands for development primary batteries. | 213 | 993 | Starts/Year |
| **M-3** | The approach must meet the demands for R&D of primary batteries. | 9 | 12 | Programs/Year |
| **M-4** | The approach must meet the demands for surveillance of primary batteries. | 6 | 9 | Programs/Year |
| **M-5** | The approach must meet the demands for production thermal batteries. | 1,322 | 1,456 | Starts/Year |
| **M-6** | The approach must meet the demands for development thermal batteries. | 250 | 409 | Starts/Year |
| **M-7** | The approach must meet the demands for R&D of thermal batteries. | 7 | 10 | Programs/Year |
| **M-8** | The approach must meet the demands for surveillance of thermal batteries. | 8 | 11 | Programs/Year |
| **M-9** | The approach must meet the demands for production RTG CMAs. | 135 | 163 | Starts/Year |
| **M-10** | The approach must meet the demands for development RTG CMAs. | 41 | 69 | Starts/Year |
| **M-11** | The approach must meet the demands for R&D of RTG CMAs. | 3 | 6 | Programs/Year |
| **M-12** | The approach must meet the demands for surveillance of RTG CMAs | 2 | 3 | Programs/Year |
| **M-13** | The approach must provide capability to support emerging requirements. | 6 | 8 | Programs/Year |

[a] Includes both starts for JTAs and Stockpiled PS

3. **Financial Schedule**[a]

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2022 | 13,827 | 13,827 | 10,370 |
| Outyears | 13,173 | 13,173 | 16,630 |
| **Total, Design** | **27,000** | **27,000** | **27,000** |
| Construction | | | |
| Outyears | 261,000 | 261,000 | 261,000 |
| **Total, Construction** | **261,000** | **261,000** | **261,000** |
| Total Estimated Costs | | | |
| FY 2022 | 13,827 | 13,827 | 10,370 |
| Outyears | 274,173 | 274,173 | 277,630 |
| **Total, TEC** | **288,000** | **288,000** | **288,000** |
| **Other Project Costs** | | | |
| OPC, except D&D | | | |
| FY 2020 | 3,000 | 3,000 | 2,000 |
| FY 2021 | 6,000 | 6,000 | 6,000 |
| FY 2022 | 800 | 800 | 1,800 |
| Outyears | 22,200 | 22,200 | 22,200 |
| **Total OPC, except D&D** | 32,000 | 32,000 | 32,000 |
| OPC D&D | | | |
| Outyears | 0 | 0 | 0 |
| **Total, OPC D&D** | 0 | 0 | 0 |
| **Total Other Project Costs** | | | |
| FY 2020 | 3,000 | 3,000 | 2,000 |
| FY 2021 | 6,000 | 6,000 | 6,000 |
| FY 2022 | 800 | 800 | 1,800 |
| Outyears | 22,200 | 22,200 | 22,200 |
| **Total, OPC** | **32,000** | **32,000** | **32,000** |
| **Total Project Costs (TPC)** | | | |
| FY 2020 | 3,000 | 3,000 | 2,000 |

[a] The project has not yet established the CD-1 cost range. Outyear funding amounts will be incorporated in future budget requests as NNSA establishes the cost range and will be further refined at CD-2 when the project baselines are approved.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2021 | 6,000 | 6,000 | 6,000 |
| FY 2022 | 14,627 | 14,627 | 12,170 |
| Outyears | 296,373 | 296,373 | 299,830 |
| **Grand Total** | **320,000** | **320,000** | **320,000** |

**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 | TBD | N/A | N/A |
| Federal Design Review Support | TBD | N/A | N/A |
| Contingency | TBD | N/A | N/A |
| Total, Design | 27,000 | N/A | N/A |
| Construction | | | |
| Site Work | TBD | N/A | N/A |
| Equipment | TBD | N/A | N/A |
| Construction | TBD | N/A | N/A |
| Federal Support | TBD | N/A | N/A |
| Contingency | TBD | N/A | N/A |
| **Total, Construction** | 261,000 | N/A | N/A |
| **Total Estimated Cost** | **288,000** | N/A | N/A |
| *Contingency, TEC* | *TBD* | *N/A* | *N/A* |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| Analysis of Alternatives | 821 | N/A | N/A |
| Conceptual Design | 3,300 | N/A | N/A |
| CD 1 Documents/Fed Support | 5,100 | N/A | N/A |
| Start-up | TBD | N/A | N/A |
| Equipment Move | TBD | N/A | N/A |
| Contingency | TBD | N/A | N/A |
| Total, OPC except D&D | 32,000 | N/A | N/A |
| OPC D&D | | | |
| Demolition | 0 | N/A | N/A |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Utility Relocation | 0 | N/A | N/A |
| Contingency | 0 | N/A | N/A |
| Total, OPC D&D | 0 | N/A | N/A |
| **Total, OPC** | **32,000** | **N/A** | **N/A** |
| *Contingency, OPC* | *TBD* | *N/A* | *N/A* |
| **Total Project Cost** | **320,000** | **N/A** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | ***TBD*** | ***N/A*** | ***N/A*** |

**5. Schedule of Appropriations Requests**[a]

(Dollars in Thousands)

| Request Year | Type | FY 2020 | FY 2021 | FY 2022 | Outyears | Total |
|---|---|---|---|---|---|---|
| FY 2022 | TEC | 0 | 0 | 13,827 | 274,173 | 288,000 |
| | OPC | 3,000 | 6,000 | 800 | 22,200 | 32,000 |
| | TPC | 3,000 | 6,000 | 14,627 | 296,373 | 320,000 |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | 1QFY 2027 |
| Expected Useful Life (number of years) | 50 |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | 1QFY 2077 |

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 | $0.8 | N/A | $40 |

**7. D&D Information**

N/A

**8. Acquisition Approach**

The conceptual design is being led by the SNL Management and Operating 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 2022.

[a] The project has not yet established the CD-1 cost range. Outyear funding amounts will be revised once NNSA establishes the cost range and will be further refined at CD-2 when the project baselines are approved.

**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 2022 Request for the High Explosive Synthesis, Formulation, and Production (HESFP) Facility is $44,500k. This funding is comprised of the final amount for the preliminary and final design and the initial amount for the site preparation and long lead procurement for the facility. Outyear funding may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B. The most recent DOE O 413.3B approved Critical Decision (CD) is CD-1, *Approve Alternative Selection and Cost Range*, which was approved on February 11, 2021, with a cost range of $523,000K to $739,000K and CD-4 date of 4Q FY 2030.

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 the synthesis, formulation, and blending facility using current batch process for synthesis. The FY 2022 Request is based upon the high end of the CD-1 cost range, which was informed by an Independent Cost Estimate (ICE) performed in June 2020.

The Total Project Cost (TPC) will not be determined until the project is baselined at the CD-2/3 approval, but it includes both Total Estimated Cost (TEC) and Other Project Cost (OPC) that will be executed through this line item funding. The TPC request in the construction line item is consistent in the budget narrative and in supporting tables. Funds will be obligated and recorded in the appropriate object classes (object class 32.0 and 25.4) as defined in Office of Management and Budget Circular A-11.

**Significant Changes:**
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2021 CPDS and does not include a new start for the budget year.

The Conceptual Design was completed in December 2019 and CD-1, *Approve Alternative Selection and Cost Range*, was approved on February 11, 2021. An Independent Cost Estimate was performed in June 2020 and an Independent Project Review was performed in October 2020. Through design evolution and a better understanding of the program and process requirements, the facility total footprint grew from the CD-0 approval to the CD-1 approval. As a result of this size growth and the maturation of the design, the top end of the cost range grew from $240,000K to $739,000K and the CD-4 date has been changed to 4Q FY2030. The project has incorporated a CD-3A approval into the schedule to support the award of a Management and Operating (M&O) firm fixed price subcontract for site preparation work and long lead procurement.

A Federal Project Director has been assigned to this project.

**Critical Milestone History**[a]

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 2021 | 01/18/2019 | 12/31/2019 | 4Q FY 2020 | 1Q FY 2022 | 4Q FY 2022 | 4Q FY 2022 | 4Q FY 2026 | 4Q FY 2025 |
| FY 2022 | 01/18/2019 | 12/31/2019 | 02/11/2021 | 2Q FY 2023 | 1Q FY 2024 | 1Q FY 2024 | N/A | 4Q FY 2030 |

**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 Project Closeout

| Fiscal Year | CD-3A |
|---|---|
| FY 2022 | 2Q FY 2023[b] |

**CD-3A** – Approve Site Preparation and Long-Lead Procurements

**Project Cost History**[c]

(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 |
| FY 2022 | 66,800 | 636,076 | 702,876 | 30,600 | N/A | 30,600 | 733,476 |

**2. Project Scope and Justification**

**Scope**
The project consists of planning, design, and construction of new buildings, access roads, and perimeters for a single synthesis and 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. Based upon June 2020 updates to the Conceptual Design, the total new facility square footage is expected to be 75,000-100,000 square feet.

[a] The schedules are estimates and consistent with the high end of the schedule ranges.
[b] The planned CD-3A approval date is at the high end of the schedule range. The project team is analyzing opportunities to reduce that schedule to move CD-3A approval into FY 2022.
[c] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.

**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 High Explosives (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.

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.

| Preliminary Performance Measure[a] |
|---|
| HE Formulation, Annual Production Rate of 25,000 pounds per year |
| HE Synthesis, Annual Production Rate of 25,000 pounds per year |
| HE Blending, 5,000 pounds per batch |
| HE Staging/packaging, 20,000 pounds |

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

**3. Project Cost and Schedule**

**Financial Schedule**[a]

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2021 | 30,600 | 30,600 | 6,400 |
| FY 2022 | 36,200 | 36,200 | 33,100 |
| Outyears | 0 | 0 | 27,300 |
| Total, Design | 66,800 | 66,800 | 66,800 |
| Construction | | | |
| FY 2022 | 8,300 | 8,300 | 0 |
| Outyears | 627,776 | 627,776 | 636,076 |
| Total, Construction | 636,076 | 636,076 | 636,076 |
| Total Estimated Costs | | | |
| FY 2021 | 30,600 | 30,600 | 6,400 |
| FY 2022 | 44,500 | 44,500 | 33,100 |
| Outyears | 627,776 | 627,776 | 663,376 |
| **Total, TEC** | 702,876 | 702,876 | 702,876 |
| Total Other Project Costs | | | |
| FY 2019 | 3,700 | 3,700 | 3,700 |
| FY 2020 | 3,093 | 3,093 | 3,093 |
| FY 2021 | 400 | 400 | 400 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 23,407 | 23,407 | 23,407 |
| **Total, OPC** | 30,600 | 30,600 | 30,600 |
| **Total Project Costs (TPC)** | | | |
| FY 2019 | 3,700 | 3,700 | 3,700 |
| FY 2020 | 3,093 | 3,093 | 3,093 |
| FY 2021 | 31,000 | 31,000 | 6,800 |
| FY 2022 | 44,500 | 44,500 | 33,100 |
| Outyears | 651,183 | 651,183 | 686,783 |
| **Grand Total** | **733,476** | **733,476** | **733,476** |

[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.

**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 | 50,200 | 28,000 | N/A |
| Federal Support | 3,200 | 1,000 | N/A |
| Contingency | 13,400 | 2,000 | N/A |
| Total, Design | 66,800 | 31,000 | N/A |
| Construction | | | |
| Site Work | 17,000 | 5,000 | N/A |
| Equipment | 50,000 | 4,895 | N/A |
| Construction | 450,000 | 100,000 | N/A |
| Federal Support | 8,800 | 1,500 | N/A |
| Contingency | 110,276 | 35,000 | N/A |
| Total, Construction | 636,076 | 146,395 | N/A |
| **Total Estimated Cost** | 702,876 | 177,395 | N/A |
| *Contingency, TEC* | *123,676* | *37,000* | *N/A* |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| Pre-Conceptual Activities | 1,200 | 1,000 | N/A |
| Conceptual Design | 5,593 | 4,800 | N/A |
| Start-up | 17,000 | 16,000 | N/A |
| Equipment Move | 4,000 | 9,605 | N/A |
| Contingency | 2,807 | 11,200 | N/A |
| Total, OPC except D&D | 30,600 | 42,605 | N/A |
| **Total, OPC D&D** | **0** | **20,000** | **N/A** |
| **Total, OPC** | **30,600** | **62,605** | **N/A** |
| *Contingency, OPC* | *2,807* | *13,200* | *N/A* |
| **Total Project Cost** | **733,476** | **240,000** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | ***126,483*** | ***50,200*** | ***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 | FY2025 | FY2026 | Out Years | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2021 | TEC | 0 | 0 | 31,000 | 20,000 | 54,000 | 60,395 | 12,000 | 0 | N/A | 177,395 |
| | OPC | 5,000 | 10,000 | 0 | 500 | 500 | 7,500 | 20,000 | 19,105 | N/A | 62,604 |
| | TPC | 5,000 | 10,000 | 31,000 | 20,500 | 54,500 | 67,895 | 32,000 | 19,105 | N/A | 240,000 |
| FY 2022 | TEC | 0 | 0 | 30,600 | 44,500 | | | | | 627,776 | 702,876 |
| | OPC | 3,700 | 3,093 | 400 | 0 | | | | | 23,407 | 30,600 |
| | TPC | 3,700 | 3,093 | 31,000 | 44,500 | | | | | 651,183 | 733,476 |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | 4QFY 2030 |
| Expected Useful Life (number of years) | 50 |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | 4QFY 2080 |

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 | $39.0 | $39.0 | $1,952 | $1,952 |

**7. D&D Information**

The disposition of the existing facilities that will be obsolete/excess once the HESFP project new construction is completed has been captured in the Office of Infrastructure & Operations planning system and will be evaluated for future funding outside of the HESFP line item.

**8. Acquisition Approach**

The conceptual design was led by the M&O contractor utilizing a subcontracted Architectural and Engineering firm. The Acquisition Strategy is planned as a design-bid-build with the design and construction as two separate project phases. The design phase strategy will be led by the M&O contractor utilizing a firm fixed price subcontract to an Architectural and Engineering firm. The project has incorporated the award of an M&O firm fixed price subcontract for site preparation work and long lead procurement, but the main construction phase strategy will be developed as part of the CD-2 approval.

[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**
**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 2022 Request for the Lithium Processing Facility (LPF) project is $167,902K. Funding will be utilized to continue preliminary and final design, site preparation and procurement of long lead items. The current Total Project Cost (TPC) range is $955,000k to $1,645,000k, approved at Critical Decision (CD)-1 on December 31, 2019. 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 project is not a new start. The most recent DOE Order 413.3B Critical Decision (CD) was CD-1. Based on this approval, the preliminary design effort was initiated.

A Federal Project Director (FPD) has been assigned to this project.

In May 2020, the Deputy Administrator for Defense Programs approved the incorporation of homogenization (HMG) technology into the LPF project. Incorporating HMG into the LPF project injects a safer technology and process into the lithium processing cycle with no increase in lifecycle cost. The M&O contractor has completed the specifications necessary to support the technology maturation effort to achieve Technology Readiness Level 7.

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.

**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 |
| FY 2022 | 06/10/2015 | 02/28/2019 | 12/31/2019 | 1 FY 2026[b] | 2Q FY 2025[c] | 1Q FY 2026 | 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

[a] Project schedules are estimates until the project baseline is approved at CD-2.
[b] CD-2 and CD-3 dates adjusted to include addition of schedule contingency previously omitted from CPDS.
[c] Final Design Completion date adjusted to include addition of schedule contingency previously omitted from CPDS

| Fiscal Year | CD-3A |
|---|---|
| FY 2019 | N/A |
| FY 2020 | 4Q FY 2021 |
| FY 2021 | 4Q FY 2022 |
| FY 2022 | 4Q FY 2023 |

**CD-3A** – Long-Lead Procurements and Site Preparation – Long-lead procurements consists of critical equipment such as lathes, mills, and presses. Site preparation work includes demolition of slabs and underground utilities; removal of unsuitable soils and backfill; and installation of site access controls, water drainage features, retention basins, and temporary facilities.

**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 | 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 |
| FY 2022 | 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 the future prior to CD-2 to account for improved definition of the design, schedule, and/or risks. 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.

**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 non-nuclear 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

[a] Project costs are estimates until the project baseline is approved at CD-2.

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). 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 |

**3. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 19,000 | 19,000 | 6,570 |
| FY 2020 | 32,000 | 19,000 | 7,736 |
| FY 2021 | 99,405[b] | 99,405 | 82,264 |
| FY 2022 | 164,902 | 164,902 | 145,000 |
| Outyears | 68,693 | 81,693 | 142,430 |
| Total Design | 384,000 | 384,000 | 384,000 |
| Construction | | | |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 1,161,000 | 1,161,000 | 1,161,000 |
| 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 | 7,736 |

[a] Key Performance Parameters will be approved upon approval of the project baseline.

[b] Adjusted FY 2021 allocation to reflect project focus on completion of required design prior to initiation of Site Preparation.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2021 | 99,405 | 99,405 | 82,264 |
| FY 2022 | 164,902 | 164,902 | 145,000 |
| Outyears | 1,229,693 | 1,242,693 | 1,303,430 |
| **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 | 3,661 | 4,527 |
| FY 2019 | 0 | 0 | 3,261 |
| FY 2020 | 1,000 | 1,000 | 0 |
| FY 2021 | 10,000 | 10,000 | 11,000 |
| FY 2022 | 3,000 | 3,000 | 3,000 |
| Outyears | 75,576 | 76,915 | 76,915 |
| **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 | 7,736 |
| FY 2021 | 109,405 | 109,405 | 93,264 |
| FY 2022 | 167,902 | 167,902 | 148,000 |
| Outyears | 1,305,269 | 1,319,608 | 1,380,345 |
| **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 | 3,00,000 | 273,000 | N/A |
| Federal Support | 18,000 | 18,000 | N/A |
| Other Costs | 0 | 0 | N/A |
| Contingency | 66,000 | 93,000 | N/A |
| Total, Design | 384,000 | 384,000 | N/A |

[a] OPC funding in FY 2015-2017 was funded out of Capability Based Investments.

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Construction | | | |
| Site Work | 25,045 | 25,045 | N/A |
| Equipment | 417,939 | 417,939 | N/A |
| Construction | 434,018 | 434,018 | N/A |
| Federal Support | 28,000 | 28,000 | N/A |
| Project Management | 66,628 | 66,628 | N/A |
| Contingency | 189,370 | 189,370 | N/A |
| Total, Construction | 1,161,000 | 1,161,000 | N/A |
| **Total Estimated Cost** | **1,545,000** | **1,545,000** | N/A |
| *Contingency, TEC* | *255,370* | *282,370* | N/A |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| R&D | 23,389 | 23,389 | N/A |
| Conceptual Planning | 7,085 | 7,085 | N/A |
| Conceptual Design | 4,218 | 4,218 | N/A |
| Federal Support | 0 | 0 | N/A |
| Other OPC Costs (Startup, ES&H, etc.) | 47,698 | 47,698 | N/A |
| Contingency | 17,610 | 17,610 | N/A |
| **Total, OPC** | **100,000** | **100,000** | N/A |
| *Contingency, OPC* | 17,610 | 17,610 | N/A |
| **Total Project Cost** | **1,645,000** | **1,645,000** | N/A |
| ***Total Contingency (TEC+OPC)*** | ***258,280*** | ***299,980*** | 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 | Out Years | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2019 | TEC | 19,000 | 32,000 | 26,200 | 125,900 | 201,600 | 200,000 | 45,300 | 0 | 0 | 650,000 |
| | OPC | 10,369 | 1,000 | 1,000 | 1,000 | 1,000 | 11,936 | 13,663 | 17,032 | 13,000 | 70,000 |
| | TPC | 29,369 | 33,000 | 27,200 | 126,900 | 202,600 | 211,936 | 58,963 | 17,032 | 13,000 | 720,000 |
| FY 2020 | TEC | 24,000 | 32,000 | 26,200 | 125,900 | 191,600 | 217,728 | 32,572 | 0 | 0 | 650,000 |
| | OPC | 9,074 | 1,000 | 1,000 | 1,000 | 1,000 | 12,236 | 16,563 | 18,132 | 9,995 | 70,000 |
| | TPC | 33,074 | 33,000 | 27,200 | 126,900 | 192,600 | 229,964 | 49,135 | 18,132 | 9,995 | 720,000 |
| FY 2021 | TEC | 19,000 | 32,000 | 99,405 | 218,902 | 223,012 | 250,770 | 245,312 | 251,000 | 205,599 | 1,545,000 |
| | OPC | 10,424 | 1,000 | 10,000 | 3,000 | 3,000 | 10,000 | 16,000 | 20,000 | 26,576 | 100,000 |
| | TPC | 29,424 | 33,000 | 109,405 | 221,902 | 226,012 | 260,770 | 261,312 | 271,000 | 232,175 | 1,645,000 |

| Request Year | Type | Prior Years | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Out Years | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2022 | TEC | 19,000 | 32,000 | 99,405 | 164,902 | TBD | TBD | TBD | TBD | 1,229,693 | 1,545,000 |
| | OPC | 10,424 | 1,000 | 10,000 | 3,000 | TBD | TBD | TBD | TBD | 75,576 | 100,000 |
| | TPC | 29,424 | 33,000 | 109,405 | 167,902 | TBD | TBD | TBD | TBD | 1,305,269 | 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 | 73 | 73 | 3,666 | 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 6, 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**: This Construction Project Data Sheet (CPDS) is an update of the FY 2021 CPDS and does not include a new start for the budget year. The FY 2022 Request for the Tritium Finishing Facility (TFF) Project is $27,000K. The current preliminary cost range approved at CD-1 on December 20, 2019 is $305,000K to $640,000K.

**Significant Changes:**

In FY 2022, $27,000K is requested to continue design activities towards 60% complete for the Process Buildings and to prepare for long-lead procurements.

The FY 2022 CPDS reflects the Process Buildings as a separate subproject (18-D-650-02) whereas previous years reflected only an overall project request and the Site Preparation and Warehouse Construction Subproject (18-D-650-01) as a subset of that request. This change is made for clarity.

As the M&O Contractor has considered the overall project schedule, it has revised the expected critical path of the project, resulting in changes to the project schedule in the FY 2022 CPDS. Anticipated Critical Decision dates for the Site Preparation and Warehouse Construction Subproject have been delayed, reflecting an emphasis on design for the Process Buildings Subproject in FY 2022-23. Additionally, previous CPDS submissions combined procurements for the Site Preparation and Warehouse Construction Subproject with a mass spectrometer associated with the Process Buildings Subproject under a single CD-3A, anticipated in FY 2024. The FY 2022 request delays the anticipated CD-3A by three years, as these activities are no longer being considered as a single CD milestone and Site Preparation activities have been delayed based on the revised critical path for the project.

In FY 2021, the overall project schedule necessary to achieve readiness for CD-2 will be finalized, including activities to begin design for the CD-3A for long lead procurement in support of the Process Buildings Subproject (18-D-650-02), and the CD-2/3 for the Site Preparation & Warehouse Construction Subproject (18-D-650-01). The M&O will award an affiliated subcontract with Fluor for the design of the Process facility. The Project team will bring to approximately 90% complete the design for the Site Preparation & Warehouse Construction Subproject (18-D-650-01) and advance the Process Buildings Subproject (18-D-650-02) toward 30% design complete.

In FY 2020, the M&O Contractor assumed the role of the project integrator, as well as design authority, and prepared design phase M&O specific project documentation including a project Team Execution Plan, a Contractor Integrated Project Team Charter, several System Design Descriptions, a Facility Design Description, and other project management documents that were submitted in March 2020. The M&O commenced expending project funding in April 2020 following submittal of those documents. The M&O formulated and awarded a design contract for the Site Preparation & Warehouse Construction Subproject (18-D-650-01) and achieved 30% design through September 2020. The M&O formulated a design contract for the Process Buildings Subproject (18-D-650-02) with the Fluor affiliate, to support design needed to achieve CD-2.

The most recent Critical Decision (CD) is CD-1, approved December 20, 2019. The CD-4 range is 4Q FY 2029 - 4Q FY 2031. A Federal Project Director has been appointed.

The TFF subprojects are described below:

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**: The subproject will demolish three warehouses, build one new replacement warehouse, relocate a cooling tower, relocate the Limited Area fence, and relocate utilities to provide space for the process building constructions.

[a] The former Tritium Production Capability has been renamed to the Tritium Finishing Facility that better defines the facilities activities.

**Process Buildings Subproject (18-D-650-02)**: The Process Building Subproject will provide the two main structures of the TFF: Building 1 is a Hazard Category (HC)-2 nuclear facility and Building 2 is a below HC-3 radiological facility. The envisioned project was intended to replace key capabilities in H-Area Old Manufacturing (HAOM), a 1950s vintage building that does not meet current codes and standards and that presents a risk to the tritium mission due to the age of the building and systems as well as susceptibility to natural phenomena. HAOM supports an extensive array of mission critical capabilities, such as the pre-loading process, inert loading, reservoir acceptance, assembly of reservoir components, packaging, storage, shipping, and metallurgical analysis. These capabilities directly support shipments of Gas Transfer Systems (GTS) and Limited Life Component Exchanges (LLCE) to the Department of Defense (DoD).

The subproject will also provide a new fire protection system, security systems, final site civil work, startup testing of new systems, and commissioning.

**Critical Milestone History**

**Overall Project (18-D-650) and Process Buildings Subproject (18-D-650-02)**

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 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 |
| FY 2022 | 06/10/2015 | 01/28/2017 | 12/20/2019 | 1Q FY 2024 | 1Q FY 2024 | 1Q FY 2024 | N/A | 4Q FY 2031 |

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**

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 2022 | 06/10/2015 | 01/28/2017 | 12/20/2019 | 1Q FY 2024 | 1Q FY2024 | 1Q FY2024 | N/A | 2Q 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-2/3 Site Preparation & Warehouse Construction 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.
**CD-4 – Site Preparation & Warehouse Construction 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

[a] The schedules are only estimates until the project baseline is approved. Dates listed correspond to the high end of the schedule range.
[b] The schedules are only estimates until the project baseline is approved. Dates listed correspond to the high end of the schedule range.

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 |
| FY 2022 | 3Q FY 2024 |

**CD-3A –** Long Lead Procurement of critical equipment

**Project Cost History**

**Overall Project (18-D-650)**

(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 |
| FY 2022 | 144,000 | 418,300 | 562,300 | 77,700 | 0 | 77,700 | 640,000 |

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**

(Dollars in Thousands)[b]

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | 8,100 | 16,700 | 24,800 | 5,500 | 0 | 5,500 | 30,300 |

**Process Buildings Subproject (18-D-650-02)**

(Dollars in Thousands)

| Fiscal Year | TEC, Design | TEC, Construction | TEC, Total | OPC, Except D&D | OPC, D&D | OPC, Total | TPC |
|---|---|---|---|---|---|---|---|
| FY 2022 | 135,900 | 401,600 | 537,500 | 72,200 | 0 | 72,200 | 609,700 |

The Site Preparation & Warehouse Construction Subproject will achieve approximately 90% design complete in FY 2021 and this will serve as input into the Process Building Subproject design. The project will initiate a CD-3A long-lead procurement of a mass spectrometer in FY 2024. Start of construction activities are dependent upon completion of the design for the Process Buildings Subproject.

**2. Project Scope and Justification**

**Scope**

[a] The costs are only estimates until the project performance baseline is approved.
[b] The schedules are only estimates until the project baseline is approved. Dates listed correspond to the high end of the schedule range.

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 tritium 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. Scope for the project also includes project design, safety basis development, and relocation of utilities, fences, and an access road.

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**: A subproject is requested for dismantlement and removal of structures, systems and components, re-establishing warehouse space and site preparation to reduce project schedule and subsequent cost. The subproject will demolish three warehouses, build one new replacement warehouse, relocate a cooling tower, relocate the Limited Area fence, and relocate utilities to provide space for the process building constructions.

**Process Buildings Subproject (18-D-650-02)**: The Process Buildings Subproject will provide the two main structures of the TFF: Building 1 is a Hazard Category (HC)-2 nuclear facility and Building 2 is a below HC-3 radiological facility. The envisioned project was intended to replace key capabilities in H-Area Old Manufacturing (HAOM), a 1950s vintage building that does not meet current codes and standards and that presents a risk to the tritium mission due to the age of the building and systems as well as susceptibility to natural phenomena. HAOM supports an extensive array of mission critical capabilities, such as the pre-loading process, inert loading, reservoir acceptance, assembly of reservoir components, packaging, storage, shipping, and metallurgical analysis. These capabilities directly support shipments of Gas Transfer Systems (GTS) and Limited Life Component Exchanges (LLCE) to the Department of Defense (DoD).

The subproject will also provide a new fire protection system, security systems, final site civil work, startup testing of new systems, and commissioning.

**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, inert 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 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.

**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**

TFF funding is appropriated, apportioned and allocated at the Overall Project level (18-D-650), then distributed within the Overall Project to the subprojects, as shown in below.

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**

(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 | 4,000 | 4,000 | 4,000 |
| FY 2021 | 2,500 | 2,500 | 2,000 |
| FY 2022 | 700 | 700 | 1,000 |
| Outyears | 900 | 900 | 1,100 |
| Total, Design | 8,100 | 8,100 | 8,100 |
| Construction | | | |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 16,700 | 16,700 | 16,700 |
| Total, Construction | 16,700 | 16,700 | 16,700 |
| Total Estimated Cost | | | |

[a] Key Performance Parameter (KPP) will be approved upon approval of the project baseline.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 4,000 | 4,000 | 4,000 |
| FY 2021 | 2,500 | 2,500 | 2,000 |
| FY 2022 | 700 | 700 | 1,000 |
| Outyears | 17,600 | 17,600 | 17,800 |
| **Total, TEC** | 24,800 | 24,800 | 24,800 |
| Other Project Cost (OPC) | | | |
| FY 2015[a] | 0 | 0 | 0 |
| FY 2016[a] | 0 | 0 | 0 |
| FY 2017[a] | 0 | 0 | 0 |
| FY 2018[a] | 0 | 0 | 0 |
| FY 2019[a] | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 5,500 | 5,500 | 5,500 |
| Total, OPC | 5,500 | 5,500 | 5,500 |
| **Total Project Cost (TPC)** | | | |
| 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 | 4,000 | 4,000 | 4,000 |
| FY 2021 | 2,500 | 2,500 | 2,000 |
| FY 2022 | 700 | 700 | 1,000 |
| Outyears | 23,100 | 23,100 | 23,300 |
| **Total, TPC (18-D-650-01)** | 30,300 | 30,300 | 30,300 |

[a] Other Project Costs changes reflect a reconciliation of activities during those years.

**Process Buildings Subproject (18-D-650-02)**

(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 | 23,000 | 23,000 | 7,500 |
| FY 2021 | 24,500 | 24,500 | 22,000 |
| FY 2022 | 26,300 | 26,300 | 41,800 |
| Outyears | 68,400 | 68,400 | 70,900 |
| Total, Design | 142,200 | 142,200 | 142,200 |
| Construction | | | |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 395,300 | 395,300 | 395,300 |
| Total, Construction | 395,300 | 395,300 | 395,000 |
| Total Estimated Cost | | | |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 23,000 | 23,000 | 7,500 |
| FY 2021 | 24,500 | 24,500 | 22,000 |
| FY 2022 | 26,300 | 26,300 | 41,800 |
| Outyears | 463,700 | 463,700 | 466,200 |
| **Total, TEC** | 537,500 | 537,500 | 537,500 |
| 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[a] | 1,000 | 1,000 | 1,700 |
| FY 2020 | 2,000 | 2,000 | 100 |
| FY 2021 | 2,000 | 2,000 | 2,000 |
| FY 2022 | 2,000 | 2,000 | 1,700 |
| Outyears | 58,500 | 58,500 | 60,700 |
| Total, OPC | 72,200 | 72,200 | 72,200 |
| **Total Project Cost (TPC)** | | | |
| FY 2015 | 1,700 | 1,700 | 1,700 |

[a] Other Project Costs changes reflect a reconciliation of activities during those years.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 25,000 | 25,000 | 7,600 |
| FY 2021 | 26,500 | 26,500 | 24,000 |
| FY 2022 | 28,300 | 28,300 | 43,500 |
| Outyears | 522,200 | 522,200 | 526,900 |
| **Total, TPC (18-D-650-02)** | 609,700 | 609,700 | 609,700 |

**Overall Project (18-D-650)**

(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 | 11,500 |
| FY 2021 | 27,000 | 27,000 | 24,000 |
| FY 2022 | 27,000 | 27,000 | 42,800 |
| Outyears | 69,300 | 69,300 | 72,000 |
| Total, Design | 150,300 | 150,300 | 150,300 |
| Construction | | | |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 412,000 | 412,000 | 412,000 |
| Total, Construction | 412,000 | 412,000 | 412,000 |
| Total Estimated Cost | | | |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 27,000 | 27,000 | 11,500 |
| FY 2021 | 27,000 | 27,000 | 24,000 |
| FY 2022 | 27,000 | 27,000 | 42,800 |
| Outyears | 481,300 | 481,300 | 484,000 |
| **Total, TEC** | 562,300 | 562,300 | 562,300 |
| Other Project Cost (OPC) | | | |
| FY 2015[a] | 1,700 | 1,700 | 1,700 |

[a] Other Project Costs changes reflect a reconciliation of activities during those years.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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[a] | 1,000 | 1,000 | 1,700 |
| FY 2020 | 2,000 | 2,000 | 100 |
| FY 2021 | 2,000 | 2,000 | 2,000 |
| FY 2022 | 2,000 | 2,000 | 1,700 |
| Outyears | 64,000 | 64,000 | 66,200 |
| 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 | 11,600 |
| FY 2021 | 29,000 | 29,000 | 26,000 |
| FY 2022 | 29,000 | 29,000 | 44,500 |
| Outyears | 545,300 | 545,300 | 550,200 |
| **Total, TPC (18-D-650)** | 640,000 | 640,000 | 640,000 |

**4. Details of Project Cost Estimate**

TFF costs roll up from the Site Preparation & Warehouse Construction (18-D-650-01) and Process Buildings Subprojects (18-D-650-02) to the cumulative Overall Project (18-D-650) Total Project Cost, as shown below.

**Site Preparation & Warehouse Construction Subproject (18-D-650-01)**

(Budget Authority in Thousands of Dollars)

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Total Estimated Cost (TEC) | | | |
| Design | | | |
| Design | 6,500 | N/A | N/A |
| Safety Basis | 100 | N/A | N/A |
| Federal Support | 500 | N/A | N/A |
| Project and Design Management | 500 | N/A | N/A |
| Contingency | 500 | N/A | N/A |
| Total, Design | 8,100 | N/A | N/A |
| Construction | | | |
| Site Work | 8,500 | N/A | N/A |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Facility Demolition | 3,000 | N/A | N/A |
| Construction | 2,000 | N/A | N/A |
| Safety Basis Documents | 200 | N/A | N/A |
| Federal Support | 1,000 | N/A | N/A |
| M&O Support | 500 | N/A | N/A |
| Contingency | 1,500 | N/A | N/A |
| Total, Construction | 16,700 | N/A | N/A |
| **Total Estimated Cost** | 24,800 | N/A | N/A |
| *Contingency, TEC* | 2,000 | N/A | N/A |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| R&D | 0 | N/A | N/A |
| Conceptual Planning | 0 | N/A | N/A |
| Analysis of Alternative | 0 | N/A | N/A |
| Conceptual Design | 1,000 | N/A | N/A |
| NEPA & Permit | 0 | N/A | N/A |
| Federal Support | 250 | N/A | N/A |
| Safeguard & Security | 250 | N/A | N/A |
| ES&H | 2,000 | N/A | N/A |
| Contractor Support | 1,500 | N/A | N/A |
| Startup | 0 | N/A | N/A |
| Contingency | 500 | N/A | N/A |
| **Total, OPC except D&D** | **5,500** | **N/A** | **N/A** |
| *Contingency, OPC* | 500 | N/A | N/A |
| **Total Project Cost (18-D-650-01)** | 30,300 | N/A | N/A |
| ***Total Contingency (TEC +OPC)*** | 2,500 | N/A | N/A |

**Process Buildings Subproject (18-D-650-02)**

(Budget Authority in Thousands of Dollars)

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Total Estimated Cost (TEC) | | | |
| Design | | | |
| Design | 95,000 | N/A | N/A |
| Safety Basis | 7,900 | N/A | N/A |
| Federal Support | 5,500 | N/A | N/A |
| Project and Design Management | 12,000 | N/A | N/A |
| Contingency | 15,500 | N/A | N/A |
| Total, Design | 142,200 | N/A | N/A |
| Construction | | | |
| Site Work | 4,000 | N/A | N/A |
| Facility Demolition | 1,000 | N/A | N/A |
| Construction | 333,800 | N/A | N/A |
| Safety Basis Documents | 5,800 | N/A | N/A |
| Federal Support | 7,000 | N/A | N/A |
| M&O Support | 4,500 | N/A | N/A |
| Contingency | 45,500 | N/A | N/A |
| Total, Construction | 395,300 | N/A | N/A |
| **Total Estimated Cost** | **537,500** | **N/A** | **N/A** |
| *Contingency, TEC* | 61,000 | N/A | N/A |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| R&D | 0 | N/A | N/A |
| Conceptual Planning | 3,700 | N/A | N/A |
| Analysis of Alternative | 800 | N/A | N/A |
| Conceptual Design | 2,200 | N/A | N/A |
| NEPA & Permit | 500 | N/A | N/A |
| Federal Support | 2,750 | N/A | N/A |
| Safeguard & Security | 750 | N/A | N/A |
| ES&H | 10,500 | N/A | N/A |
| Contractor Support | 4,500 | N/A | N/A |
| Startup | 38,000 | N/A | N/A |
| Contingency | 8,500 | N/A | N/A |
| **Total, OPC except D&D** | **72,200** | **N/A** | **N/A** |
| *Contingency, OPC* | 8,500 | N/A | N/A |
| **Total Project Cost (18-D-650-02)** | **609,700** | **N/A** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | **69,500** | **N/A** | **N/A** |

**Overall Project (18-D-650)**

(Budget Authority in Thousands of Dollars)

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Total Estimated Cost (TEC) | | | |
| Design | | | |
| Design | 101,500 | 56,500 | N/A |
| Safety Basis | 8,000 | 4,000 | N/A |
| Federal Support | 6,000 | 3,000 | N/A |
| Project and Design Management | 12,500 | 9,500 | N/A |
| Contingency | 16,000 | 7,000 | N/A |
| Total, Design | 150,300 | 80,000 | N/A |
| Construction | | | |
| Site Work | 12,500 | 12,500 | N/A |
| Facility Demolition | 4,000 | 4,000 | N/A |
| Construction | 335,800 | 396,800 | 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 | 47,000 | 50,000 | N/A |
| Total, Construction | 412,000 | 482,300 | N/A |
| **Total Estimated Cost** | 562,300 | 562,300 | N/A |
| *Contingency, TEC* | 63,000 | 57,000 | N/A |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| R&D | 0 | 0 | N/A |
| Conceptual Planning | 3,700 | 3,700 | N/A |
| Analysis of Alternative | 800 | 800 | 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 | 6,000 | N/A |
| Startup | 38,000 | 38,000 | N/A |
| Contingency | 9,000 | 9,000 | N/A |
| **Total, OPC except D&D** | **77,700** | **77,700** | **N/A** |
| *Contingency, OPC* | 9,000 | 9,000 | N/A |
| **Total Project Cost (18-D-650)** | 640,000 | 640,000 | N/A |
| ***Total Contingency (TEC+OPC)*** | 72,000 | 66,000 | N/A |

**5. Schedule of Appropriations Requests**

TFF funding is appropriated, apportioned and allocated at the Overall Project level (18-D-650), then distributed within the Overall Project to the subprojects, as shown in previous Sections of this Project Data Sheet.

**Overall Project (18-D-650)**

(Dollars in Thousands)

| Request Year | Type | Prior Years | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 | FY2026 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2018 | TEC | 32,305 | 49,500 | 13,000 | 22,000 | 0 | 0 | N/A | N/A | 308,195 | 425,000 |
| | OPC | 13,100 | 3,000 | 3,000 | 3,000 | 0 | 0 | N/A | N/A | 51,900 | 74,000 |
| | TPC | 45,405 | 52,500 | 16,000 | 25,000 | 0 | 0 | N/A | N/A | 360,095 | 499,000 |
| FY 2019 | TEC | 33,800 | 27,000 | 13,000 | 30,000 | 45,000 | 200,000 | | | 152,242 | 501,042 |
| | OPC | 13,100 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | N/A | N/A | 45,900 | 74,000 |
| | TPC | 46,900 | 30,000 | 16,000 | 33,000 | 48,000 | 203,000 | N/A | N/A | 198,142 | 575,042 |
| FY 2020 | TEC | 0 | 27,000 | 13,000 | 30,000 | 44,909 | 166,500 | | | 262,420 | 543,829 |
| | OPC | 10,600 | 2,000 | 2,000 | 2,000 | 3,000 | 3,000 | N/A | N/A | 52,400 | 75,000 |
| | TPC | 10,600 | 29,000 | 15,000 | 32,000 | 47,909 | 169,500 | N/A | N/A | 314,820 | 618,829 |
| FY 2021 | TEC | 0 | 27,000 | 27,000 | 27,000 | 55,000 | 85,000 | 120,000 | 97,000 | 124,300 | 562,300 |
| | OPC | 7,700 | 2,000 | 2,000 | 2,000 | 3,000 | 3,000 | 6,000 | 10,000 | 42,000 | 77,700 |
| | TPC | 7,700 | 29,000 | 29,000 | 29,000 | 58,000 | 88,000 | 126,000 | 107,000 | 166,300 | 640,000 |
| FY 2022 | TEC | 0 | 27,000 | 27,000 | 27,000 | TBD | TBD | TBD | TBD | 481,300 | 562,300 |
| | OPC | 7,700 | 2,000 | 2,000 | 2,000 | TBD | TBD | TBD | TBD | 64,000 | 77,700 |
| | TPC | 7,700 | 29,000 | 29,000 | 29,000 | TBD | TBD | TBD | TBD | 545,300 | 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 |
| 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 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 during project execution, the TFF subcontracts will be assignable to the successor 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 2022 Request for the U1a Complex Enhancements Project (UCEP) is $135,000K. 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 Project Management Executive reaffirmed CD-1 for Laboratory and Support Infrastructure project on February 25, 2021, following cost growth in the project above DOE O 413.3B thresholds. The design of this subproject 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 $455M to $526.5M, and a *CD-4 Approve Start of Operations or Project Completion* is scheduled for 1QFY 2026. 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) 2021 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. Growth in design funding reflects refined understanding of requirements (power, cooling, etc.) and re-work of previously completed design work to reflect the changes.
2. Reduced contingency for 17-D-640-020 based on updated Monte Carlo risk analysis
3. CD-2/3 for 17-D-640-020 was moved from 1Q FY 2021 to 4Q FY 2021 due to additional design work

**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 |
| FY 2022 | 9/25/2014 | 8/13/2015 | 08/09/2017 | 4Q FY 2021 | 2Q FY 2021 | 4Q FY 2021 | N/A | 1Q FY 2026 |

**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 |
| FY 2022 | 9/25/2014 | 8/13/2015 | 08/09/2017 | 03/27/2019 | 7/11/2018 | 03/27/2019 | N/A | 3QFY2022 |

**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 |
| FY 2022 | 9/25/2014 | 8/13/2015 | 08/09/2017 | 4QFY2021 | 2QFY2021 | 4QFY2021 | N/A | 1QFY2026 |

**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-3A** – Approve Site Preparation
**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 |
| FY 2022 | 4QFY2021 | 3QFY2021 |

**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 |
| FY 2022 | 70,756 | 436,444 | 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 |
| FY 2022 | 3,356 | 46,074 | 49,430 | 1,398 | N/A | 1,398 | 50,828 |

**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 |
| FY 2022 | 67,400 | 390,370 | 457,770 | 17,911 | N/A | 17,911 | 475,681 |

**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 |

| Performance Measure | Completion Criteria |
|---|---|
| 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 | 2,000 | 2,000 | 16,300 |
| FY 2021 | 10,790 | 10,790 | 16,570 |
| FY 2022 | 0 | 0 | 3,884 |
| **Total, Construction** | **46,074** | **46,074** | **46,074** |
| 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 | 2,000 | 2,000 | 16,300 |
| FY 2021 | 10,790 | 10,790 | 16,570 |
| FY 2022 | 0 | 0 | 3,884 |
| **Total, TEC** | **49,430** | **49,430** | **49,430** |
| **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 | 417 | 417 | 310 |
| FY 2022 | 0 | 0 | 107 |
| **Total OPC, except D&D** | **1,398** | **1,398** | **1,398** |
| OPC D&D | | | |
| FY 2015 | 0 | 0 | 0 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 |
| **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 | 417 | 417 | 310 |
| FY 2022 | 0 | 0 | 107 |
| **Total, OPC** | **1,398** | **1,398** | **1,398** |
| **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 | 2,000 | 2,000 | 16,300 |
| FY 2021 | 11,207 | 11,207 | 16,880 |
| FY 2022 | 0 | 0 | 3,991 |
| **Grand Total** | **50,828** | **50,828** | **50,828** |

**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 | 33,000 | 33,000 | 32,675 |
| FY 2021 | 17,440 | 17,440 | 22,595 |
| **Total, Design** | **67,400** | **67,400** | **67,400** |
| Construction | | | |
| FY 2021 | 132,370 | 132,370 | 96,860 |
| FY 2022 | 135,000 | 135,000 | 135,000 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Outyears | 123,000 | 123,000 | 158,510 |
| **Total, Construction** | **390,370** | **390,370** | **390,370** |
| **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 | 33,000 | 33,000 | 32,675 |
| FY 2021 | 149,810 | 149,810 | 119,455 |
| FY 2022 | 135,000 | 135,000 | 135,000 |
| Outyears | 123,000 | 123,000 | 158,510 |
| **Total, TEC** | **457,770** | **457,770** | **457,770** |
| **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 |
| Outyears | 12,583 | 12,583 | 12,583 |
| **Total OPC, except D&D** | **17,911** | **17,911** | **17,911** |
| 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 |
| Outyears | 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 |
| Outyears | 12,583 | 12,583 | 12,583 |
| **Total, OPC** | **17,911** | **17,911** | **17,911** |
| **Total Project Costs (TPC)** | | | |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 33,000 | 33,000 | 32,675 |
| FY 2021 | 149,810 | 149,810 | 119,455 |
| FY 2022 | 135,000 | 135,000 | 135,000 |
| Outyears | 135,583 | 135,583 | 171,093 |
| **Grand Total** | **475,681** | **475,681** | **475,681** |

**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 | 33,000 | 33,000 | 32,675 |
| FY 2021 | 17,440 | 17,440 | 22,595 |
| **Total, Design** | **70,756** | **70,756** | **70,756** |
| 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 | 2,000 | 2,000 | 16,300 |
| FY 2021 | 143,160 | 143,160 | 113,430 |
| FY 2022 | 135,000 | 135,000 | 138,884 |
| Outyears | 123,000 | 123,000 | 158,510 |
| **Total, Construction** | **436,444** | **436,444** | **436,444** |
| **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 | 48,975 |
| FY 2021 | 160,600 | 160,600 | 136,025 |
| FY 2022 | 135,000 | 135,000 | 138,884 |
| Outyears | 123,000 | 123,000 | 158,510 |
| **Total, TEC** | **507,200** | **507,200** | **507,200** |
| **Other Project Costs (OPC)** | | | |
| OPC, except D&D | | | |
| FY 2015 | 281 | 281 | 281 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 417 | 417 | 310 |
| FY 2022 | 0 | 0 | 107 |
| Outyears | 12,583 | 12,583 | 12,583 |
| **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 |
| Outyears | 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 | 417 | 417 | 310 |
| FY 2022 | 0 | 0 | 107 |
| Outyears | 12,583 | 12,583 | 12,583 |
| **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 |
| FY 2018 | 23,100 | 23,100 | 5,071 |
| FY 2019 | 20,000 | 20,000 | 20,880 |
| FY 2020 | 35,000 | 35,000 | 48,975 |
| FY 2021 | 161,017 | 161,017 | 136,335 |
| FY 2022 | 135,000 | 135,000 | 138,991 |
| Outyears | 135,583 | 135,583 | 171,093 |
| **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 | 32,896 | 31,606 | 31,606 |
| Construction Management | 5,368 | 5,368 | 5,368 |
| Contingency | 7,810 | 7,810 | 7,810 |
| **Total, Construction** | **46,074** | **44,784** | **44,784** |
| **Total Estimated Cost** | **49,430** | **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 | 917 | 1,500 | 1,500 |
| Contingency | 0 | 0 | 0 |
| **Total, OPC** | 1,398 | 1,981 | 1,981 |
| *Contingency, OPC* | *0* | *0* | *0* |
| **Total Project Cost** | **50,828** | **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 | 42,653 | 21,024 | N/A |
| Project Management | 20,947, | 12,736 | N/A |
| Contingency | 3,800 | 1,800 | N/A |
| **Total, Design** | **67,400** | **35,560** | **N/A** |
| Construction | | | |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Site Work | 0 | 0 | N/A |
| Equipment | 0 | 0 | N/A |
| Construction | 266,000 | 240,175 | N/A |
| Construction Management | 41,925 | 41,925 | N/A |
| Contingency | 82,445 | 141,400 | N/A |
| **Total, Construction** | **390,370** | **423,500** | **N/A** |
| **Total Estimated Cost** | **457,770** | **459,060** | N/A |
| *Contingency, TEC* | *86,245* | *143,200* | *N/A* |
| **Other Project Cost (OPC)** | | | |
| OPC except D&D | | | |
| R&D | 0 | 0 | N/A |
| Conceptual Planning | 300 | 300 | N/A |
| Conceptual Design | 728 | 728 | N/A |
| Other OPC Costs | 16,083 | 15,500 | N/A |
| Contingency | 800 | 800 | N/A |
| **Total, OPC** | 17,911 | 17,328 | N/A |
| *Contingency, OPC* | *800* | *800* | *N/A* |
| **Total Project Cost** | **475,681** | **476,388** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | **87,045** | **144,000** | **N/A** |

**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 | 45,505 | 23,876 | N/A |
| Project Management | 21,451 | 13,240 | N/A |
| Contingency | 3,800 | 1,800 | N/A |
| **Total, Design** | **70,756** | **38,916** | **N/A** |
| Construction | | | |
| Site Work | 0 | 0 | N/A |
| Equipment | 0 | 0 | N/A |
| Construction | 298,896 | 271,781 | N/A |
| Construction Management | 47,293 | 47,293 | N/A |
| Contingency | 90,255 | 149,210 | N/A |
| **Total, Construction** | **436,444** | **468,284** | **N/A** |
| **Total Estimated Cost** | **507,200** | **507,200** | N/A |
| *Contingency, TEC* | *94,055* | *151,010* | *N/A* |
| **Other Project Cost (OPC)** | | | |
| OPC except D&D | | | |
| R&D | 0 | 0 | N/A |
| Conceptual Planning | 500 | 500 | N/A |
| Conceptual Design | 1,009 | 1,009 | N/A |
| Other OPC Costs | 17,000 | 17,000 | N/A |
| Contingency | 800 | 800 | N/A |
| **Total, OPC** | 19,309 | 19,309 | N/A |
| *Contingency, OPC* | *800* | *800* | *N/A* |
| **Total Project Cost** | **526,509** | **526,509** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | ***94,855*** | ***151,810*** | ***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 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|
| FY 2017 | TEC | 96,600 | 35,000 | 19,900 | 0 | 0 | 0 | 0 | 151,500 |
| | OPC | 7,109 | 0 | 0 | 0 | 0 | 0 | 0 | 7,109 |
| | TPC | 103,709 | 35,000 | 19,900 | 0 | 0 | 0 | 0 | 158,609 |
| FY 2018 | TEC | 96,600 | 35,000 | 19,900 | 0 | 0 | 0 | 0 | 151,500 |
| | OPC | 7,100 | 0 | 0 | 0 | 0 | 0 | 0 | 7,109 |
| | TPC | 103,709 | 35,000 | 19,900 | 0 | 0 | 0 | 0 | 158,609 |
| FY 2019 | TEC | 86,600 | 35,000 | 29,900 | 0 | 0 | 0 | 0 | 151,500 |
| | OPC | 7,100 | 0 | 0 | 0 | 0 | 0 | 0 | 7,109 |
| | TPC | 93,709 | 35,000 | 29,900 | 0 | 0 | 0 | 0 | 158,609 |
| FY 2020 | TEC | 53,600 | 35,000 | 48,800 | 25,600 | 0 | 0 | 0 | 163,000 |
| | OPC | 6,309 | 0 | 0 | 1,000 | 0 | 4,500 | 0 | 11,809 |
| | TPC | 59,909 | 35,000 | 48,800 | 26,600 | 0 | 4,500 | 0 | 174,809 |
| FY 2021 | TEC | 53,600 | 35,000 | 160,600 | 135,000 | 123,000 | 0 | 0 | 507,200 |
| | OPC | 6,309 | 0 | 0 | 0 | 3,000 | 10,000 | 0 | 19,309 |
| | TPC | 59,909 | 35,000 | 160,600 | 135,000 | 126,000 | 10,000 | 136,000 | 526,509 |
| FY 2022 | TEC | 53,600 | 35,000 | 160,600 | 135,000 | TBD | TBD | 123,000 | 507,200 |
| | OPC | 6,309 | 0 | 417 | 0 | TBD | TBD | 12,583 | 19,309 |
| | TPC | 59,909 | 35,000 | 161,017 | 135,000 | TBD | TBD | 135,583 | 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 through CLIN 001 on the M&O cost-plus contract.

**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 2022 request for the TA-55 Reinvestment Project Phase III is $27,000K. The Total Estimated Cost (TEC) baseline is $188,887K, and the Total Project Cost (TPC) baseline is $236,030K.

**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 a combined CD-1/2/3 to approve the alternative selection, performance baseline, and authorization of construction which was approved on May 6, 2021. On October 14, 2016, the Project Management Executive (PME) approved the Analysis of Alternatives (AoA) and the scope recommendation was to replace the Fire Panels and Devices only. 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 were completed in January 2021 to support the approval of the Performance Baseline. FY 2022 funding will be used to continue construction. The pace at which construction and turnover to operations can be executed is limited by the work being performed in an operating nuclear facility that is required to support critical program deliverables during the execution of this project. These considerations were validated during the NNSA review and approval of the CD-1/2/3 package and are reflected in the revised CD-4 date that has been established.

The Baseline is reflective of CD-1/2/3 package and consistent with the scope selection from the Federal AoA, final design, lessons learned, and input from the Independent Cost Estimate and External Independent Reviews.

A Federal Project Director has been appointed to this project and has approved this data sheet.

**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 |
| FY 2022 | 03/23/2005 | 11/15/2018 | 5/06/2021 | 5/06/2021 | 1/22/2021 | 5/06/2021 | 2QFY2025 | 3QFY2027 |

**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

**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 | 35,628 | 155,104 | 190,732 | 34,658 | 12,808 | 47,466 | 238,198 |
| FY 2022 | 22,435 | 166,452 | 188,887 | 44,778 | 2,365 | 47,143 | 236,030 |

**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 Department of Energy (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 conduct technical reviews of design and construction documents.

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.

**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 KPP | Objective KPP |
|---|---|---|
| New PF-4 fire alarm system | **T1:** New FAS is installed and accepted into operations for PF-4 | **O1:** New FAS is installed and accepted into operations for Balance of Plant |
| | **T2:** All data points cutover from old system to the new system as required per baseline design | **O2:** All Balance of Plant data points cutover from old system to the new system as required per baseline design |

**3. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2015 | 16,062 | 16,062 | 0 |
| FY 2016[b] | 6,373 | 8,193 | 0 |
| FY 2017 | 0 | 0 | 0 |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 1,503 |
| FY 2020[b] | 0 | (1,820) | 12,247 |
| FY 2021 | 0 | 0 | 8,685 |
| FY 2022 | 0 | 0 | 0 |
| Total Design | 22,435 | 22,435 | 22,435 |
| Construction | | | |
| FY 2016 | 10,002 | 10,002 | 0 |
| FY 2017 | 2,000 | 2,000 | 0 |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 30,000 | 30,000 | 16,079 |
| FY 2022 | 27,000 | 27,000 | 44,221 |

[a] Key Performance Parameters approved per CD-1/2/3.

[b] In FY 2020 there was reprogramming of $1.82M of the FY 2016 appropriation to the LANL TA-3 Substation replacement, 16-D-621.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Outyears | 97,450 | 97,450 | 106,152 |
| Total Construction | 166,452 | 166,452 | 166,452 |
| Total Estimated Costs (TEC) | | | |
| FY 2015 | 16,062 | 16,062 | 0 |
| FY 2016[a] | 16,375 | 18,195 | 0 |
| FY 2017 | 2,000 | 2,000 | 0 |
| FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 1,503 |
| FY 2020 | 0 | (1,820) | 12,247 |
| FY 2021 | 30,000 | 30,000 | 24,764 |
| FY 2022 | 27,000 | 27,000 | 44,221 |
| Outyears | 97,450 | 97,450 | 106,152 |
| **Total TEC** | **188,887** | **188,887** | **188,887** |
| Other Project Costs (OPC) | | | |
| OPC except D&D | | | |
| FY 2013[b] | 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 | 1,775 |
| FY 2020[c] | 500 | 500 | -6 |
| FY 2021 | 2,000 | 2,000 | 685 |
| FY 2022 | 5,000 | 5,000 | 6,000 |
| Outyears | 26,690 | 26,690 | 27,540 |
| Total, OPC except D&D | 44,778 | 44,778 | 44,778 |
| OPC D&D | | | |
| Outyears | 2,365 | 2,365 | 2,365 |
| Total OPC D&D | 2,365 | 2,365 | 2,365 |
| Total OPC | | | |
| FY 2013[b] | 1,675 | 1,675 | 1,675 |
| FY 2014 | 751 | 751 | 751 |
| FY 2015 | 1,801 | 1,801 | 1,801 |

[a] In FY 2020 there was reprogramming of $1.82M of the FY 2016 appropriation to the LANL TA-3 Substation replacement, 16-D-621.

[b] The OPC costs for FY 2013 through FY 2019 have been updated to reflect the actual cost incurred.

[c] No OPC funding was provided in FY 2020. The required OPCs were added in FY 2022.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2016 | 133 | 133 | 133 |
| FY 2017 | 828 | 828 | 828 |
| FY 2018 | 3,596 | 3,596 | 3,596 |
| FY 2019 | 1,804 | 1,804 | 1,775 |
| FY 2020 | 500 | 500 | -6 |
| FY 2021 | 2,000 | 2,000 | 685 |
| FY 2022 | 5,000 | 5,000 | 6,000 |
| Outyears | 29,055 | 29,055 | 29,905 |
| **Total OPC** | **47,143** | **47,143** | **47,143** |
| **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 | 16,508 | 18,328 | 133 |
| FY 2017 | 2,828 | 2,828 | 828 |
| FY 2018 | 3,596 | 3,596 | 3,596 |
| FY 2019 | 1,804 | 1,804 | 3,278 |
| FY 2020 | 500 | (1,320) | 12,241 |
| FY 2021 | 32,000 | 32,000 | 25,449 |
| FY 2022 | 32,000 | 32,000 | 50,221 |
| Outyears | 126,505 | 126,505 | 136,057 |
| **Grand Total TPC** | **236,030** | **236,030** | **236,030** |

**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 | 22,135 | 22,794 | 22,135 |
| Federal Support | 300 | 2,585 | 300 |
| Contingency | | 8,429 | |
| Total, Design | 22,435 | 33,808 | 22,435 |
| Construction | | | |
| Long Lead Procurements | 0 | 0 | N/A |
| Equipment | 0 | 0 | N/A |
| Construction | 111,499 | 89,622 | 111,499 |
| Safety Basis | | 142 | |
| Federal Support | 5,239 | 10,180 | 5,239 |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Contingency | 49,713 | 55,160 | 49,713 |
| Total, Construction | 166,452 | 155,104 | 166,452 |
| Total, TEC | 188,887 | 188,912 | 188,887 |
| *Contingency, TEC* | 49,713 | 63,589 | 49,713 |
| Other Project Cost (OPC) | | | |
| OPC except D&D | 0 | 0 | 0 |
| Conceptual Planning | 8,885 | 7,897 | 8,885 |
| Conceptual Design | 1,668 | 3,532 | 1,668 |
| Start-Up | 9,405 | 2,961 | 9,405 |
| Project Support | 14,541 | 9,547 | 14,541 |
| Contingency | 9,119 | 10,721 | 9,119 |
| Total OPC except D&D | 44,778 | 34,658 | 44,778 |
| OPC D&D | | | |
| OPC D&D | 2,365 | 7,092 | 2,365 |
| Contingency | | 5,716 | |
| Total OPC D&D | 2,365 | 12,808 | 2,365 |
| **Total, OPC** | **47,143** | **47,466** | **47,143** |
| *Contingency, OPC* | 9,119 | 16,437 | 9,119 |
| **Total, TPC** | **236,030** | **236,378** | **236,030** |
| **Total, Contingency** | **58,832** | **80,026** | **58,832** |

**5. Schedule of Appropriation Requests**

(Dollars in Thousands)

| Request Year | Type | Prior Years | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2015 | TEC | 128,062 | 10,000 | 2,000 | 0 | 0 | 0 | 0 | 0 | 0 | 140,062 |
| | OPC | 18,500 | 4,000 | 3,000 | 0 | 0 | 0 | 0 | 0 | 0 | 25,500 |
| | TPC | 146,562 | 14,000 | 5,000 | 0 | 0 | 0 | 0 | 0 | 0 | 165,562 |
| FY 2016 | TEC | 95,370 | 12,996 | 31,696 | 0 | 0 | 0 | 0 | 0 | 0 | 140,062 |
| | OPC | 22,500 | 4,000 | 3,000 | 0 | 0 | 0 | 0 | 0 | 0 | 29,500 |
| | TPC | 117,870 | 16,996 | 34,696 | 0 | 0 | 0 | 0 | 0 | 0 | 169,562 |
| FY 2017 | TEC | 96,512 | 12,996 | 0 | 32,000 | 0 | 0 | 0 | 0 | 0 | 141,508 |
| | OPC | 17,500 | 3,000 | 3,000 | 3,000 | 3,000 | 2,000 | 0 | 0 | 0 | 31,500 |
| | TPC | 114,012 | 15,996 | 3,000 | 35,000 | 3,000 | 2,000 | 0 | 0 | 0 | 173,008 |
| FY 2021 | TEC | 36,257 | 0 | 30,000 | 30,000 | 30,000 | 30,000 | 34,475 | 0 | 0 | 190,732 |
| | OPC | 10,588 | 2,000 | 2,000 | 3,000 | 11,000 | 11,808 | 4,000 | 3,070 | 0 | 47,466 |
| | TPC | 46,845 | 2,000 | 32,000 | 33,000 | 41,000 | 41,808 | 38,475 | 3,070 | 0 | 238,198 |
| FY 2022 | TEC | 34,437[a] | 0 | 30,000 | 27,000 | TBD | TBD | TBD | TBD | 97,450 | 188,887 |
| | OPC | 11,088 | 0 | 2,000 | 5,000 | TBD | TBD | TBD | TBD | 29,055 | 47,143 |
| | TPC | 45,525 | 0 | 32,000 | 32,000 | TBD | TBD | TBD | TBD | 126,505 | 236,030 |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | FY 2027 |
| Expected Useful Life (number of years) | 25 years |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | FY 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 | N/A | N/A | N/A | N/A |

**7. D&D Information**

There is no new area being constructed in this construction project, but the old system will be removed.

**8. Acquisition Approach**

The TRP III acquisition strategy assigns project execution to the LANL Management and Operating (M&O) Contractor. The final design was 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.

[a] The decrease in the prior year TEC funding is the result of an FY 2020 reprogramming of $1.82M of the FY 2016 appropriation to the LANL TA-3 Substation replacement 16-D-621.

**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 2022 Request for the Uranium Processing Facility (UPF) project is $524 million. The project's overall Total Project Cost (TPC) remains at $6,500 million and CD-4 of December 31, 2025.

This FY 2022 Construction Project Data Sheet (CPDS) reflects the most recent DOE Order 413.3B Critical Decision (CD) approval of CD-4, *Project Completion*, for the Substation Subproject 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 Main Process Building (MPB), the Salvage and Accountability Building (SAB), the 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:**
In FY 2020, the project completed approximately $800M of work and awarded additional fixed price procurements such that 97% of the planned $1.7 billion of UPF procurements was awarded. The Substation Subproject was completed 6 months ahead of schedule and $16.2 million under budget. Construction associated with the UPF project is ongoing, and the project is performing startup and commissioning activities for completed scope as appropriate.

FY 2022 and prior year funds will be used for ongoing construction, startup, and commissioning activities for the UPF project. 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 under budget and CD-4 was achieved ahead of schedule.

**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.

Per DOE O 413.3B, the cost savings from the Substation subproject have been returned to the Total Project contingency pool for other Subprojects within this PDS. This contingency will be incorporated into the other UPF Subprojects as needed after approval of a baseline change.

A Level 4 Project Management Career Development Program (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 Federal Project Director 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 |
| FY 2022 | 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 |
| FY 2022 | 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 |
| FY 2022 | 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 |
| FY 2022 | 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 |
| FY 2022 | 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 –** Long Lead Procurement for 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 |
| FY 2022[a] | 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 | N/A | 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 |

[a] Includes $16,200k of savings from the Substation Subproject held at the overall project level.

**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 |
| FY 2022 | 0 | 43,800 | 43,800 | 0 | 0 | 0 | 43,800 |

**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 |
| FY 2022 | 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 |
| FY 2022 | 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 |
| FY 2022 | 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 |
| FY 2022 | 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. 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 UPF Project and capacity for most of the rest of the Y-12 plant. The Substation provides electrical power from the Tennessee Valley Authority (TVA) 161kV transmission system. The Substation Subproject included all equipment, facilities, and structures needed for a fully operational 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, 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, 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, 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 Subproject will house 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 Highly Enriched Uranium Materials Facility (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 Enriched Uranium (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 Manhattan Project-era facilities. 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 Management and Operating (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 Federal Project Director 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 |
| FY 2017 | 0 | 0 | 0 |
| 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 |
| FY 2017 | 0 | 0 | 0 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total TEC** | **43,714** | **43,714** | **43,714** |
| Other Project Costs (OPC) | | | |
| FY 2017 | 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 |
| FY 2017 | 0 | 0 | 0 |
| **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 | 60,500[a] | 8,746 |
| FY 2016 | 0 | 0 | 26,875 |
| FY 2017 | 0 | 0 | 23,166 |
| FY 2018 | 0 | 0 | 1,713 |
| FY 2019 | 0 | 0 | 0 |
| 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 |

[a] Subproject received CD-4 approval in FY 2018 and completed under budget; baseline was $78M, actual cost was $60.5M.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2018 | 0 | 0 | 1,713 |
| FY 2019 | 0 | 0 | 0 |
| **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 |
| FY 2019 | 0 | 0 | 0 |
| **Grand Total** | **60,500** | **60,500** | **60,500** |

**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 | 43,800[a] | 43,800 | 0 |
| FY 2017 | 0 | 0 | 11,064 |
| FY 2018 | 0 | 0 | 26,101 |
| FY 2019 | 0 | 0 | 6,635 |
| FY 2020 | 0 | 0 | 0 |
| Total Construction | 43,800 | 43,800 | 43,800 |
| Total Estimated Costs (TEC) | | | |

[a] Per DOE O 413.3B, the approximately $16.2 million of cost savings from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2016 | 43,800 | 43,800 | 0 |
| FY 2017 | 0 | 0 | 11,064 |
| FY 2018 | 0 | 0 | 26,101 |
| FY 2019 | 0 | 0 | 6,635 |
| FY 2020 | 0 | 0 | 0 |
| **Total TEC** | **43,800** | **43,800** | **43,800** |
| 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 | 43,800 | 43,800 | 0 |
| FY 2017 | 0 | 0 | 11,064 |
| FY 2018 | 0 | 0 | 26,101 |
| FY 2019 | 0 | 0 | 6,635 |
| FY 2020 | 0 | 0 | 0 |
| **Grand Total** | **43,800** | **43,800** | **43,800** |

**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 | 61,043 |
| FY 2020 | 0 | 0 | 107,361 |
| FY 2021 | 0 | 0 | 69,000 |
| FY 2022 | 0 | 0 | 9,090 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 61,043 |
| FY 2020 | 0 | 0 | 107,361 |
| FY 2021 | 0 | 0 | 69,000 |
| FY 2022 | 0 | 0 | 9,090 |
| **Total TEC** | **282,980** | **282,980** | **282,980** |
| Other Project Costs (OPC) | | | |
| FY 2019 | 1,020 | 1,020 | 0 |
| FY 2020 | 0 | 0 | 28 |
| FY 2021 | 0 | 0 | 880 |
| FY 2022 | 0 | 0 | 112 |
| 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 | 61,043 |
| FY 2020 | 0 | 0 | 107,389 |
| FY 2021 | 0 | 0 | 69,880 |
| FY 2022 | 0 | 0 | 9,202 |
| **Grand Total** | **284,000** | **284,000** | **284,000** |

(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 | 6,853 |
| FY 2020 | 54,000 | 54,000 | 18,539 |
| FY 2021 | 19,000 | 19,000 | 53,000 |
| FY 2022 | 0 | 0 | 33,000 |
| Outyears | | | 4,469 |
| 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 | 6,853 |
| FY 2020 | 54,000 | 54,000 | 18,539 |
| FY 2021 | 19,000 | 19,000 | 53,000 |
| FY 2022 | 0 | 0 | 33,000 |
| Outyears | | | 4,469 |
| **Total TEC** | **118,000** | **118,000** | **118,000** |
| Other Project Costs (OPC) | | | |
| FY 2020 | 1,000 | 1,000 | 0 |
| FY 2021 | 21,000 | 21,000 | 0 |
| FY 2022 | 0 | 0 | 12,000 |
| Outyears | | | 10,000 |
| 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 | 6,853 |
| FY 2020 | 55,000 | 55,000 | 18,539 |
| FY 2021 | 40,000 | 40,000 | 53,000 |
| FY 2022 | 0 | 0 | 45,000 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Outyears | | | 14,469 |
| **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 | 144,702 |
| FY 2020 | 250,000 | 250,000 | 227,861 |
| FY 2021 | 197,000 | 197,000 | 325,000 |
| FY 2022 | 178,000 | 178,000 | 247,000 |
| Outyears | 32,000 | 32,000 | 104,243 |
| 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 | 144,702 |
| FY 2020 | 250,000 | 250,000 | 227,861 |
| FY 2021 | 197,000 | 197,000 | 325,000 |
| FY 2022 | 178,000 | 178,000 | 247,000 |
| Outyears | 32,000 | 32,000 | 104,243 |
| **Total TEC** | **1,105,000** | **1,105,000** | **1,105,000** |
| Other Project Costs (OPC) | | | |
| FY 2020 | 2,000 | 2,000 | 35 |
| FY 2021 | 5,000 | 5,000 | 5,000 |
| FY 2022 | 22,000 | 22,000 | 16,000 |
| Outyears | 46,000 | 46,000 | 53,965 |
| Total OPC | 75,000 | 75,000 | 75,000 |
| **Total Project Costs (TPC)** | | | |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2018 | 195,000 | 195,000 | 56,194 |
| FY 2019 | 253,000 | 253,000 | 144,702 |
| FY 2020 | 252,000 | 252,000 | 227,896 |
| FY 2021 | 202,000 | 202,000 | 330,000 |
| FY 2022 | 200,000 | 200,000 | 263,000 |
| Outyears | 78,000 | 78,000 | 158,208 |
| **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 |
| 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 |

[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.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 349,013 |
| FY 2020 | 436,000 | 435,973 | 473,080 |
| FY 2021 | 502,500 | 502,500 | 596,000 |
| FY 2022 | 292,500 | 292,500 | 499,000 |
| Outyears | 335,589 | 335,743 | 459,570 |
| 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 |
| 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 | 349,013 |
| FY 2020 | 436,000 | 435,973 | 473,080 |
| FY 2021 | 502,500 | 502,500 | 596,000 |
| FY 2022 | 292,500 | 292,500 | 499,000 |
| Outyears | 335,589 | 335,743 | 459,570 |
| **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 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 1,020 |
| FY 2021 | 5,500 | 5,500 | 2,000 |
| FY 2022 | 31,500 | 31,500 | 30,000 |
| Outyears | 147,000 | 147,000 | 152,980 |
| Total OPC | 280,643 | 280,643 | 280,643 |
| **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 | 349,013 |
| FY 2020 | 438,000 | 437,973 | 474,100 |
| FY 2021 | 508,000 | 508,000 | 598,000 |

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| FY 2022 | 324,000 | 324,000 | 529,000 |
| Outyears | 482,589 | 482,743 | 612,550 |
| **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 |
| 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 |
| Construction | | | |
| FY 2012 | 0 | 0 | 0 |
| FY 2013 | 43,714 | 43,714 | 5,242 |
| FY 2014 | 0 | 0 | 25,928 |
| FY 2015 | 60,500 | 60,500 | 20,853 |
| FY 2016 | 115,800[a] | 115,800 | 32,270 |

[a] Allocation of funding and obligations reflects the final TPC of the Substation Subproject. Per DOE O 413.3B, the approximately $16.2 million of cost savings from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS, the funding for this contingency is from FY 2016.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 739,973 | 826,841 |
| FY 2021 | 718,500 | 718,500 | 1,043,000 |
| FY 2022 | 470,500 | 470,500 | 788,090 |
| Outyears | 367,589 | 367,743 | 568,282 |
| Total Construction | 4,267,137 | 4,267,137 | 4,267,137 |
| 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 | 312,783 | 312,740 | 197,631 |
| FY 2014 | 301,886 | 301,886 | 224,376 |
| FY 2015 | 331,429 | 330,323 | 241,614 |
| FY 2016 | 413,800[a] | 413,778 | 341,424 |
| FY 2017 | 575,000 | 574,864 | 416,123 |
| FY 2018 | 663,000 | 664,392 | 414,185 |
| FY 2019 | 701,980 | 701,853 | 563,465 |
| FY 2020 | 740,000 | 740,127 | 831,622 |
| FY 2021 | 718,500 | 718,500 | 1,043,000 |
| FY 2022 | 470,500 | 470,500 | 788,090 |
| Outyears | 367,589 | 367,589 | 568,282 |
| **Total TEC** | **6,105,137** | **6,105,137** | **6,105,137** |
| Other Project Costs (OPC) | | | |
| FY 2005 | 12,113 | 12,113 | 12,113 |

[a] Allocation of funding and obligations reflects the final TPC of the Substation Subproject. Per DOE O 413.3B, the approximately $16.2 million of cost savings from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS, the funding for this contingency is from FY 2016.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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[a] | 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 | 1,020 | 1,020 | 0 |
| FY 2020 | 5,000 | 5,000 | 1,083 |
| FY 2021 | 31,500 | 31,500 | 7,880 |
| FY 2022 | 53,500 | 53,500 | 58,112 |
| Outyears | 193,000 | 193,000 | 216,945 |
| **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 | 413,800 | 413,778 | 341,424 |

[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.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| 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 | 744,973 | 827,924 |
| FY 2021 | 750,000 | 750,000 | 1,050,880 |
| FY 2022 | 524,000 | 524,000 | 846,202 |
| Outyears | 560,589 | 560,743 | 785,227 |
| **Subtotal** | **6,483,800** | **6,483,800** | **6,483,800** |
| Contingency from Substation Subproject – FY 2016 funds | 16,200 | 16,200 | 16,200 |
| **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 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **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 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **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 | 43,800[a] | 48,568 | 0 |
| Contingency | 0 | 0 | 10,000 |
| Total Construction | 43,800 | 48,568 | 60,000 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 43,800 | 48,568 | 60,000 |
| *Contingency, TEC* | 0 | 0 | 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** | **43,800** | **48,568** | **60,000** |
| ***Total Contingency (TEC+OPC)*** | **0** | **0** | **10,000** |

**Mechanical Electrical Building (MEB) Subproject (06-D-141-06)**

[a] Allocation of funding and obligations reflects the final TPC of the Substation Subproject. Per DOE O 413.3B, the approximately $16.2 million of cost savings from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS.

(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 | 214,980 | 194,105 | 184,000 |
| Contingency | 50,000 | 70,875 | 80,000 |
| Total Construction | 282,980 | 282,980 | 284,000 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 282,980 | 282,980 | 284,000 |
| *Contingency, TEC* | 50,000 | 70,875 | 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)*** | **50,020** | **70,895** | **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 | 74,524 | 85,500 |
| Contingency | 33,476 | 33,476 | 22,500 |
| Total Construction | 118,000 | 118,000 | 118,000 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 118,000 | 118,000 | 118,000 |
| *Contingency, TEC* | 33,476 | 33,476 | 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** | **37,476** | **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 | 437,000 | 349,341 | 503,500 |
| Contingency | 290,000 | 377,659 | 223,500 |
| Total Construction | 1,105,000 | 1,105,000 | 1,105,000 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 1,105,000 | 1,105,000 | 1,105,000 |
| *Contingency, TEC* | 290,000 | 377,659 | 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)*** | **305,000** | **392,659** | **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 | 1,033,343 | 825,722 | 1,139,343 |
| Contingency | 548,000 | 755,621 | 442,000 |
| Total Construction | 2,613,143 | 2,613,143 | 2,613,143 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 4,451,143 | 4,451,143 | 4,451,143 |
| *Contingency, TEC* | 548,000 | 755,621 | 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)*** | **588,000** | **795,621** | **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) | | | |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| 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 | 156,214 | 156,214 | 156,214 |
| Equipment | 1,325,300 | 1,325,300 | 1,325,300 |
| Construction | 1,864,147 | 1,551,192 | 2,038,623 |
| Contingency | 921,476 | 1,250,631[a] | 763,200 |
| Total Construction | 4,267,137 | 4,283,337 | 4,283,337 |
| Other TEC (if any) | | | |
| Cold Startup | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 |
| Total, Other TEC | 0 | 0 | 0 |
| **Total Estimated Cost** | 6,105,137 | 6,121,337 | 6,121,337 |
| *Contingency, TEC* | 921,476 | 1,250,631 | 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 |
| *Contingency from completed subprojects* | 16,200[b] | 0[c] | 0 |
| **Total Project Cost** | **6,500,000** | **6,500,000** | **6,500,000** |
| ***Total Contingency (TEC+OPC)*** | **996,696** | **1,309,651** | **822,220** |

[a] $13,000k included in Contingency, TEC of $1,250,631 in the fiscal year 2021 project data sheet.

[b] Allocation of funding and obligations reflects the final TPC of the Substation Subproject. Per DOE O 413.3B, the $16.2 million of cost savings from the Substation Subproject has been returned to the Total Project contingency pool for other Subprojects within this CPDS, the funding for this contingency is from FY 2016.

[c] $13,000k included in Contingency, TEC of $1,250,631 in the fiscal year 2021 project data sheet.

**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 | 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 | 3,525,096 | TBD | 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 | 3,525,096 | 525,000 | TBD | 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 | 3,800,096 | 620,000 | 635,000 | 645,000 | 500,000 | 250,000 | 49,904 | 0 | 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 | 3,945,096 | 735,000 | 740,000 | 630,000 | 385,000 | 64,904 | 0 | 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 | 3,920,411 | 745,000 | 750,000 | 620,000 | 300,000 | 159,000 | 5,589 | 0 | 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 | 3,920,411 | 745,000 | 750,000 | 620,000 | 300,000 | 164,589 | 0 | 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 | 3,920,411 | 745,000 | 750,000 | 620,000 | 300,000 | 164,589 | 0 | 0 | 6,500,000 |
| FY 2022 | TEC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | N/A | N/A |

| Request Year | Type | Prior Years | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | OPC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | N/A | N/A |
| | TPC | 3,920,411 | 745,000 | 750,000 | 524,000 | TBD | TBD | TBD | 560,589 | 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 special 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 the Integrated Project Team are responsible for the execution of the project. The Y-12 M&O contractor is the designated design authority. Designated officials within 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 2022 Request for the Chemistry and Metallurgy Research Replacement (CMRR) Project is $138,123K, supporting subprojects for equipment installation into Plutonium Facility 4 (PF-4) and the Radiological Laboratory and Utility Office Building (RLUOB), and associated infrastructure for related operations in and around the two facilities.

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.

**Significant Changes:**
The FY 2022 Construction Project Data Sheet (CPDS) is an update from FY 2021 and does not include a new start for the budget year. This data sheet updates the project to include, a) previously completed subprojects, b) forecasted completion of the RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI 1)[a] subprojects, and c) continuation of the PF-4 Equipment Installation Phase 2 (PEI2) and RLUOB Hazard Category 3 (RC3) subprojects.

Critical Decision (CD)-1 for all remaining subprojects was approved on August 21, 2014, with a combined CMRR total project cost (TPC) of $2,886,230K. PEI2 and RC3 have yet to be baselined and will be bounded to remain with the approved CMRR TPC. Remaining funds available for PEI2 and RC3 are forecasted at this time and will be refined with the completion of the REI2 subproject.

This Construction Project Data Sheet reflects:
- Ongoing work on the final two CMRR subprojects, PEI2 and RC3.
- The anticipated completion of REI2 during FY 2022.
- The completion of PEI1 in FY21.

The CMRR subprojects are listed below. Completed subprojects are described in Section 2 of this document.

**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):** *FORECASTED TO COMPLETE IN FY 2022*[a] - 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. 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 2022, with an estimated cost at completion of $71 million below the baseline cost estimate.

**PEI1 Subproject (04-D-125-05):** *COMPLETE*[a] – CD-4 approved on January 8, 2021, more than one year ahead of schedule. The final project cost at CD-4 was $284,000K, $110 million below the baseline cost estimate.

**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. PEI2 also improves TA-55 and PF-4 personnel and vehicular ingress/egress, levels of worker preparation/staging and warehousing for relocated AC/MC operations and personnel. See Section 4 of this datasheet for additional detail on *Project Scope and Justification*. The high end of the current cost range for

[a] REI2 has a forecasted CD-4/completion in FY 2022, with no additional funds requested in FY 2022. Consistent with DOE O 413.3B, any TPC savings from CMRR subprojects will be returned to the contingency pool and used for execution of other CMRR subprojects (PEI2/RC3) as needed.

the subproject was increased to reflect the completion of PEI1/anticipated completion of REI2 subprojects and returning the underruns to the project contingency. The contingency will be used/made available to address existing scope as performance baselines are established. Until a performance baseline for all scope elements of the project is achieved, the project will maintain the top end of the range established at CD-1. The schedule range for completion is currently FY 2026 to FY 2029. An integrated master schedule will be developed for CD-2/3 approval.

**RC3 Subproject (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. RC3 also includes office and parking. The high end of the current cost range for this subproject was increased to reflect the completion of PEI1/anticipated completion of REI2 subprojects and returning the underruns to the project contingency. The contingency will be used/made available to address existing scope as performance baselines are established. Until a performance baseline for all scope elements of the project is achieved, the project will maintain the top end of the range established at CD-1. The schedule range for completion is currently FY 2026 to FY 2028. An integrated master schedule will be developed for CD-2/3.

**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 |
| FY 2022 | 07/16/2002 | N/A | 08/21/2014 | 4QFY2023 | 4QFY2023 | 4QFY2023 | 3QFY2028 | 4QFY2029[a] |

**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[b] |

[a] These dates reflect current planning estimates and will be revised when the remaining subprojects are baselined.

[b] This subproject is complete and the project history has not changed.

**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 | 04/30/2013[a] |

**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[a] |

**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 |
| FY 2022 | 07/16/2002 | 8/21/2014 | 8/21/2014 | 10/31/2016 | 4/6/2016 | 10/31/2016 | N/A | 2QFY2022 |

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 |
| FY 2022 | 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 |
| FY 2022 | 07/16/2002 | 8/21/2014 | 08/21/2014 | 10/31/2016 | 12/1/2016 | 10/31/2016 | 11/12/2019 | 1/08/2021 |

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 |
| FY 2022 | 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 |
| FY 2022 | 07/16/2002 | 8/21/2014 | 8/21/2014 | 3QFY2023 | 3QFY2023 | 3QFY2023 | 3QFY2028 | 4QFY2029 |

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 |
| FY 2022 | 03/18/2015 | 02/03/2021 |

**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 |
| FY 2022 | 07/16/2002 | 08/21/2014 | 8/21/2014 | 4QFY2023 | 4QFY2023 | 1QFY2024 | N/A | 4QFY2028 |

Fiscal Quarter or Date

| Fiscal Year | CD-3A |
|---|---|
| FY 2022 | 1QFY2022 |

**CD-3A** – Essential Legacy Systems Repairs/Improvements

**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[a] |
| FY 2021 | 63,573 | 2,209,069 | 2,272,642 | 550,588 | 54,000 | 604,588 | 2,877,230 |
| FY 2022 | 63,573 | 2,241,987 | 2,305,560 | 520,035 | 54,000 | 580,670 | 2,886,230 |

**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 |
|---|---|---|---|---|---|---|---|
| **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[b] | 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[c] | N/A | 151,963 | 151,963 | 44,797 | N/A | 44,797 | 196,760 |

[a] In the FY2020 CMRR Data Project Data Sheet the PEI2 and RC3 subprojects were removed from the CMRR project and funded under the Plutonium Pit Production Project in accordance with the Conference Report.

[b] This subproject is complete and the project history has not changed.

[c] This sub-project is complete and the project history has not changed.

**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[a] | 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 |
| FY 2022 | 0 | 451,517[b] | 451,517[b] | 111,090[b] | N/A | 111,090[b] | 562,607[b] |

**PEI1 Subproject (04-D-125-05)**

(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 |
| FY 2022 | 0 | 231,400[c] | 231,400[b] | 52,600[b] | N/A | 52,600[b] | 284,000[b] |

[a] This sub-project was canceled and the project history has not changed.

[b] The subproject costs have been evaluated in the final project year, and underruns have been moved to contingency until the subproject completes.

[c] The subproject was completed in FY 2021. Under runs to this subproject have been moved from contingency to the PEI2 and RC3 subprojects.

**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 | 29,035 |
| FY 2021 | 0 | 475,242 | 475,242 | 146,098 | 54,000 | 200,098 | 675,340 |
| FY 2022 | 0 | 538,662 | 538,662 | 156,533 | 54,000 | 210,533 | 749,195 |

**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 |
| FY 2021 | 0 | 270,475 | 270,475 | 68,859 | N/A | 68,859 | 339,334 |
| FY 2022 | 0 | 337,396 | 337,396 | 117,726 | N/A | 117,726 | 455,122 |

**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 three 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 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, 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 involved 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 supports the AC and MC capabilities that require the processing of larger amounts of nuclear material. This project made progress toward ceasing program operations in CMR. These capabilities support pit production, pit surveillance, plutonium science and other national security programs. The removal work was executed as site-prep work within this subproject. Specific capabilities in PEI1 scope included:

  - 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:

  - 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 preliminary cost range for the work in this subproject is $675,340K - $749,195K and schedule range 2026 to 2029 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. The CD-3B approved on February 3, 2021 included increasing change rooms capacity and upgrade to one of the existing PF-4 ingress/egress security posts identified above.

  **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. 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.

The preliminary cost range for the work in this subproject is $339,334K - $455,122K 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.

**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 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 maximize use of RLUOB by reconfiguring existing laboratory space and equipping the remaining empty laboratories with AC and MC systems. 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**

**Prior Subprojects (RLUOB/REI/Nuclear Facility) 03-D-103-010 & 04-D-125-01, -02, -03)**

(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-125-01, -02, -03)** | **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) | | | |
| Prior Years - FY 2018 | 42,179 | 42,179 | 42,179 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| **Total Design (04-D-125-04)** | **42,179** | **42,179** | **42,179** |
| Construction (04-D-125-04) | | | |
| Prior Years - FY 2018 | 282,289 | 241,682 | 228,937 |
| FY 2019 | 99,262 | 78,912 | 84,730 |
| FY 2020 | 23,747 | 84,688 | 50,000 |
| FY 2021 | 4,040 | 4,056 | 34,919 |
| FY 2022 | 0 | 0 | 10,752 |
| **Total Construction (04-D-125-04)** | **409,338[a]** | **409,338[a]** | **409,338[a]** |
| TEC (04-D-125-04) | | | |
| Prior Years - FY 2018 | 324,468 | 283,861 | 271,116 |
| FY 2019 | 99,262 | 78,912 | 84,730 |
| FY 2020 | 23,747 | 84,688 | 50,000 |
| FY 2021 | 4,040 | 4,056 | 34,919 |
| FY 2022 | 0 | 0 | 10,752 |
| **Total TEC (04-D-125-04)** | **451,517[a]** | **451,517[a]** | **451,517[a]** |

[a] The sub-project cost has been evaluated in the final project year and under runs have been moved to contingency until the subproject completes.

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| Other Project Cost (OPC) (OPC except D&D) | | | |
| Prior Years - FY 2018 | 49,462 | 45,663 | 23,417 |
| FY 2019 | 50,000 | 40,000 | 37,375 |
| FY 2020 | 11,628 | 25,427 | 30,290 |
| FY 2021 | 0 | 0 | 10,008 |
| FY 2022 | 0 | 0 | 10,000 |
| **Total OPC except D&D (04-D-125-04)** | **111,090[a]** | **111,090[a]** | **111,090[a]** |
| Total Project Cost (TPC) | | | |
| Prior Years - FY 2018 | 373,930 | 329,524 | 294,533 |
| FY 2019 | 149,262 | 118,912 | 122,105 |
| FY 2020 | 35,375 | 110,115 | 80,290 |
| FY 2021 | 4,040 | 4,056 | 44,927 |
| FY 2022 | 0 | 0 | 20,752 |
| **Total TPC (04-D-125-04)** | **562,607[a]** | **562,607[a]** | **562,607[a]** |

**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)** | | | |
| Prior Years - FY 2018 | 31,611 | 31,611 | 31,611 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| **Total Design (04-D-125-05)** | **31,611** | **31,611** | **31,611** |

[a] The sub-project cost has been evaluated in the final project year and under runs have been moved to contingency until the subproject completes.

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| **Construction (04-D-125-05)** | | | |
| Prior Years - FY 2018 | 157,704 | 156,435 | 110,245 |
| FY 2019 | 42,085 | 43,354 | 44,415 |
| FY 2020 | 0 | 0 | 44,154 |
| FY 2021 | 0 | 0 | 975 |
| FY 2022 | 0 | 0 | 0 |
| **Total Construction (04-D-125-05)** | **199,789**[a] | **199,789** | **199,789**[a] |
| TEC (04-D-125-05) | | | |
| Prior Years - FY 2018 | 189,315 | 188,046 | 141,856 |
| FY 2019 | 42,085 | 43,354 | 44,415 |
| FY 2020 | 0 | 0 | 44,154 |
| FY 2021 | 0 | 0 | 975 |
| FY 2022 | 0 | 0 | 0 |
| **Total TEC (04-D-125-05)** | **231,400**[a] | **231,400**[a] | **231,400**[a] |
| Other Project Cost (OPC) | | | |
| (OPC except D&D) | | | |
| Prior Years - FY 2018 | 37,292 | 35,505 | 24,678 |
| FY 2019 | 15,308 | 12,961 | 24,221 |
| FY 2020 | 0 | 4,134 | 3,292 |
| FY 2021 | 0 | 0 | 409 |
| FY 2022 | 0 | 0 | 0 |
| **Total OPC except D&D (04-D-125-05)** | **52,600**[b] | **52,600**[a] | **52,600**[a] |
| Total Project Cost (TPC) | | | |
| Prior Years - FY 2018 | 226,607 | 223,551 | 166,534 |
| FY 2019 | 57,393 | 56,315 | 68,636 |
| FY 2020 | 0 | 4,134 | 47,446 |
| FY 2021 | 0 | 0 | 1,385 |
| FY 2022 | 0 | 0 | 0 |
| **Total TPC (04-D-125-05)** | **284,000**[a] | **284,000**[a] | **284,000**[a] |

**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) | | | |
| Prior Years - FY 2018 | 16,915 | 16,915 | 14,991 |
| FY 2019 | 13,187 | 13,187 | 0 |
| FY 2020 | 84,788 | 84,788 | 5,000 |
| FY 2021 | 9,921 | 9,921 | 39,620 |

[a] The sub-project has been completed in FY21, under runs to this subproject have been moved from contingency to the PEI2 and RC3 subprojects.

[b] The sub-project has been completed in FY 2021. Underruns have been moved from contingency to the PEI2 and RC3 subprojects.

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| FY 2022 | 0 | 0 | 46,550 |
| Outyears | 0 | 0 | 18,650 |
| **Total Design (04-D-125-06)** | **124,811** | **124,811** | **124,811** |
| Construction (04-D-125-06) | | | |
| Prior Years - FY 2018 | 21,748 | 21,748 | 21,241 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 43,508 | 43,508 | 0 |
| FY 2021 | 85,384 | 85,384 | 34,410 |
| FY 2022 | 63,000 | 63,000 | 64,120 |
| Outyears | 200,211 | 200,211 | 294,080 |
| **Total Construction (04-D-125-06)** | **413,851** | **413,851** | **413,851** |
| TEC (04-D-125-06) | | | |
| Prior Years - FY 2018 | 38,663 | 38,663 | 36,232 |
| FY 2019 | 13,187 | 13,187 | 0 |
| FY 2020 | 128,296 | 128,296 | 5,000 |
| FY 2021 | 95,305 | 95,305 | 74,030 |
| FY 2022 | 63,000 | 63,000 | 110,670 |
| Outyears | 200,211 | 200,211 | 312,730 |
| **Total TEC (04-D-125-06)** | **538,662** | **538,662** | **538,662** |
| Other Project Cost (OPC) | | | |
| (OPC non capital) | | | |
| Prior Years - FY 2018 | 296 | 296 | 296 |
| FY 2019 | 6,177 | 6,177 | 1,480 |
| FY 2020 | 0 | 0 | 4,697 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| **Total OPC non capital (04-D-125-06)** | **6,473** | **6,473** | **6,473** |
| Other Project Cost (OPC) | | | |
| (OPC except D&D) | | | |
| Prior Years - FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 15,250 | 15,250 | 7,070 |
| FY 2022 | 14,599 | 14,599 | 8,330 |
| Outyears | 120,211 | 120,211 | 134,660 |
| Other Project Cost (OPC) D&D | | | |
| Prior Years - 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 |
| Outyears | 54,000 | 54,000 | 54,000 |
| **Total OPC D&D (04-D-125-06)** | **54,000** | **54,000** | **54,000** |
| Total Other Project Cost (OPC) | | | |

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| Prior Years - FY 2018 | 296 | 296 | 296 |
| FY 2019 | 6,177 | 6,177 | 1,480 |
| FY 2020 | 0 | 0 | 4,697 |
| FY 2021 | 15,250 | 15,250 | 7,070 |
| FY 2022 | 14,599 | 14,599 | 8,330 |
| Outyears | 174,211 | 174,211 | 188,660 |
| **Total OPC (04-D-125-06)** | **210,533** | **210,533** | **210,533** |
| Total Project Cost (TPC) | | | |
| Prior Years - FY 2018 | 38,959 | 38,959 | 36,528 |
| FY 2019 | 19,364 | 19,364 | 1,480 |
| FY 2020 | 128,296 | 128,296 | 9,697 |
| FY 2021 | 110,555 | 110,555 | 81,100 |
| FY 2022 | 77,599 | 77,599 | 119,000 |
| Outyears | 374,422 | 374,422 | 501,390 |
| **Total TPC (04-D-125-06)** | **749,195** | **749,195** | **749,195** |

**RLUOB Hazard Category 3 (RC3) (04-D-125-07)**

(dollars in thousands)

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| Design (04-D-125-07) | | | |
| Prior Years - FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 4,773 | 4,773 | 0 |
| FY 2021 | 15,748 | 15,748 | 7,440 |
| FY 2022 | 26,636 | 26,636 | 37,200 |
| Outyears | 17,013 | 17,013 | 19,530 |
| **Total Design (04-D-125-07)** | **64,170** | **64,170** | **64,170** |
| Construction (04-D-125-07) | | | |
| Prior Years - FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 11,334 | 11,334 | 10,750 |
| Outyears | 261,892 | 261,892 | 262,476 |
| **Total Construction (04-D-125-07)** | **273,226** | **273,226** | **273,226** |
| TEC (04-D-125-07) | | | |
| Prior Years - FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 4,773 | 4,773 | 0 |
| FY 2021 | 15,748 | 15,748 | 7,440 |
| FY 2022 | 37,970 | 37,970 | 47,950 |
| Outyears | 278,905 | 278,905 | 282,006 |
| | **Budget** | **Obligations** | **Cost** |

| | Authority (Appropriations) | | |
|---|---|---|---|
| **Total TEC (04-D-125-07)** | **337,396** | **337,396** | **337,396** |
| Other Project Cost (OPC) | | | |
| (OPC non capital) | | | |
| Prior Years - FY 2018 | 162 | 162 | 162 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| **Total OPC non capital (04-D-125-07)** | **162** | **162** | **162** |
| (OPC except D&D) | | | |
| Prior Years - FY 2018 | 1,000 | 1,000 | 324 |
| FY 2019 | 11,000 | 11,000 | 836 |
| FY 2020 | 0 | 0 | 7,000 |
| FY 2021 | 39,084 | 39,084 | 28,560 |
| FY 2022 | 22,554 | 22,554 | 26,050 |
| Outyears | 43,926 | 43,926 | 54,794 |
| **Total OPC except D&D (04-D-125-07)** | **117,564** | **117,564** | **117,564** |
| Total Other Project Cost (OPC) | | | |
| Prior Years - FY 2018 | 1,162 | 1,162 | 486 |
| FY 2019 | 11,000 | 11,000 | 836 |
| FY 2020 | 0 | 0 | 7,000 |
| FY 2021 | 39,084 | 39,084 | 28,560 |
| FY 2022 | 22,554 | 22,554 | 26,050 |
| Outyears | 43,926 | 43,926 | 54,794 |
| **Total OPC (04-D-125-07)** | **117,726** | **117,726** | **117,726** |
| Total Project Cost (TPC) | | | |
| Prior Years - FY 2018 | 1,162 | 1,162 | 486 |
| FY 2019 | 11,000 | 11,000 | 836 |
| FY 2020 | 4,773 | 4,773 | 7,000 |
| FY 2021 | 54,832 | 54,832 | 36,000 |
| FY 2022 | 60,524 | 60,524 | 74,000 |
| Outyears | 322,831 | 322,831 | 336,800 |
| **Total TPC (04-D-125-07)** | **455,122** | **455,122** | **455,122** |

**Total Project**

(dollars in thousands)

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| 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 | 477,634 | 477,634 | 475,710 |

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| FY 2019 | 13,187 | 13,187 | 0 |
| FY 2020 | 89,561 | 89,561 | 5,000 |
| FY 2021 | 25,669 | 25,669 | 47,060 |
| FY 2022 | 26,636 | 26,636 | 83,750 |
| Outyears | 17,013 | 17,013 | 38,180 |
| **Total Design (04-D-125)** | **649,700** | **649,700** | **649,700** |
| Construction | | | |
| Prior Years - FY 2018 | 757,824 | 715,948 | 656,506 |
| FY 2019 | 141,347 | 122,266 | 129,145 |
| FY 2020 | 67,255 | 128,196 | 94,154 |
| FY 2021 | 89,424 | 89,440 | 70,304 |
| FY 2022 | 74,334 | 74,334 | 85,622 |
| Outyears | 462,103 | 462,103 | 556,556 |
| **Total Construction (04-D-125)** | **1,592,287** | **1,592,287** | **1,592,287** |
| TEC | | | |
| Prior Years - FY 2018 | 1,299,031 | 1,257,155 | 1,195,789 |
| FY 2019 | 154,534 | 135,453 | 129,145 |
| FY 2020 | 156,816 | 217,757 | 99,154 |
| FY 2021 | 115,093 | 115,109 | 117,364 |
| FY 2022 | 100,970 | 100,970 | 169,372 |
| Outyears | 479,116 | 479,116 | 594,736 |
| **Total TEC (04-D-125)** | **2,305,560** | **2,305,560** | **2,305,560** |
| Other Project Cost (OPC) | | | **2,305,560** |
| (OPC non capital) | | | |
| Prior Years - FY 2018 | 89,179 | 89,179 | 89,179 |
| FY 2019 | 6,177 | 6,177 | 1,480 |
| FY 2020 | 0 | 0 | 4,697 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| **Total OPC non capital** | **95,356** | **95,356** | **95,356** |
| Other Project Cost (OPC) | | | |
| (OPC except D&D) | | | |
| Prior Years - FY 2018 | 87,754 | 82,168 | 48,419 |
| FY 2019 | 76,308 | 63,961 | 62,432 |
| FY 2020 | 11,628 | 29,561 | 40,582 |
| FY 2021 | 54,334 | 54,334 | 46,047 |
| FY 2022 | 37,153 | 37,153 | 44,380 |
| Outyears | 164,137 | 164,137 | 189,454 |
| **Total OPC except D&D (04-D-125)** | **431,314** | **431,314** | **431,314** |
| Other Project Cost (OPC) D&D | | | |
| OPC D&D | | | |
| Prior Years - FY 2018 | 0 | 0 | 0 |
| FY 2019 | 0 | 0 | 0 |

| | Budget Authority (Appropriations) | Obligations | Cost |
|---|---|---|---|
| FY 2020 | 0 | 0 | 0 |
| FY 2021 | 0 | 0 | 0 |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 54,000 | 54,000 | 54,000 |
| **Total OPC D&D (04-D-125)** | **54,000** | **54,000** | **54,000** |
| OPC Total | | | |
| OPC Total | | | |
| Prior Years - FY 2018 | 176,933 | 171,347 | 137,598 |
| FY 2019 | 82,485 | 70,138 | 63,912 |
| FY 2020 | 11,628 | 29,561 | 45,279 |
| FY 2021 | 54,334 | 54,334 | 46,047 |
| FY 2022 | 37,153 | 37,153 | 44,380 |
| Outyears | 218,137 | 218,137 | 243,454 |
| **Total OPC (04-D-125)** | **580,670** | **580,670** | **580,670** |
| Total Project Costs (TPC) | | | |
| Prior Years - FY 2018 | 1,475,964 | 1,428,502 | 1,333,387 |
| FY 2019 | 237,019 | 205,591 | 193,057 |
| FY 2020 | 168,444 | 247,318 | 144,433 |
| FY 2021 | 169,427 | 169,443 | 163,411 |
| FY 2022 | 138,123 | 138,123 | 213,752 |
| Outyears | 697,253 | 697,253 | 838,190 |
| **Total TPC** | **2,886,230** | **2,886,230** | **2,886,230** |

**4. Details of Project Cost Estimate**

**Prior Subprojects (RLUOB/REI/Nuclear Facility) 03-D-103-010 & 04-D-125-01, -02, -03)**

(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 |
| Contingency | | | N/A |
| Total, Construction | 296,083 | 296,083 | N/A |
| **Total Estimated Cost** | **746,585** | **746,585** | **N/A** |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| *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 | 271,128 | 307,660 | 305,023 |
| Contingency | 80,651 | 80,651 | 80,651 |
| Total, Construction | 409,338 | 445,861 | 443,224 |
| **Total Estimated Cost** | **451,517** | **488,040** | **488,040** |
| *Contingency, TEC* | 80,651 | 80,651 | 80,651 |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| 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 |

| | Current Total Estimate | Previous Total Estimate | Original Validated Baseline |
|---|---|---|---|
| Contingency | 25,474 | 59,594 | 59,594 |
| **Total, OPC** | 111,090 | 145,210 | 145,210 |
| *Contingency, OPC* | 25,474 | 59,594 | 59,594 |
| **Total Project Cost** | **562,607** | **633,250** | **633,250** |
| ***Total Contingency (TEC+OPC)*** | **106,125** | **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 | 30,054 | 43,054 | 43,054 |
| Equipment | 11,842 | 11,842 | 11,842 |
| Construction | 157,893 | 140,589 | 137,892 |
| Contingency | | 65,204 | 65,204 |
| Total, Construction | 199,789 | 260,689 | 257,992 |
| **Total Estimated Cost** | **231,400** | **292,300** | **292,300** |
| *Contingency, TEC* | | *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 | 50,411 | 63,686 | 63,686 |
| Contingency | | 35,825 | 35,825 |
| **Total, OPC** | **52,600** | **101,700** | **101,700** |
| *Contingency, OPC* | | *35,825* | *35,825* |
| **Total Project Cost** | **284,000** | **394,000** | **394,000** |
| ***Total Contingency (TEC+OPC)*** | | ***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 | 46,657 | | N/A |
| Contingency | 78,154 | | N/A |
| Total, Design | 124,811 | 46,657 | N/A |
| Construction | | | |
| Site Work | | | N/A |
| Equipment | | | N/A |
| Construction | 413,851 | | N/A |
| Other, as needed | | | N/A |
| Contingency | | | N/A |
| Total, Construction | 413,851 | 428,585 | N/A |
| Other TEC (if any) | | | |
| Cold Startup | | | N/A |
| Contingency | | | N/A |
| Total, Other TEC | | | N/A |
| **Total Estimated Cost** | **538,662** | **475,242** | **N/A** |
| *Contingency, TEC* | *78,154* | | |
| 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 |
| Contingency | 10,435 | | |
| **Total, OPC** | **210,533** | **200,098** | N/A |
| *Contingency, OPC* | *10,435* | | N/A |
| **Total Project Cost** | **749,195** | **675,340** | N/A |
| ***Total Contingency (TEC+OPC)[a]*** | ***88,589*** | | N/A |

[a] The high end of the current cost range the subproject was increased to reflect the completion of PEI1/anticipated completion of REI2 subprojects and returning the underruns to the project contingency. The contingency will be used/made available to address existing scope as performance baselines are established. Until a performance baseline for all scope elements of the project is achieved, the project will maintain the top end of the range established at CD-1.

**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 | 44,000 | | N/A |
| Contingency | 20,170 | | N/A |
| Total, Design | 64,170 | 44,000 | N/A |
| Construction | | | |
| Site Work | | | N/A |
| Equipment/Construction | 226,475 | | N/A |
| Other, as needed | | | N/A |
| Contingency | 46,751 | | N/A |
| Total, Construction | 273,226 | 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** | **337,396** | **270,475** | N/A |
| *Contingency, TEC* | *66,921* | | |
| 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 | 48,867 | | N/A |
| **Total, OPC** | 117,726 | 68,859 | N/A |
| *Contingency, OPC* | | | N/A |
| **Total Project Cost** | **455,122** | **339,334** | N/A |
| ***Total Contingency (TEC+OPC)[a]*** | ***115,788*** | | N/A |

[a] The high end of the current cost range the subproject was increased to reflect the completion of PEI1/anticipated completion of REI2 subprojects and returning the underruns to the project contingency. The contingency will be used/made available to address existing scope as performance baselines are established. Until a performance baseline for all scope elements of the project is achieved, the project will maintain the top end of the range established at CD-1.

**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 | 713,273 | 614,949 | N/A |
| Construction | | | N/A |
| Site Work | | | N/A |
| Equipment | | | N/A |
| Contingency | | | N/A |
| Total, Construction | 1,580.202 | 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** | 2,293,475 | 2,272,642 | N/A |
| *Contingency, TEC* | *115,870* | *145,855* | N/A |
| Other Project Cost (OPC) | | | N/A |
| OPC D&D | | | N/A |
| OPC D&D | 54,000 | 54,000 | N/A |
| OPC except D&D | 532,120 | 550,588 | N/A |
| **Total, OPC** | **592,755** | **604,588** | N/A |
| *Contingency, OPC* | *41,299* | *95,419* | N/A |
| **Total Project Cost** | 2,886,230 | **2,877,230** | N/A |
| ***Total Contingency (TEC+OPC)*** | ***157,169*** | ***241,274*** | N/A |

**5. Schedule of Appropriations Requests**

(Dollars in Thousands)

| Request Year | Type | Prior Years | FY2020 | FY2021 | FY2022 | FY2023 | FY 2024 | FY 2025 | FY2026 | 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 | 0 | 0 | 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 | 0 | 2,537,709 |
| | TEC | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| Request Year | Type | Prior Years | FY2020 | FY2021 | FY2022 | FY2023 | FY 2024 | FY 2025 | FY2026 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FY 2020 | 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 |
| | OPC | N/A | N/A | N/A | N/A | N/A | N/A | | N/A | N/A | N/A |
| | TPC | 1,702,059 | 168,444 | 169,427 | 238,123 | 113,655 | 275,841 | 198,477 | 11,204 | 0 | 2,877,230 |
| FY 2022 | TEC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | N/A | N/A |
| | OPC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | N/A | N/A |
| | TPC | 1,712,983 | 168,444 | 169,427 | 138,123 | TBD | TBD | TBD | TBD | 697,253 | 2,886,230 |

**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 |

| Gross Square Footage Created/Eliminated | REI1<br>Square Feet | REI2/PEI1<br>Square Feet | PEI2<br>Square Feet |
|---|---|---|---|
| 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 was executed via LANL-issued final design, and the construction was 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 2022 Stockpile Stewardship and Management Plan. The Program Direction subprogram provides salaries, travel, and other related expenses in support of 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. STA will continue to balance and prioritize customer requests against 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 2022 Budget Request of $330,764,000 is 5.1% percent below the FY 2021 Enacted Level. The FY 2021 budget included one- time costs for a replacement aircraft. The FY 2022 Request supports modernizing and sustaining STA transportation assets, including life extension of the Safeguards Transporter (SGT) until replaced by Mobile Guardian Transporter (MGT), First Production Unit planned in FY 2026, replacement of vehicles and tractors, sustainment of the infrastructure and command and control system platforms, and minor construction projects. The Program Direction budget provides for 574 federal FTEs and supports STA's focus on recruiting, stabilizing, training, and retaining the Federal Agent workforce to include federal pilots, emergency management, security and safety programs, and other key elements of the STA mission. The STA budget funds 11 support service contracts to include approximately 368 personnel assisting in a number of areas to include aviation, administration, information technology, facility maintenance, intelligence, and engineering. The Federal Agent workforce was impacted by the inability to hire Federal Agents and cancellation of planned Nuclear Materials Courier Basic (NMCB) classes in FY 2020 and FY 2021 due to COVID-19. Therefore, the projected FTEs on-board at the end of FY 2022 was reduced from 590 to 574. STA plans to grow its Federal Agent workforce by increasing the number of students in future NMCB courses.

## Secure Transportation Asset
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Secure Transportation Asset** | | | | | |
| Operations and Equipment | 185,000 | 225,000 | 213,704 | -11,296 | -5.0% |
| Program Direction | 107,660 | 123,684 | 117,060 | -6,624 | -5.4% |
| **Total, Secure Transportation Asset** | **292,660** | **348,684** | **330,764** | **-17,920** | **-5.1%** |
| **Federal FTEs** | **590** | **552** | **574** | **+22** | **+4.0%** |

## Secure Transportation Asset
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Secure Transportation Asset** | | | | | |
| Operations and Equipment | | | | | |
| Mission Capacity | 55,168 | 87,187 | 59,188 | -27,999 | -32.1% |
| Security/Safety Capability | 23,760 | 23,135 | 24,502 | +1,367 | +5.9% |
| Infrastructure and C5 Systems | 34,295 | 32,942 | 30,286 | -2,656 | -8.1% |
| Program Management | 9,623 | 8,247 | 11,395 | +3,148 | +38.2% |
| Mobile Guardian Transporter | 62,154 | 73,489 | 88,333 | +14,844 | +20.2% |
| **Total Operations and Equipment** | **185,000** | **225,000** | **213,704** | **-11,296** | **-5.0%** |
| **Program Direction** | | | | | |
| Salaries and Benefits | 86,803 | 100,605 | 91,942 | -8,663 | -8.6% |
| Travel | 6,912 | 6,807 | 6,618 | -189 | -2.8% |
| Other Related Expenses | 13,945 | 16,272 | 18,500 | +2,228 | +13.7% |
| **Total, Program Direction** | **107,660** | **123,684** | **117,060** | **-6,624** | **-5.4%** |
| **Total, Secure Transportation Asset** | **292,660** | **348,684** | **330,764** | **-17,920** | **-5.1%** |
| **Federal FTEs - Program Direction Funded** | **590** | **552** | **574** | **+22** | **+4.0%** |

**Secure Transportation Asset**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Secure Transportation Asset (STA)** | |
| **Operations and Equipment:** The decrease results from one-time FY 2021 costs associated with the aircraft procurement, and completion of the Baseline Design Review, timeline, and testing results of Test Article 1 (TA1) for the MGT. FY 2022 funding supports delivery of the Pre-Production Unit Rolling Chassis, completion of TA2 Assembly, and start of the PPU Assembly. | **-11,296** |
| **Program Direction:** The FY 2021 budget included higher than normal workers' compensation costs due to a non-mission vehicle accident in FY 2018 and re-baselined requirements through the FYNSP for fully burdened salaries. The FY 2022 budget provides salaries and benefits, travel, and other related expenses for Federal Agents and the secure transportation workforce (574 FTEs). The Federal Agent workforce was impacted by the inability to hire Federal Agents and cancellation of planned NMCB classes in FY 2020 and FY 2021 due to COVID-19. Therefore, the projected FTEs on-board at the end of FY 2022 was reduced from 590 to 574. STA plans to grow its Federal Agent workforce by increasing the number of students in future NMCB courses. | **-6,624** |
| **Total, Secure Transportation Asset** | **-17,920** |

**Secure Transportation Asset**
**Operations and Equipment**

**Description**

The Operations and Equipment (O&E) subprogram includes providing unit training to Federal Agents (FAs), specialized vehicles (such as highly secure trailers), and robust communications systems. Within the STA O&E subprogram, six 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 - NMCB training to increase the FA workforce, develops and implements new fleet technologies, executes agent sustainment training, implements Security, Safety, and Emergency Response programs, and provides uniforms or allowances for uniforms, 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 to ensure availability and reliability for mission operations.
- 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 the Mission Management System, a secure unclassified to classified controlled interface. 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 activity includes:

- Corporate functions such as technical document support and business processes that control, assist, and direct secure transport operations (includes supplies, equipment, and regulation control procedures).
- Assess, evaluate, and improve work functions and processes including self-assessments, STA's configuration management web-based system, 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

**Highlights of the FY 2022 Budget Request**

The FY 2022 Request includes the development, design, production, and maintenance of specialized mission vehicles, tractors, trailers, and escort vehicles, trained FAs, and robust communications systems.

**FY 2022 funding specifically supports:**

- The MGT funding profile supports the delivery of the Pre-Production Unit Rolling Chassis, completion of TA2 Assembly, start of the PPU Assembly, and the delivery of the First Production Unit (FPU) in FY 2026.
- Production of the Next Generation Armored Tractor (T4) and Escort Vehicle (EV4) as a replacement for the current armored tractor and escort vehicle.
- 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.
- Maintenance of existing facilities required by DOE Order 430.1C and minor construction projects of new facilities.
- Steady state replacement of vehicles and tractors.

- Maintaining and sustaining staffing levels, travel, workers' compensation, Energy Information Technology Services/DOE Common Operating Environment (EITS/DOECOE) fees, and professional development training and support service contracts.

**FY 2020 Accomplishments**

- Completed over 108 weapon/special nuclear materials shipments and made over 62 limited-life component deliveries without incident.
- Modernized server infrastructure to enhance reliability and availability of mission support communications by developing an integrated domain awareness capability that supports pre-mission planning, mission execution, and post-mission analysis functions.
- Executed vehicle sustainment efforts to remove mission vehicles that reached the end-of-service life.
- Developed an Integrated Master Schedule for MGT development to include the System Integrator (SI), Design Agency (DA), and Production Agency (PA); completed Test Article 1 (TA1) Side Crash Test, and accepted delivery of Test Article 2 (TA2) chassis.
- Completed running track and replaced Heating Ventilation Air Conditioning system at Agent Operations Central Command.
- Awarded contract for the build of Agent Operations Western Command to replace the temporary structure.

**Operations and Equipment**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Operations and Equipment $225,000,000** | **Operations and Equipment $213,704,000** | **Operations and Equipment -$11,296,000** |
| **Mission Capacity $87,187,000** | **Mission Capacity $59,188,000** | **Mission Capacity -$27,999,000** |
| • Refurbish 6 Escort Vehicle Light Chassis vehicles.<br>• Begin redesign of the Tractor Control Unit (TCU).<br>• Supports risk reduction initiatives for sustainment of the SGT until MGT is fully integrated into mission operations. Includes Air Stream development work to customize and qualify designs for legacy and future systems.<br>• Procurement of a B-747 aircraft to replace the DC-9. | • Design and begin production of three next generation T4 and eight EV4 vehicles.<br>• Vehicle sustainment efforts to continue redesign of the TCU.<br>• Supports risk reduction initiatives for sustainment of the SGT until MGT is fully integrated into mission operations. | • Decrease reflects the one-time FY 2021 costs associated with the aircraft procurement, partially off-set by an increase for design and initial production of three next generation T4 and eight EV4 vehicles. |
| **Security/Safety Capability $23,135,000** | **Security/Safety Capability $24,502,000** | **Security/Safety Capability +$1,367,000** |
| • Conduct two NMCB classes.<br>• Conduct an Operational Readiness Training (ORT) and Validation Force on Force (VFoF) exercise.<br>• Conduct Security Site Survey and Staff Assistance Visits.<br>• Continue National Incident Management System/Incident Command System training program for FAs and staff. | • Conduct three NMCB classes.<br>• Conduct an ORT and VFoF exercise.<br>• Conduct annual Security Site Survey and Staff Assistance Visits.<br>• Conduct the National Incident Management System/Incident Command System training program for FAs and staff. | • Additional Sustainment Training and inflation applied to essential support contracts.<br>• COVID-19 impacts reduced training support requirements in FY 2021 due to cancellation of NMCB course. |
| **Infrastructure and C5 Systems $32,942,000** | **Infrastructure and C5 Systems $30,286,000** | **Infrastructure and C5 Systems -$2,656,000** |
| • Conduct maintenance and minor construction projects at the FA commands, training facility, and STA HQs to include a new shipping and receiving facility and running track at Agent Operations Eastern Command and Vehicle Maintenance Facility at Agent Operations Western Command.<br>• Continue implementation and maintenance of applications and systems that interconnect communications with STA vehicles and the TECC. | • Conduct maintenance and minor construction projects at the FA commands, training facility, and STA HQs to include new classrooms at the Training facility in Arkansas.<br>• Continue implementation and maintenance of applications and systems that interconnect communications with STA vehicles and the TECC.<br>• Support advanced cyber threat intelligence capabilities and integrate awareness into mission operations. | • Decrease reflects the completion of planned construction projects.<br>• One-time costs in FY 2021 to support the transition of the Information Technology support service contract. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Support advanced cyber threat intelligence capabilities and integrate awareness into mission operations. | | |
| **Program Management $8,247,000** | **Program Management $11,395,000** | **Program Management +$3,148,000** |
| • Execute program with approximately 25 full-time support service contractors that provide acquisitions and program support.<br>• Conduct Quality Assurance assessments.<br>• Continue 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 574 federal full-time staff.<br>• Conduct Quality Assurance assessments.<br>• Continue corporate business services and integration activities. | • Basic option year increases for service support contracts and inflation.<br>• Contractor support as a result of increased operations post COVID-19. |
| **Mobile Guardian Transporter $73,489,000** | **Mobile Guardian Transporter $88,333,000** | **Mobile Guardian Transporter +$14,844,000** |
| • Begin build of the qualification and production testers.<br>• Release product specifications to the production agency.<br>• Perform Test Article 2 Phase 1 Qualification Tests. | • Delivery of Pre-Production Unit Rolling Chassis.<br>• Complete Test Article 2 assembly.<br>• Pre-Production Unit assembly. | • Increased work and resources required to support delivery of the Pre-Production Unit Rolling Chassis, complete assembly of Test Article 2, and begin assembly of the Pre-Production Unit. |

## 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) supports 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 plans to reach its goal of 370 FAs by the end of FY 2023 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. 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 military installations and other facilities, 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 maintains the HRP for FAs and designated staff, provides for EITS/DOECOE services, and other contractual service requirements, to include facility maintenance.

**Highlights of the FY 2022 Budget Request**

The FY 2022 Program Direction Budget Request supports FA and staff FTEs for STA mission priorities. This includes:

- Support for 574 FTEs (accounts for vacancies).
- Travel to support mission and training requirements.
- Energy Information Technology Services/DOE Common Operating Environment (EITS/DOECOE) Fees.
- Professional development training.
- Funding for support service contracts.

**FY 2020 Accomplishments**

- On-boarded 46 FAs.
- Continued to support mission operations to include mission travel through COVID-19 pandemic.

**Program Direction**
**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Program Direction $123,684,000** | **Program Direction $117,060,000** | **Program Direction -$6,624,000** |
| **Salaries and Benefits $100,605,000** | **Salaries and Benefits $91,942,000** | **Salaries and Benefits -$8,663,000** |
| • Recruit, hire, and retain quality personnel based on current and future mission needs.<br>• Continue to fill agent vacancies to support workload requirements.<br>• Increase Workers' Compensation costs due to non-mission accident (2018).<br>• Conduct two NMCB classes. STA plans to increase class size in future NMCB courses to meet FA workforce target. | • Recruit, hire, and retain quality personnel based on current and future mission needs.<br>• Fill FA and staff vacancies to support workload requirements.<br>• Workers' Compensation costs due to non-mission accident (2018).<br>• Conduct three NMCB classes. | • FY 2021 included higher than normal workers' compensation costs to support non-mission accident in 2018. The cost decreases in FY 2022 and should return to normal levels in FY 2023.<br>• Reflects the use of carryover as a result of cancelled NMCB classes in FY 2020 and FY 2021 due to COVID-19. |
| **Travel $6,807,000** | **Travel $6,618,000** | **Travel -$189,000** |
| • Travel required to transport nuclear weapons, components, and special nuclear material.<br>• Funding to support travel to facilities that provide unique training to maintain agent skill sets.<br>• Support charter plane service (unavailability of STA aircraft due to maintenance and/or other mission support). | • Travel required to transport nuclear weapons, components, and special nuclear material.<br>• Funding to support travel to facilities that provide unique training to maintain agent skill sets. | • Reflects the use of carryover to fund charter plane support required when STA aircraft is not available to meet requirements. |
| **Other Related Expenses $16,272,000** | **Other Related Expenses $18,500,000** | **Other Related Expenses +$2,228,000** |
| • Continue medical evaluations of individuals assigned to HRP duties and medical training for STA FA medics.<br>• Support NMCB candidate training at the Federal Law Enforcement Training Center.<br>• Support processing of security clearances.<br>• Support EITS/DOECOE costs. | • Continuous medical evaluations of individuals assigned to HRP duties and additional medical training for STA FA medics.<br>• Support NMCB candidate training at the Federal Law Enforcement Training Center.<br>• Support for mandatory ethics/integrity training for new STA employees.<br>• Support processing of security clearances.<br>• Support EITS/DOECOE costs.<br>• Support service contracts for facility maintenance at multiple STA sites in Albuquerque and Arkansas. | • Additional medical training courses for FA medics and mandatory ethics/integrity training for new employees.<br>• Support service contracts for facility maintenance costs for additional space requirements at Agent Operations Western Command in Albuquerque and the Training Command in Arkansas. |

## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | 7,130 | 2,362 | 45,083 | 7,225 | -37,858 |
| Minor Construction | N/A | 5,566 | 17,651 | 24,350 | 18,500 | -5,850 |
| **Total, Capital Operating Expenses** | **N/A** | **12,696** | **20,013** | **69,433** | **25,725** | **-43,708** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | 7,130 | 2,362 | 7,083 | 7,225 | +142 |
| Aircraft | 38,000 | 0 | 0 | 38,000 | 0 | -38,000 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **7,130** | **2,362** | **45,083** | **7,225** | **-37,858** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | 5,566 | 4,494 | 12,350 | 3,500 | -8,850 |
| Agents Operation Western Command Facility | 13,157 | 0 | 13,157 | 0 | 0 | 0 |
| Vehicle Maintenance Facility – Agent Operation Western Command VMF | 12,000 | 0 | 0 | 12,000 | 0 | -12,000 |
| Vehicle Maintenance Facility – Agent Operations Central Command VMF | 15,000 | 0 | 0 | 0 | 15,000 | +15,000 |
| **Total, Minor Construction Projects** | **N/A** | **5,566** | **17,651** | **24,350** | **18,500** | **-5,850** |
| **Total, Capital Summary** | **N/A** | **12,696** | **20,013** | **69,433** | **25,725** | **-43,708** |

## 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 1,800 Protective Force officers, DNS secures more than 5,000 buildings and protects more than 62,000 personnel.

## Defense Nuclear Security
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Defense Nuclear Security** | | | | | |
| **Operations and Maintenance** | | | | | |
| Protective Forces | 392,617 | 410,770 | 455,445 | +44,675 | +10.9% |
| Physical Security Systems | 149,138 | 127,035 | 125,934 | -1,101 | -0.9% |
| Information Security | 44,261 | 51,860 | 56,293 | +4,433 | +8.5% |
| Personnel Security | 39,988 | 45,790 | 52,806 | +7,016 | +15.3% |
| Material Control and Accountability | 30,865 | 31,690 | 41,534 | +9,844 | +31.1% |
| Security Program Operations and Planning | 93,131 | 95,933 | 92,611 | -3,322 | -3.5% |
| **Total, Operations and Maintenance** | **750,000** | **763,078** | **824,623** | **+61,545** | **+8.1%** |
| Construction | 25,000 | 26,000 | 23,000 | -3,000 | -11.5% |
| **Total, Defense Nuclear Security** | **775,000** | **789,078** | **847,623** | **+58,545** | **+7.4%** |

**Defense Nuclear Security**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Defense Nuclear Security** | |
| **Operations and Maintenance:** The increases are based on additional security needs associated with growth across the NNSA NSE, including Plutonium Pit Production efforts and efforts to implement additional security requirements resulting from completed Design Basis Threat (DBT) analysis. In addition, increase reflects support for highest priority Caerus milestones. | **+61,545** |
| **Construction**: This decrease reflects use of carryover funding to cover FY 2022 requirements for 17-D-710, the West End Protected Area Reduction (WEPAR) project, which will reduce the size of the Protected Area while integrating with the Uranium Processing Facility (UPF). | **-3,000** |
| **Total, Defense Nuclear Security** | **+58,545** |

**Defense Nuclear Security**
**Budget Request Highlights and Future Milestones**

**Highlights of the FY 2022 Budget Request**

The FY 2022 Budget Request of $847,623,000 reflects an increase of $58,545,000, or 7.4% above the FY 2021 Enacted amount. The Budget Request includes funding to fill positions in key security program areas required to implement a risk-based, layered protection strategy at the sites. These areas include protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning. The Budget Request supports increased security needs associated with known mission growth in Weapons Programs across the NSE, including Pit Production at Los Alamos National Laboratory (LANL) and Kansas City expansion efforts; supports beginning efforts to replace the aging Argus system with a modern security system, Caerus; and begins efforts to implement additional security requirements resulting from completed DBT analysis. This Request also includes funding for continued efforts to recapitalize security infrastructure through critical SIRP projects, which address high-priority security systems and related security infrastructure and equipment refresh needs, as well as funding for the WEPAR project, which will install a new Perimeter Intrusion Detection and Assessment System (PIDAS) section, reducing the Y-12 National Security Complex (Y-12) Protected Area by approximately 50%.

**FY 2020 Accomplishments**

- Completed the Device Assembly Facility Argus Installation Project at the NNSS ahead of schedule and under budget.
- Launched the fully developed Center for Security Technology, Analysis, Response, and Testing (CSTART) portal designed to better integrate the security community.
- Completed Interagency Acquisition to standardize the long gun (M27 Infantry Automatic Rifle) across the NNSA NSE.
- Reduced the personnel security clearance inventory by over 75%, from more than 5,000 clearance actions down to a daily average of approximately 1,300 clearance actions in less than 6 months; this was accomplished while implementing 100% telework operations due to the COVID-19 pandemic.
- Implemented the Uncleared HSPD-12 Program for all NNSA sites with 1,921 Personal Identity Verifications for Uncleared Contractors (UPIVs) granted since September 3, 2019.
- Developed a DBT Implementation Strategy that captures action items, risk acceptance, and site recommendations on risk acceptance/mitigation.
- Created a risk management framework strategy for mitigating and managing NNSA security risks.
- Ensured security operations could support all NNSA requirements during the COVID-19 pandemic through a myriad of contracting, policy and logistical modifications.

**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 contractor partner 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 NNSA sites.

*Physical Security Systems* includes critical SIRP projects, counter unmanned aircraft systems (CUAS), intrusion detection and assessment systems, 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 Physical Security Center of Excellence (PSCOE) at Sandia National Laboratories (SNL), New Mexico, the centrally managed Argus Program, and the effort to replace the aging centrally managed Argus system at sites possessing Category I quantities of special nuclear material (SNM) with Caerus, a modern security system.

Table 1 shows the plans for critical SIRP projects to be executed in FY 2022. Other than PIDAS vehicle barrier upgrades, SIRP projects do not qualify as minor construction. Rather, SIRP projects include sensor, camera, lighting, 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.

**Planned FY 2022 SIRP Project Allocations by Site**
**(Dollars in Millions)**

| Site | Project Name | FY 2022 Allocation ($M) |
|---|---|---|
| Y-12 | Portal 8 Booths: replacement of existing booths with NNSA standard Positive Personnel Identification and Verification (PPIV) booths | 5.9 |
| | Vehicle Barrier Upgrade: replaces current cable barrier | 4.4 |
| Pantex | Zone 12 Material Access Area (MAA) Booths: replacement of existing booths with NNSA standard PPIV booths | 4.3 |
| **Total, FY 2022** | | **14.6** |

*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 visits and assignments. It encompasses the administrative support for the site clearance process, including security clearance determinations at each site.

*Material Control and Accountability* controls and accounts for special and alternative nuclear materials through measurements, quality assurance, accounting, containment, surveillance, and physical inventory. This activity also includes 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.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Operations and Maintenance $763,078,000** | **Operations and Maintenance $824,623,000** | **Operations and Maintenance +$61,545,000** |
| **Protective Forces $410,770,000** | **Protective Forces $455,445,000** | **Protective Forces +$44,675,000** |
| • Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments.<br>• Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner.<br>• Supports Pit Production at LANL. | • Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments.<br>• Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner. | • Reflects escalation and increases associated with mission growth across NNSA's NSE, including Pit Production support. |
| **Physical Security Systems $127,035,000** | **Physical Security Systems $125,934,000** | **Physical Security Systems -$1,101,000** |
| • Funds preventive and corrective maintenance for physical security systems and infrastructure at NNSA sites, and provides protection against threats.<br>• Includes funding for PSCOE activities at SNL.<br>• Sustains CUAS operation at sites possessing Category 0/I quantities of SNM.<br>• Supports critical SIRP projects included in 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 threats.<br>• Includes funding for highest priority PSCOE activities at SNL.<br>• Sustains CUAS operation at sites possessing Category 0/I quantities of SNM.<br>• Supports critical SIRP projects included in the 10-Year Refresh Plan at all NNSA sites.<br>• Supports highest priority Caerus milestones. | • Decrease reflects reprioritization to ensure support for highest priority mission growth across NNSA's NSE, including Pit Production. |
| **Information Security $51,860,000** | **Information Security $56,293,000** | **Information Security +$4,433,000** |
| • Maintains an information protection program and sustains implementation of DOE Order 470.6, *Technical Security Program*.<br>• Supports Pit Production at LANL. | • Maintains an information protection program and sustains implementation of DOE Order 470.6, *Technical Security Program.*<br>• Supports Pit Production at LANL. | • Reflects escalation and increases associated with growth across NNSA's NSE, including Pit Production support. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Personnel Security $45,790,000** | **Personnel Security $52,806,000** | **Personnel Security +$7,016,000** |
| • Maintains a personnel security program while implementing efficiencies in a risk-based manner.<br>• Supports Pit Production at LANL. | • Maintains a personnel security program while implementing efficiencies in a risk-based manner.<br>• Supports Pit Production at LANL. | • Reflects escalation and increases associated with growth across NNSA's NSE, including Pit Production support. |
| **Material Control and Accountability $31,690,000** | **Material Control and Accountability $41,534,000** | **Material Control and Accountability +$9,844,000** |
| • Provides for control and accountability of special and alternative nuclear materials and maintained a level of effort that was a critical part of NNSA's layered protection program.<br>• Sustains LANMAS software upgrade.<br>• Supports Pit Production at LANL. | • 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.<br>• Sustains LANMAS software upgrade.<br>• Supports Pit Production at LANL. | • Reflects escalation and increases associated with growth across NNSA's NSE, including Pit Production support.<br>• Increase in funding is attributed to transition of DNS managed Material Control and Accountability (MC&A) scope, including LANMAS software license, which was previously accounted for under Security Program Operations and Planning. |
| **Security Program Operations and Planning $95,933,000** | **Security Program Operations and Planning $92,611,000** | **Security Program Operations and Planning -$3,322,000** |
| • Maintains Site Security Plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs.<br>• Includes funding for the CSTART effort.<br>• Supports Pit Production at LANL. | • Maintains Site Security Plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs.<br>• Includes funding for highest priority CSTART efforts.<br>• Supports Pit Production at LANL. | • Decrease in funding is primarily attributed to the transfer in operations of the classified network that supports NNSA SAPs to the Information Technology and Cybersecurity Program and a reduction to CSTART effort.<br>• Provides escalation and increases associated with growth across NNSA's NSE, including Pit Production support. |

**Description**

DNS Construction supports critical physical security infrastructure within the NNSA NSE. Funding for 17-D-710, WEPAR, or Protected Area Reduction Project at Y-12, was appropriated in FY 2017 ($2,500,000), 2018 ($53,600,000), 2020 ($25,000,000), and 2021 ($26,000,000). This project will install a new PIDAS section to reduce the Y-12 Protected Area by approximately 50%. CD-2/3, Approve Performance Baseline & Start of Construction was approved in January 2021. FY 2022 funding will be used for construction.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Construction $26,000,000** | **Construction $23,000,000** | **Construction -$3,000,000** |
| • Began WEPAR construction. | • WEPAR construction continues. | • Decrease due to use of carryover balances to address FY 2022 funding requirements. |

## Defense Nuclear Security
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 2,186 | 2,232 | 2,234 | +2 |
| Minor Construction | N/A | N/A | 4,400 | 0 | 4,410 | +4,410 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **6,586** | **2,232** | **6,644** | **+4,412** |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 2,186 | 2,232 | 2,234 | +2 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **2,186** | **2,232** | **2,234** | **+2** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 0 | 0 | 0 | +0 |
| Y12 PIDAS Vehicle Barriers | 9,160 | 350 | 4,400 | 0 | 4,410 | +4,410 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **4,400** | **0** | **4,410** | **+4,410** |
| **Total, Capital Summary** | **N/A** | **N/A** | **6,586** | **2,232** | **6,644** | **+4,412** |

## Defense Nuclear Security
## Construction Projects Summary

(Dollars in Thousands)

| | Total | Prior Years[a] | FY 2020 Enacted | FY 2020 Actuals | FY 2021 Actuals | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted |
|---|---|---|---|---|---|---|---|
| **17-D-710, West End Protected Area Reduction (WEPAR), Y-12** | | | | | | | |
| Total Estimated Cost (TEC) | 150,028 | 56,100 | 25,000 | 25,000 | 26,000 | 22,278 | -3,722 |
| Other Project Cost (OPC) | 9,822 | 6,100 | 0 | 0 | 0 | 722 | +722 |
| **Total Project Cost, 17-D-710, West End Protected Area Reduction (WEPAR), Y-12** | 159,850 | 62,200 | 25,000 | 25,000 | 26,000 | 23,000 | -3,000 |
| **Total All Construction Projects** | | | | | | | |
| Total Estimated Cost (TEC) | 150,028 | 56,100 | 25,000 | 25,000 | 26,000 | 22,278 | -3,722 |
| Other Project Cost (OPC) | 9,822 | 6,100 | 0 | 0 | 0 | 722 | +722 |
| **Total Project Cost (TPC) All Construction Projects** | **159,850** | **62,200** | **25,000** | **25,000** | **26,000** | **23,000** | **-3,000** |

[a] Prior Year OPCs have been updated from the FY 2021 congressional justification to reflect actuals.

## Defense Nuclear Security
## Other Information

### Full Cost Recovery Estimates

The FY 2022 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Site** | | | | | |
| Kansas City National Security Campus | 629 | 715 | 883 | +168 | 23.5% |
| Lawrence Livermore National Laboratory | 9,200 | 9,200 | 10,000 | 800 | 8.7% |
| Los Alamos National Laboratory | 5,200 | 5,414 | 4,814 | - 600 | -11.1% |
| NNSA Production Office | 2,574 | 2,366 | 4,759 | +2,393 | 101.1% |
| Sandia National Laboratories | 22,571 | 21,700 | 21,249 | - 451 | -2.1% |
| **Total** | **40,174** | **39,395** | **41,705** | **+2,310** | **5.9%** |

**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 2022 Request for the West End Protected Area Reduction (WEPAR) Project is $23,000K. The current Total Project Cost (TPC) is $159.85M, approved at Critical Decision-2/3 (CD-2/3) on January 11, 2021, with CD-4 planned for July FY 2025.

**Significant Changes:** This Construction Project Data Sheet (CPDS) is an update of the FY 2021 CPDS and does not include a new start. The most recent DOE Order 413.3B Critical Decision (CD) was CD-2/3, Approve Performance Baseline and Start of Construction, approved on January 11, 2021, with a cost of $159.85M and a CD-4 approval of July 2025. The CD-2/3 WEPAR TPC is based on final design and construction bids. Project cost and schedule contingency is based on risks associated with interfaces with other Y-12 construction projects and concurrent Y-12 operations. The Total Project Cost was validated with an Independent Cost Estimate completed prior to CD-2/3.

A Federal Project Director has been assigned to this project.

FY 2022 funding will be used for construction.

**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 |
| FY 2022 PB | 9/9/2017 | 7/25/2018 | 12/14/2018 | 1/11/2021 | 1/11/2021 | 1/11/2021 | N/A | 7/31/2025 |

**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
**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 |
| FY 2022 | $12,710 | $137,318 | $150,028 | $9,822 | N/A | $9,822 | $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.

**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 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.

| Performance Measure | Threshold |
|---|---|
| Provide a new PIDAS boundary | Detection and assessment capability as required by DOE O 473.3A |
| Provide a new entry control point | Control point will provide access control and entry/exit inspection as required by DOE O 473.3A |
| Install annunciator agnostic communications that is compatible with current system | Satisfactory completes Assessment, Verification, Cut Over (Testing compliant with DOE O 473.3A |
| Secure storage in Buildings 9720-25, 9720-33, 9811-1 and 9720-59 | Buildings meet DOE O 473.3A requirements |

**3. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Total Estimated Cost (TEC) | | | |
| Design | | | |
| FY 2017 | 2,500 | 2,500 | 0 |
| FY 2018 | 10,210 | 10,210[a] | 0 |
| FY 2019 | 0 | 0 | 3,462 |
| FY 2020 | 0 | 0 | 7,305 |
| FY 2021 | 0 | 0 | 1,943 |
| Total Design | 12,710 | 12,710 | 12,710 |

[a] Adjusted prior year to reflect actual design cost.

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| Construction | | | |
| FY 2017 | 0 | 0 | 0 |
| FY 2018 | 43,390 | 43,390 | 0 |
| FY 2019 | 0 | 0 | 0 |
| FY 2020 | 25,000 | 25,000 | 0 |
| FY 2021 | 26,000 | 26,000 | 54,857 |
| FY 2022 | 23,000 | 23,000 | 54,197 |
| Outyears | 19,928 | 19,928 | 28,264 |
| Total Construction | 137,318 | 137,318 | 137,318 |
| 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 | 7,305 |
| FY 2021 | 26,000 | 26,000 | 56,800 |
| FY 2022 | 23,000 | 23,000 | 54,197 |
| Outyears | 19,928 | 19,928 | 28,264 |
| Total TEC | 150,028 | 150,028 | 150,028 |
| Other Project Costs | | | |
| FY 2017 | 6,100 | 6,100 | 0 |
| FY 2018 | 0 | 0 | 1,743 |
| FY 2019 | 0 | 0 | 915 |
| FY 2020 | 0 | 0 | 814 |
| FY 2021 | 0 | 0 | 875 |
| FY 2022 | 0 | 0 | 258 |
| Outyears | 3,722 | 3,722 | 5,217 |
| Total OPC | 9,822 | 9,822 | 9,822 |
| Total Project Costs (TPC) | | | |
| FY 2017 | 8,600 | 8,600 | 0 |
| FY 2018 | 53,600 | 53,600 | 1,743 |
| FY 2019 | 0 | 0 | 4,377 |
| FY 2020 | 25,000 | 25,000 | 8,119 |
| FY 2021 | 26,000 | 26,000 | 57,675 |
| FY 2022 | 23,000 | 23,000 | 54,455 |
| Outyears | 23,650 | 23,650 | 33,481 |
| **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 | 12,710 | 15,885 | 12,710 |
| Contingency | 0 | 3,655 | 0 |
| Total, Design | 12,710 | 19,540 | 12,710 |
| Construction | | | |
| Site Work | 22,781 | 10,000 | 22,781 |
| Equipment | 7,879 | 30,000 | 7,879 |
| Construction | 71,698 | 71,203 | 71,698 |
| D&D | 2,433 | 1,100 | 2,433 |
| Contingency | 32,527 | 10,967 | 32,527 |
| Total, Construction | 137,318 | 123,270 | 137,318 |
| **Total Estimated Cost** | 150,028 | 142,810 | 150,028 |
| *Contingency, TEC* | 32,527 | 14,622 | 32,527 |
| Other Project Cost (OPC) | | | |
| OPC except D&D | | | |
| Conceptual Planning | 2,189 | 900 | 2,189 |
| Conceptual Design | 532 | 1,200 | 532 |
| Other OPC Costs | 5,681 | 11,940 | 5,681 |
| Contingency | 1,420 | 3,000 | 1,420 |
| **Total, OPC** | 9,822 | 17,040 | 9,822 |
| *Contingency, OPC* | 1,420 | 3,000 | 1,420 |
| **Total Project Cost** | 159,850 | 159,850 | 159,850 |
| ***Total Contingency (TEC+OPC)*** | 33,947 | 17,622 | 33,947 |

**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 | Outyears | 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 |
| FY 2022 | TEC | 56,100 | 25,000 | 26,000 | 23,000 | TBD | TBD | TBD | TBD | 19,928 | 150,028 |
| | OPC | 6,100 | 0 | 0 | 0 | TBD | TBD | TBD | TBD | 3,722 | 9,822 |
| | TPC | 62,200 | 25,000 | 26,000 | 23,000 | TBD | TBD | TBD | TBD | 23,650 | 159,850 |

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy (fiscal quarter or date) | 4Q FY 2025 |
| Expected Useful Life (number of years) | 25 |
| Expected Future Start of D&D of this capital asset (fiscal quarter) | 1Q 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 | 2.1 | 2.1 | 63.9 | 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 (rounded to nearest 1,000) |
|---|---|
| New area being constructed by this project at Y-12 | 5,000 |
| Area of D&D in this project at Y-12 | 1,000 |
| 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 and overall project manager under cost plus incentive fee contract DE-NA0001942 Contract Line Item 0001, while the Sandia M&O contractor's Physical Security Center of Excellence (PSCOE) is the design agent and construction manager through Inter-Entity Work Order 4300156910. 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. 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 manage the M&O performance through the DOE/NNSA Strategic Performance Evaluation and Measurement Plan (PEMP), which sets forth the criteria by which NNSA will evaluate M&O performance and upon which NNSA shall determine the amount of award fee earned.

## Information Technology and Cybersecurity

**Overview**

The NNSA 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 and implementing the President's Executive Order to Improve the Nation's Cybersecurity. The OCIO supports Information Technology (IT) and cybersecurity services and solutions, which include continuous monitoring, cloud-based technologies, and enterprise security technologies (i.e., identity, credential, and access management) to help meet security challenges. The IT and Cybersecurity Program is based on practical principles that provide superior information management support to current operations while implementing unclassified and classified cloud-based technologies and infrastructure to support the Nuclear Security Enterprise (NSE). The program collaborates and coordinates with the DOE Office of the Chief Information Officer (DOE OCIO) on the development and deployment of IT and cybersecurity solutions protecting DOE information and information assets.

The requested funds for the IT and Cybersecurity Program are used to operate cyber infrastructure at NNSA sites, implement departmental policies and procedures, implement Committee on National Security Systems (CNSS) requirements for the classified computing environment, and execute IT services, software, and hardware solutions for both unclassified and classified computing environments. NNSA OCIO FY 2022 priorities support both IT and cybersecurity solutions and activities. These are interconnected, vital initiatives that enable and underpin the DOE/NNSA mission, as every capability in the NSE depends on IT and cybersecurity to keep information and related assets available, securely protected, and well-managed. Together, IT and cybersecurity directly support the DOE/NNSA mission and statutory requirements governing classified data protection and information assurance. The FY 2022 priorities reflect key initiatives where IT and cybersecurity work together to not only enable the NNSA mission but also to serve as the first lines of defense against known adversaries and emerging threats.

The IT and Cybersecurity capability provides infrastructure and protection for both classified and unclassified computing networks, secure communications, applications, systems, and logical environments. It ensures electronic information and information assets are operating efficiently and effectively and are protected from unauthorized access and malicious acts that would adversely affect national and economic security. NNSA OCIO directs the design, development, and maintenance of all aspects of DOE/NNSA computing and provides NNSA staff with the IT resources necessary to achieve mission goals and objectives.

The NNSA IT 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 and cybersecurity 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 the security of sensitive unclassified and classified NNSA data and host shared services. Additionally, the NNSA IT and Cybersecurity Program will create a plan to explore information technology application capabilities, operational technology, machine learning, and artificial intelligence to implement tools and capabilities to secure future NNSA operations.

The IT and Cybersecurity Program establishes goals and objectives to guide the NNSA OCIO in support of the execution of NNSA missions, goals, and objectives. By achieving these goals and objectives, NNSA will improve the 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.

Cybersecurity is not only about mitigating risk, but it is also about keeping up with ever-changing threats and vulnerabilities. To that end, NNSA must maintain a strong and comprehensive program to ensure the protection of NNSA information and information assets. The IT and Cybersecurity Program is designed to provide information management and cybersecurity services and solutions for the NSE to accomplish its mission goals and objectives. These services and solutions include commodity IT, unified communications, collaboration, mission applications, and security tools.

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 IT and Cybersecurity Program with NNSA cultural and business drivers. Risk management, agility, trust, and partnership are the guiding tenets that support NNSA OCIO's defense-in-depth approach to achieving mission effectiveness. These tenets align the people, processes, and technology and lend themselves to the success of the IT and Cybersecurity Program. The OCIO mission is accomplished through the hard work of a highly talented workforce committed to public service. In order to meet current and future workforce needs, NNSA will continually review and analyze position requirements to meet the evolving needs of the NNSA mission. Emphasis will be placed on making NNSA a competitive employer that can recruit, develop, and retain top talent in the IT and cyber workforce.

The OCIO collaborates with other NNSA program elements to manage supply chain risk to the enterprise 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.

NNSA will reduce threats by minimizing attack surfaces and find innovative ways support the mission goals and objectives of the NSE. To ensure mission success, the NNSA IT and Cybersecurity Program is committed to 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.

## Information Technology and Cybersecurity
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Information Technology and Cybersecurity** | | | | | |
| **Cybersecurity** | | | | | |
| Site Infrastructure | 100,000 | 106,151 | 115,178 | +9,027 | +8.5% |
| Enterprise Operations | 114,361 | 145,321 | 182,065 | +36,744 | +25.3% |
| **Subtotal, Cybersecurity** | **214,361** | **251,472** | **297,243** | **+45,771** | **+18.2%** |
| Information Technology | 85,639 | 114,761 | 109,287 | -5,474 | -4.8% |
| **Total, Information Technology and Cybersecurity** | **300,000** | **366,233** | **406,530** | **+40,297** | **+11.0%** |

**Information Technology and Cybersecurity**
**Explanation of Major Changes**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Information Technology and Cybersecurity** | |
| **Cybersecurity:** The increase for Site Infrastructure and Enterprise Operations is in part due to the transfer of responsibility for the Emergency Communications Network (ECN) from the Emergency Operations subprogram within the Nuclear Counterterrorism and Incident Response program (+$21 million) and support for other classified networks (+$14 million). Additional increases reflect funding for remaining requirements for M&O cybersecurity infrastructure, including full scope enhancements to the Enterprise Secure Network (ESN) infrastructure, upgrades for the inherited legacy classified network systems, as well as funding for the cross site-initiatives Enterprise Efficiency Working Group and pilot testing team for advancing cybersecurity protection measures across the enterprise. | **+45,771** |
| **Information Technology:** The decrease in funding reflects the implementation of Phase I requirements for the IT Modernization Project, the development and implementation of services and solutions to provide operational connectivity during COVID-19, the launching of Phase I for the IT infrastructure upgrades working with the DOE CIO and improving application development and implementation with updated tools and technologies. | **-5,474** |
| **Total, Information Technology and Cybersecurity** | **+40,297** |

The NNSA relies on the OCIO's ability to successfully detect, deny, disrupt, and degrade malicious events and activities on our networks and systems.

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 industry best practices and implementation 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 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 DOE. 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. Additionally, Enterprise Operations 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 a 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, public key infrastructure (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 DOE Secret Fabric users to meet the Committee on National Security Systems (CNSS) requirements.

In FY 2020, NNSA OCIO gained responsibility and authority for the information technology and cybersecurity of classified networks. As part of this effort, in FY 2022, NNSA OCIO will work to update, enhance, and improve the network and system infrastructure associated with this activity. This effort will include improved connectivity with Other Governmental Agency (OGA) classified networks, as well as a concept developed for the prioritization and optimization of the systems, applications, and networks that allow for sharing of information between the OGAs and NNSA classified networks. Additionally, the FY 2022 Request includes funding for the operation and modernization of ECN previously funded under Emergency Operations within the Defense Nuclear Nonproliferation Account.

**Highlights of the FY 2022 Budget Request**

- Implement a strong and comprehensive IT and cybersecurity program to support enhanced the NSE mission goals and objectives.
- Protect NSE information and the information assets of sites, employees, and the public.
- Implement orchestration and automation of cybersecurity capabilities to detect, prevent, counter, and respond to emerging cybersecurity threats and vulnerabilities.
- Recapitalize and modernize aging logical infrastructure hardware and software components.
- Continue to update, improve, and execute classified unified communications capabilities.

- Continue the modernization and development of the ESC environments by enhancing the core services and collaborative capabilities and consolidating disparate network infrastructure.
- Create and actualize a plan to utilize IT research and development capabilities, operational technology, machine learning, and artificial intelligence to secure future NNSA operations.
- Engage externally with other government agencies.

**FY 2020 Accomplishments**

- Transferred the responsibility and oversight for information technology and cybersecurity for the Emergency Communication Network (ECN) from the Office of Emergency Operations to OCIO.
- Transferred the responsibility and oversight of a classified network to IT and Cyber from the Office of Defense Nuclear Security to OCIO.
- Completed the Phase I implementation of Classified Infrastructure Improvement Project.
- Implemented Phase I of the IT Modernization Project working closely with the Department and element CIOs and IT Managers.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Cybersecurity $251,472,000** | **Cybersecurity $297,243,000** | **Cybersecurity +$45,771,000** |
| **Site Infrastructure $106,151,000** | **Site Infrastructure $115,178,000** | **Site Infrastructure +$9,027,000** |
| • Funding supports cybersecurity operations of the NNSA sites.<br>• Continues modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats.<br>• Strengthens the M&O cybersecurity operations at each NNSA site along the defense-in-depth approach. | • Continues cybersecurity operations of the NNSA sites.<br>• Continues modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats.<br>• Further strengthens the M&O cybersecurity operations at each NNSA site along the defense-in-depth approach.<br>• Supports the software and hardware enhancements and upgrades to the NNSA Security and Network Operation Center to support NNSA mission operations, to include PU Pit Productions. | • Increases M&O cybersecurity infrastructure remaining requirements for accomplishing full scope as defined by Cybersecurity Site Infrastructure WBS, national standards, departmental requirements, laws, and regulations.<br>• Maintains execution requirements amidst forecasted escalation rate increases at the NNSA sites.<br>• Continues implementation of the classified enhanced infrastructure. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Enterprise Operations $145,321,000** | **Enterprise Operations $182,065,000** | **Enterprise Operations +$36,744,000** |
| • Provides funding for Enterprise Operations and procurement of cybersecurity tools for the protection of the NNSA Cybersecurity Infrastructure.<br>• Reinforces the enterprise network security posture by continuing to address known critical capability gaps at the IARC.<br>• Initiates modern cross-domain solution to replace the last legacy gateways currently in production.<br>• Expands 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.<br>• Bolsters the enterprise network security posture by continuing to address known critical capability gaps at the IARC.<br>• Reinforces modern cross-domain solution to replace the last legacy gateways currently in production.<br>• Expands the application of Digital Rights Management (DRM)/Data Loss Protection (DLP) Technology.<br>• Supports the operation of classified IT services and solutions to support weapons design and development. | • Supports network upgrades and enhancements for classified network infrastructure.<br>• Implementation of Cross Site-Initiatives Enterprise Efficiency Working Group and Pilot Testing Team for Advancing Cybersecurity Protection Measures across Enterprise.<br>• Reflects assumption of funding for operation and modernization of ECN. |

## 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 services and solutions whenever possible to support infrastructure hosting and application development, operations, and maintenance. Commodity Information Technology services include, but are not limited to, application hosting, unified communications, and desktop services to include teleworking capabilities.

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 Enterprise Secure Computing (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 and complexity 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, federal departments, other organizations, and select allied nations. The footprint of the enterprise networks continues 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 IT 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 IT and Cybersecurity Program more effectively manage the information security posture for the agency and maximize investment allocation across multiple program areas.

Unclassified Federal IT 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 IT organizations, contract partners in the labs and field, and associates across the Federal IT community, NNSA has identified an opportunity to push modernization efforts to implement an IT 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 2022 Budget Request**

- Implementing a strong and comprehensive IT and cybersecurity program to support the NSE mission.
- Recapitalizing and modernizing aging logical infrastructure.
- Continuing execution of the IT Modernization strategy, which will incorporate an NNSA managed model that will enable and support new technologies.
- Creating and actualizing a plan to utilize IT research and development capabilities, operational technology, machine learning, and artificial intelligence to secure future NNSA operations.
- Strengthening inherited legacy networks, systems, and applications.
- Engaging externally with other government agencies.
- Implement the NNSA Application Modernization Strategy for both mission and non-mission applications.

- Assume operational control of and responsibility for modernization of the Emergency Communications Network (ECN).
- Implement commodity IT desktop services, enterprise licenses and technology tools to support the NNSA mission goals and objectives.

**FY 2020 Accomplishments**
- Implemented Phase I requirements for the IT Modernization Project.
- Developed and implemented services and solutions to provide operational connectivity during COVID 19.
- Launched Phase I for the IT infrastructure upgrades working with the Department CIO.
- Improved application development and implementation with updated tools and technologies.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Information Technology $114,761,000** | **Information Technology $109,287,000** | **Information Technology -$5,474,000** |
| • Continues 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.<br>• Continues to provide Information Technology technical services, incidental advisory, and assistance services.<br>• Continues to oversee the implementation of hardware and software licensing, maintenance, and refresh.<br>• Continues providing funding support for NNSA field office Information Technology services provisioned by M&O partners.<br>• Continues oversight of the M&O partners' unclassified Information Technology programs.<br>• Continues implementation of the application modernization project.<br>• Continues implementation of Enterprise Voice over Internet Protocol (VoIP) as a service.<br>• Provides oversight of activities related to, and ensure agency compliance with, the provisions of FITARA.<br>• Enables 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.<br>• Continue to provide Information Technology technical services, incidental advisory, and assistance services.<br>• Continue to oversee the implementation of hardware and software licensing, maintenance, and refresh.<br>• Continue providing funding support for NNSA field office Information Technology services provisioned by M&O partners.<br>• Continue oversight of the M&O partners' unclassified Information Technology programs.<br>• Continue implementation of the application modernization project.<br>• Continue implementation of Enterprise VoIP as a service.<br>• Provide oversight of activities related to, and ensure agency compliance with, the provisions of FITARA.<br>• 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. | • The decrease in funding reflects the implementation of Phase I requirements for the IT Modernization Project and the launching of Phase I for the IT infrastructure upgrades. Supports IT related requirements associated with implementing the classified infrastructure modernization effort. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | • Support the enhancement of commodity IT services and solutions to maintain Federal and support service contractor mission operations.<br>• Increase the requirement for software assurance, and supply chain management related to weapons software and hardware design and configuration. | |

## Information Technology and Cybersecurity
## Other Information

### Full Cost Recovery Estimates

The FY 2022 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|
| **Site** | | | | |
| Kansas City National Security Campus | 350 | 600 | 612 | +12 |
| Lawrence Livermore National Laboratory | 2,500 | 2,500 | 2,550 | +50 |
| Los Alamos National Laboratory | 1,200 | 1,300 | 1,326 | +26 |
| Nevada National Security Site | 400 | 400 | 408 | +8 |
| Pantex | 70 | 60 | 61 | +1 |
| Sandia National Laboratories | 5,000 | 600 | 612 | +12 |
| **Total** | **9,520** | **5,460** | **5,569** | **+109** |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Argonne National Laboratory** | | | |
| Tritium and Domestic Uranium Enrichment | 30 | 18 | 40 |
| Production Modernization | 30 | 18 | 40 |
| Assessment Science | 1,500 | 3,750 | 1,964 |
| Advanced Simulation and Computing | 0 | 100 | 0 |
| Academic Programs | 0 | 848 | 0 |
| Stockpile Research, Technology, and Engineering | 1,500 | 4,698 | 1,964 |
| **Total Argonne National Laboratory** | **1,530** | **4,716** | **2,004** |
| **Brookhaven National Laboratory** | | | |
| Safety and Environmental Operations | 427 | 464 | 477 |
| Operating | 427 | 464 | 477 |
| Infrastructure and Operations | 427 | 464 | 477 |
| **Total Brookhaven National Laboratory** | **427** | **464** | **477** |
| **Chicago Operations Office** | | | |
| Academic Programs | 0 | 2,000 | 2,000 |
| Stockpile Research, Technology, and Engineering | 0 | 2,000 | 2,000 |
| **Total Chicago Operations Office** | **0** | **2,000** | **2,000** |
| **Idaho National Laboratory** | | | |
| Stockpile Sustainment | 200 | 200 | 0 |
| Stockpile Management | 200 | 200 | 0 |
| Tritium and Domestic Uranium Enrichment | 2,114 | 1,905 | 3,467 |
| Production Modernization | 2,114 | 1,905 | 3,467 |
| Engineering and Integrated Assessments | 0 | 60 | 0 |
| Stockpile Research, Technology, and Engineering | 0 | 60 | 0 |
| Safety and Environmental Operations | 2,138 | 1,100 | 575 |
| Operating | 2,138 | 1,100 | 575 |
| Infrastructure and Operations | 2,138 | 1,100 | 575 |
| **Total Idaho National Laboratory** | **4,452** | **3,265** | **4,042** |
| **Kansas City National Security Complex (KCNSC)** | | | |
| B61 Life Extension Program | 252,228 | 275,000 | 290,000 |
| W88 Alteration Program | 150,357 | 109,310 | 61,491 |
| W80-4 Life Extension Program | 124,455 | 166,147 | 176,066 |
| W80-4 Alteration-SLCM | 0 | 0 | 200 |
| W87-1 Modification Program | 3,000 | 40,000 | 75,000 |
| W93 Program | 0 | 2,000 | 3,000 |
| Stockpile Major Modernization | 530,040 | 592,457 | 605,757 |
| Stockpile Sustainment | 112,008 | 130,650 | 146,781 |
| Weapons Dismantlement and Disposition | 630 | 712 | 100 |
| Production Operations | 85,487 | 85,849 | 91,013 |
| Stockpile Management | 728,165 | 809,668 | 843,651 |
| Plutonium Modernization | 7,446 | 8,968 | 7,133 |
| Primary Capability Modernization | 7,446 | 8,968 | 7,133 |
| Non-Nuclear Capability Modernization | 3,894 | 32,000 | 66,898 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Production Modernization | 11,340 | 40,968 | 74,031 |
| Engineering and Integrated Assessments | 4,375 | 10,393 | 10,998 |
| Advanced Simulation and Computing | 2,500 | 0 | 3,500 |
| Weapons Technology and Manufacturing Maturation | 15,150 | 27,417 | 26,761 |
| Stockpile Research, Technology, and Engineering | 22,025 | 37,810 | 41,259 |
| Operations of Facilities | 79,099 | 106,850 | 110,000 |
| Safety and Environmental Operations | 0 | 1,600 | 9,014 |
| Maintenance and Repair of Facilities | 24,247 | 28,000 | 30,000 |
| Infrastructure and Safety | 31,199 | 34,898 | 44,993 |
| Capabilities Based Investments | 18,046 | 14,050 | 13,500 |
| Recapitalization | 49,245 | 48,948 | 58,493 |
| Operating | 152,591 | 185,398 | 207,507 |
| Infrastructure and Operations | 152,591 | 185,398 | 207,507 |
| STA Operations and Equipment | 25,893 | 22,490 | 37,597 |
| Secure Transportation Asset | 25,893 | 22,490 | 37,597 |
| Defense Nuclear Security (DNS) | 12,946 | 17,560 | 22,004 |
| Defense Nuclear Security | 12,946 | 17,560 | 22,004 |
| Information Technology and Cyber Security | 26,576 | 26,817 | 8,406 |
| **Total Kansas City National Security Complex (KCNSC)** | **979,536** | **1,140,711** | **1,234,455** |
| **Kansas City Site Office** | | | |
| Information Technology and Cyber Security | 130 | 140 | 145 |
| **Total Kansas City Site Office** | **130** | **140** | **145** |
| **Lawrence Berkeley National Laboratory** | | | |
| Weapons Technology and Manufacturing Maturation | 350 | 0 | 0 |
| Stockpile Research, Technology, and Engineering | 350 | 0 | 0 |
| Information Technology and Cyber Security | 467 | 650 | 530 |
| **Total Lawrence Berkeley National Laboratory** | **817** | **650** | **530** |
| **Lawrence Livermore National Laboratory** | | | |
| B61 Life Extension Program | 2,200 | 695 | 695 |
| W80-4 Life Extension Program | 176,637 | 173,304 | 194,517 |
| W80-4 Alteration-SLCM | 0 | 0 | 2,000 |
| W87-1 Modification Program | 44,000 | 200,000 | 225,000 |
| W93 Program | 0 | 4,000 | 3,000 |
| Stockpile Major Modernization | 222,837 | 377,999 | 425,212 |
| Stockpile Sustainment | 88,554 | 83,839 | 105,672 |
| Weapons Dismantlement and Disposition | 3,900 | 1,472 | 500 |
| Production Operations | 5,955 | 5,819 | 5,476 |
| Stockpile Management | 321,246 | 469,129 | 536,860 |
| Plutonium Modernization | 36,755 | 51,361 | 68,580 |
| High Explosives & Energetics | 8,068 | 14,000 | 16,000 |
| Primary Capability Modernization | 44,823 | 65,361 | 84,580 |
| Secondary Capability Modernization | 3,905 | 4,300 | 9,900 |
| Tritium and Domestic Uranium Enrichment | 37 | 38 | 40 |
| Non-Nuclear Capability Modernization | 0 | 850 | 0 |
| Production Modernization | 48,765 | 70,549 | 94,520 |
| Assessment Science | 147,695 | 208,339 | 210,551 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Engineering and Integrated Assessments | 71,103 | 90,719 | 87,641 |
| Inertial Confinement Fusion | 335,876 | 349,000 | 324,500 |
| Advanced Simulation and Computing | 290,442 | 300,172 | 255,729 |
| Weapons Technology and Manufacturing Maturation | 35,885 | 35,710 | 36,577 |
| Academic Programs | 2,000 | 1,000 | 1,462 |
| Stockpile Research, Technology, and Engineering | 883,001 | 984,940 | 916,460 |
| Operations of Facilities | 75,625 | 80,205 | 80,000 |
| Safety and Environmental Operations | 35,588 | 16,532 | 33,644 |
| Maintenance and Repair of Facilities | 14,770 | 35,483 | 34,000 |
| Infrastructure and Safety | 59,903 | 100,970 | 93,040 |
| Capabilities Based Investments | 17,662 | 33,030 | 26,000 |
| Recapitalization | 77,565 | 134,000 | 119,040 |
| Operating | 203,548 | 266,220 | 266,684 |
| 18-D-620, Exascale Computing Facility Modernization Project, LLNL | 50,000 | 29,200 | 0 |
| Programmatic | 50,000 | 29,200 | 0 |
| 22-D-514 Digital Infrastructure Capability Expansion, LLNL | 0 | 0 | 8,000 |
| 15-D-612, Emergency Operations Center, LLNL | 5,000 | 27,000 | 0 |
| Mission Enabling | 5,000 | 27,000 | 8,000 |
| I&O - Construction | 55,000 | 56,200 | 8,000 |
| Infrastructure and Operations | 258,548 | 322,420 | 274,684 |
| Defense Nuclear Security (DNS) | 67,135 | 69,430 | 71,302 |
| Defense Nuclear Security | 67,135 | 69,430 | 71,302 |
| Information Technology and Cyber Security | 29,679 | 30,687 | 19,089 |
| **Total Lawrence Livermore National Laboratory** | **1,608,374** | **1,947,155** | **1,912,915** |
| | | | |
| **Livermore Site Office** | | | |
| Safety and Environmental Operations | 150 | 0 | 0 |
| Operating | 150 | 0 | 0 |
| Infrastructure and Operations | 150 | 0 | 0 |
| **Total Livermore Site Office** | **150** | **0** | **0** |
| | | | |
| **Los Alamos National Laboratory** | | | |
| B61 Life Extension Program | 73,000 | 59,500 | 52,300 |
| W88 Alteration Program | 32,330 | 31,319 | 26,058 |
| W80-4 Life Extension Program | 24,721 | 67,893 | 33,257 |
| W80-4 Alteration-SLCM | 0 | 0 | 70 |
| W87-1 Modification Program | 3,250 | 15,000 | 17,500 |
| W93 Program | 0 | 18,000 | 28,000 |
| Stockpile Major Modernization | 133,301 | 191,712 | 157,185 |
| Stockpile Sustainment | 153,202 | 176,497 | 214,561 |
| Weapons Dismantlement and Disposition | 7,600 | 1,472 | 500 |
| Production Operations | 47,235 | 45,883 | 46,228 |
| Stockpile Management | 341,338 | 415,564 | 418,474 |
| Los Alamos Plutonium Operations | 286,975 | 580,599 | 639,400 |
| 21-D-512, Plutonium Pit Production Project, LANL | 20,000 | 220,000 | 350,000 |
| Los Alamos Plutonium Modernization | 306,975 | 800,599 | 989,400 |
| Plutonium Modernization | 306,975 | 800,599 | 989,400 |
| High Explosives & Energetics | 0 | 10,800 | 12,800 |
| Primary Capability Modernization | 306,975 | 811,399 | 1,002,200 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Secondary Capability Modernization | 7,598 | 6,764 | 9,925 |
| Tritium and Domestic Uranium Enrichment | 230 | 38 | 40 |
| Production Modernization | 314,803 | 818,201 | 1,012,165 |
| Assessment Science | 198,202 | 275,529 | 254,252 |
| Engineering and Integrated Assessments | 78,719 | 99,973 | 99,983 |
| Inertial Confinement Fusion | 18,781 | 20,000 | 18,062 |
| Advanced Simulation and Computing | 221,300 | 218,792 | 193,413 |
| Weapons Technology and Manufacturing Maturation | 49,802 | 65,298 | 68,347 |
| Stockpile Research, Technology, and Engineering | 566,804 | 679,592 | 634,057 |
| Operations of Facilities | 241,042 | 303,380 | 287,000 |
| Safety and Environmental Operations | 17,065 | 17,784 | 16,474 |
| Maintenance and Repair of Facilities | 82,914 | 150,000 | 150,000 |
| Infrastructure and Safety | 89,993 | 123,581 | 63,622 |
| Capabilities Based Investments | 12,692 | 17,110 | 16,000 |
| Recapitalization | 102,685 | 140,691 | 79,622 |
| Operating | 443,706 | 611,855 | 533,096 |
| 15-D-302, TA-55 Reinvestment Project - Phase 3, LANL | 0 | 29,500 | 27,000 |
| 07-D-220-04, Transuranic Liquid Waste Facility, LANL | 0 | 36,187 | 0 |
| 04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL | 168,444 | 167,127 | 138,123 |
| Chemistry and Metallurgy Research Replacement (CMRR) | 168,444 | 167,127 | 138,123 |
| Programmatic | 168,444 | 232,814 | 165,123 |
| I&O - Construction | 168,444 | 232,814 | 165,123 |
| Infrastructure and Operations | 612,150 | 844,669 | 698,219 |
| Defense Nuclear Security (DNS) | 112,430 | 117,360 | 156,660 |
| Defense Nuclear Security | 112,430 | 117,360 | 156,660 |
| Information Technology and Cyber Security | 19,643 | 20,190 | 18,506 |
| **Total Los Alamos National Laboratory** | **1,967,168** | **2,895,576** | **2,938,081** |
| | | | |
| **Los Alamos Site Office** | | | |
| Information Technology and Cyber Security | 53 | 63 | 60 |
| **Total Los Alamos Site Office** | **53** | **63** | **60** |
| | | | |
| **National Energy Technology Lab** | | | |
| B61 Life Extension Program | 5,130 | 5,700 | 5,000 |
| W76-2 Modification Program | 2,528 | 0 | 0 |
| W88 Alteration Program | 2,218 | 3,526 | 6,921 |
| W80-4 Life Extension Program | 8,196 | 10,000 | 11,000 |
| W80-4 Alteration-SLCM | 0 | 0 | 1,000 |
| W87-1 Modification Program | 2,178 | 5,807 | 2,800 |
| W93 Program | 0 | 0 | 3,600 |
| Stockpile Major Modernization | 20,250 | 25,033 | 30,321 |
| Stockpile Sustainment | 9,178 | 11,755 | 0 |
| Production Operations | 2,065 | 5,325 | 0 |
| Stockpile Management | 31,493 | 42,113 | 30,321 |
| Los Alamos Plutonium Operations | 0 | 2,000 | 2,000 |
| Los Alamos Plutonium Modernization | 0 | 2,000 | 2,000 |
| Plutonium Modernization | 2,322 | 4,000 | 4,000 |
| High Explosives & Energetics | 0 | 0 | 1,600 |
| Primary Capability Modernization | 2,322 | 4,000 | 5,600 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Secondary Capability Modernization | 471 | 1,000 | 1,300 |
| Tritium and Domestic Uranium Enrichment | 2,725 | 1,455 | 4,684 |
| Non-Nuclear Capability Modernization | 0 | 675 | 0 |
| Production Modernization | 5,518 | 7,130 | 11,584 |
| Engineering and Integrated Assessments | 1,269 | 2,213 | 3,656 |
| Weapons Technology and Manufacturing Maturation | 2,024 | 1,157 | 2,603 |
| Stockpile Research, Technology, and Engineering | 3,293 | 3,370 | 6,259 |
| Capabilities Based Investments | 300 | 0 | 0 |
| Recapitalization | 300 | 0 | 0 |
| Operating | 300 | 0 | 0 |
| Infrastructure and Operations | 300 | 0 | 0 |
| **Total National Energy Technology Lab** | **40,604** | **52,613** | **48,164** |
| | | | |
| **Naval Research Laboratory** | | | |
| Assessment Science | 4,600 | 4,100 | 2,600 |
| Inertial Confinement Fusion | 0 | 6,000 | 0 |
| Stockpile Research, Technology, and Engineering | 4,600 | 10,100 | 2,600 |
| **Total Naval Research Laboratory** | **4,600** | **10,100** | **2,600** |
| | | | |
| **Nevada Field Office** | | | |
| Defense Nuclear Security (DNS) | 80,527 | 85,620 | 90,111 |
| Defense Nuclear Security | 80,527 | 85,620 | 90,111 |
| Information Technology and Cyber Security | 1,266 | 1,349 | 1,294 |
| **Total Nevada Field Office** | **81,793** | **86,969** | **91,405** |
| | | | |
| **Nevada National Security Site** | | | |
| B61 Life Extension Program | 500 | 0 | 0 |
| Stockpile Major Modernization | 500 | 0 | 0 |
| Stockpile Sustainment | 300 | 1,896 | 616 |
| Weapons Dismantlement and Disposition | 0 | 48 | 0 |
| Production Operations | 0 | 57 | 0 |
| Stockpile Management | 800 | 2,001 | 616 |
| Plutonium Modernization | 8,858 | 13,600 | 13,200 |
| High Explosives & Energetics | 2,242 | 900 | 2,220 |
| Primary Capability Modernization | 11,100 | 14,500 | 15,420 |
| Tritium and Domestic Uranium Enrichment | 75 | 153 | 0 |
| Production Modernization | 11,175 | 14,653 | 15,420 |
| Assessment Science | 88,225 | 111,646 | 102,793 |
| Engineering and Integrated Assessments | 18,218 | 7,600 | 7,554 |
| Inertial Confinement Fusion | 0 | 4,000 | 4,400 |
| Weapons Technology and Manufacturing Maturation | 0 | 950 | 1,000 |
| Stockpile Research, Technology, and Engineering | 106,443 | 124,196 | 115,747 |
| Operations of Facilities | 102,000 | 102,555 | 103,000 |
| Safety and Environmental Operations | 4,654 | 4,044 | 5,719 |
| Maintenance and Repair of Facilities | 50,050 | 58,000 | 61,000 |
| Infrastructure and Safety | 46,602 | 42,990 | 45,450 |
| Capabilities Based Investments | 7,960 | 11,820 | 11,000 |
| Recapitalization | 54,562 | 54,810 | 56,450 |
| Operating | 211,266 | 219,409 | 226,169 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| 17-D-640, U1a Complex Enhancements Project, NNSS | 35,000 | 152,600 | 130,000 |
| Programmatic | 35,000 | 152,600 | 130,000 |
| 19-D-670, 138kV Power Transmission System Replacement, NNSS | 6,000 | 59,000 | 0 |
| Mission Enabling | 6,000 | 59,000 | 0 |
| I&O - Construction | 41,000 | 211,600 | 130,000 |
| Infrastructure and Operations | 252,266 | 431,009 | 356,169 |
| Information Technology and Cyber Security | 7,856 | 6,297 | 28,571 |
| **Total Nevada National Security Site** | **378,540** | **578,156** | **516,523** |
| | | | |
| **NNSA Albuquerque Complex** | | | |
| B61 Life Extension Program | 106,405 | 135,119 | 112,313 |
| W76-2 Modification Program | 3,866 | 0 | 0 |
| W88 Alteration Program | 27,965 | 43,722 | 27,188 |
| W80-4 Life Extension Program | 42,447 | 35,810 | 57,513 |
| W80-4 Alteration-SLCM | 0 | 0 | 2,680 |
| W87-1 Modification Program | 500 | 34,430 | 10,000 |
| W93 Program | 0 | 8,337 | 7,240 |
| Stockpile Major Modernization | 181,183 | 257,418 | 216,934 |
| Stockpile Sustainment | 38,698 | 47,304 | 42,829 |
| Weapons Dismantlement and Disposition | 0 | 315 | 0 |
| Production Operations | 3,796 | 22,248 | 14,426 |
| Stockpile Management | 223,677 | 327,285 | 274,189 |
| Los Alamos Plutonium Operations | 0 | 18,993 | 9,113 |
| 21-D-512, Plutonium Pit Production Project, LANL | 0 | 6,000 | 0 |
| Los Alamos Plutonium Modernization | 0 | 24,993 | 9,113 |
| Plutonium Modernization | 7,237 | 38,711 | 23,692 |
| High Explosives & Energetics | 0 | 0 | 5,634 |
| Primary Capability Modernization | 7,237 | 38,711 | 29,326 |
| Secondary Capability Modernization | 550 | 0 | 0 |
| Tritium and Domestic Uranium Enrichment | 165,000 | 155,926 | 142,433 |
| Production Modernization | 172,787 | 194,637 | 171,759 |
| Assessment Science | 68,378 | 5,619 | 3,000 |
| Engineering and Integrated Assessments | 46,756 | 15,816 | 9,916 |
| Inertial Confinement Fusion | 128,043 | 113,000 | 31,000 |
| Weapons Technology and Manufacturing Maturation | 20,530 | 19,117 | 4,917 |
| Academic Programs | 84,492 | 98,064 | 92,183 |
| Stockpile Research, Technology, and Engineering | 348,199 | 251,616 | 141,016 |
| Infrastructure and Safety | 2,303 | 341 | 21,726 |
| Recapitalization | 2,303 | 341 | 21,726 |
| Operating | 2,303 | 341 | 21,726 |
| 15-D-302, TA-55 Reinvestment Project - Phase 3, LANL | 0 | 500 | 0 |
| 07-D-220-04, Transuranic Liquid Waste Facility, LANL | 0 | 500 | 0 |
| 06-D-141, Uranium Processing Facility, Y-12 | 0 | 16,000 | 0 |
| 04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL | 0 | 300 | 0 |
| Chemistry and Metallurgy Research Replacement (CMRR) | 0 | 300 | 0 |
| Programmatic | 0 | 17,300 | 0 |
| I&O - Construction | 0 | 17,300 | 0 |
| Infrastructure and Operations | 2,303 | 17,641 | 21,726 |
| STA Operations and Equipment | 88,432 | 121,606 | 87,375 |
| Secure Transportation Asset | 88,432 | 121,606 | 87,375 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Defense Nuclear Security (DNS) | 7,767 | 7,150 | 9,137 |
| Defense Nuclear Security | 7,767 | 7,150 | 9,137 |
| **Total NNSA Albuquerque Complex** | **843,165** | **919,935** | **705,202** |
| **NNSA Production Office (NPO)** | | | |
| Tritium and Domestic Uranium Enrichment | 275 | 0 | 0 |
| Production Modernization | 275 | 0 | 0 |
| **Total NNSA Production Office (NPO)** | **275** | **0** | **0** |
| **Oak Ridge Institute for Science & Education** | | | |
| Assessment Science | 100 | 0 | 0 |
| Stockpile Research, Technology, and Engineering | 100 | 0 | 0 |
| **Total Oak Ridge Institute for Science & Education** | **100** | **0** | **0** |
| **Oak Ridge National Laboratory** | | | |
| Tritium and Domestic Uranium Enrichment | 40,855 | 0 | 34,415 |
| Production Modernization | 40,855 | 0 | 34,415 |
| Advanced Simulation and Computing | 608 | 0 | 831 |
| Stockpile Research, Technology, and Engineering | 608 | 0 | 831 |
| Safety and Environmental Operations | 10,403 | 9,662 | 11,226 |
| Operating | 10,403 | 9,662 | 11,226 |
| Infrastructure and Operations | 10,403 | 9,662 | 11,226 |
| **Total Oak Ridge National Laboratory** | **51,866** | **9,662** | **46,472** |
| **Office of Scientific & Technical Information** | | | |
| Assessment Science | 220 | 220 | 220 |
| Advanced Simulation and Computing | 0 | 681 | 0 |
| Stockpile Research, Technology, and Engineering | 220 | 901 | 220 |
| Information Technology and Cyber Security | 219 | 519 | 228 |
| **Total Office of Scientific & Technical Information** | **439** | **1,420** | **448** |
| **Pacific Northwest National Laboratory** | | | |
| Production Operations | 125 | 0 | 0 |
| Stockpile Management | 125 | 0 | 0 |
| Secondary Capability Modernization | 756 | 1,935 | 1,650 |
| Tritium and Domestic Uranium Enrichment | 54,279 | 56,786 | 56,750 |
| Production Modernization | 55,035 | 58,721 | 58,400 |
| Assessment Science | 10 | 0 | 0 |
| Engineering and Integrated Assessments | 35 | 0 | 0 |
| Weapons Technology and Manufacturing Maturation | 35 | 0 | 900 |
| Stockpile Research, Technology, and Engineering | 80 | 0 | 900 |
| Safety and Environmental Operations | 3,325 | 7,571 | 5,674 |
| Infrastructure and Safety | 689 | 0 | 0 |
| Capabilities Based Investments | 100 | 0 | 0 |
| Recapitalization | 789 | 0 | 0 |
| Operating | 4,114 | 7,571 | 5,674 |
| Infrastructure and Operations | 4,114 | 7,571 | 5,674 |
| **Total Pacific Northwest National Laboratory** | **59,354** | **66,292** | **64,974** |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Pantex Plant** | | | |
| B61 Life Extension Program | 55,552 | 54,500 | 67,445 |
| W88 Alteration Program | 34,660 | 53,918 | 59,776 |
| W80-4 Life Extension Program | 35,410 | 41,500 | 51,603 |
| W80-4 Alteration-SLCM | 0 | 0 | 100 |
| W87-1 Modification Program | 500 | 12,000 | 12,000 |
| W93 Program | 0 | 500 | 1,000 |
| Stockpile Major Modernization | 126,122 | 162,418 | 191,924 |
| Stockpile Sustainment | 128,130 | 107,926 | 130,486 |
| Weapons Dismantlement and Disposition | 27,553 | 35,000 | 31,370 |
| Production Operations | 116,066 | 120,093 | 121,227 |
| Stockpile Management | 397,871 | 425,437 | 475,007 |
| High Explosives & Energetics | 3,047 | 20,828 | 16,500 |
| Primary Capability Modernization | 3,047 | 20,828 | 16,500 |
| Production Modernization | 3,047 | 20,828 | 16,500 |
| Engineering and Integrated Assessments | 4,284 | 8,029 | 10,919 |
| Weapons Technology and Manufacturing Maturation | 4,757 | 5,173 | 5,746 |
| Stockpile Research, Technology, and Engineering | 9,041 | 13,202 | 16,665 |
| Operations of Facilities | 76,793 | 75,190 | 77,000 |
| Safety and Environmental Operations | 18,241 | 14,454 | 27,498 |
| Maintenance and Repair of Facilities | 83,600 | 117,000 | 112,000 |
| Infrastructure and Safety | 58,194 | 62,972 | 70,577 |
| Capabilities Based Investments | 17,103 | 9,080 | 6,000 |
| Recapitalization | 75,297 | 72,052 | 76,577 |
| Operating | 253,931 | 278,696 | 293,075 |
| 21-D-510, HE Synthesis, Formulation, and Production Facility, PX | 0 | 28,000 | 44,500 |
| 15-D-301, HE Science & Engineering Facility, PX | 5,880 | 43,000 | 0 |
| Programmatic | 5,880 | 71,000 | 44,500 |
| I&O - Construction | 5,880 | 71,000 | 44,500 |
| Infrastructure and Operations | 259,811 | 349,696 | 337,575 |
| STA Operations and Equipment | 7,431 | 7,006 | 8,105 |
| Secure Transportation Asset | 7,431 | 7,006 | 8,105 |
| Defense Nuclear Security (DNS) | 138,847 | 143,250 | 147,125 |
| Defense Nuclear Security | 138,847 | 143,250 | 147,125 |
| Information Technology and Cyber Security | 7,203 | 10,259 | 7,696 |
| **Total Pantex Plant** | **823,251** | **969,678** | **1,008,673** |
| **Portsmouth Gaseous Diffusion Plant** | | | |
| Secondary Capability Modernization | 0 | 15,000 | 20,000 |
| Tritium and Domestic Uranium Enrichment | 0 | 69,125 | 25,567 |
| Production Modernization | 0 | 84,125 | 45,567 |
| **Total Portsmouth Gaseous Diffusion Plant** | **0** | **84,125** | **45,567** |
| **Richland Operations Office** | | | |
| Safety and Environmental Operations | 25 | 0 | 0 |
| Operating | 25 | 0 | 0 |
| Infrastructure and Operations | 25 | 0 | 0 |
| **Total Richland Operations Office** | **25** | **0** | **0** |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Sandia National Laboratories** | | | |
| B61 Life Extension Program | 231,270 | 173,500 | 112,362 |
| W88 Alteration Program | 44,971 | 11,425 | 15,933 |
| W80-4 Life Extension Program | 422,389 | 487,150 | 493,520 |
| W80-4 Alteration-SLCM | 0 | 0 | 3,500 |
| W87-1 Modification Program | 52,950 | 185,000 | 225,000 |
| W93 Program | 0 | 18,000 | 22,000 |
| Stockpile Major Modernization | 751,580 | 875,075 | 872,315 |
| Stockpile Sustainment | 326,450 | 334,628 | 409,106 |
| Weapons Dismantlement and Disposition | 3,600 | 1,473 | 500 |
| Production Operations | 136,254 | 136,979 | 136,796 |
| Stockpile Management | 1,217,884 | 1,348,155 | 1,418,717 |
| High Explosives & Energetics | 411 | 12,000 | 13,000 |
| Primary Capability Modernization | 411 | 12,000 | 13,000 |
| Tritium and Domestic Uranium Enrichment | 448 | 118 | 495 |
| Non-Nuclear Capability Modernization | 7,138 | 41,500 | 56,618 |
| Production Modernization | 7,997 | 53,618 | 70,113 |
| Assessment Science | 66,918 | 64,545 | 60,173 |
| Engineering and Integrated Assessments | 81,637 | 88,245 | 88,847 |
| Inertial Confinement Fusion | 65,957 | 66,900 | 61,300 |
| Advanced Simulation and Computing | 182,836 | 168,896 | 172,685 |
| Weapons Technology and Manufacturing Maturation | 76,872 | 116,332 | 121,499 |
| Stockpile Research, Technology, and Engineering | 474,220 | 504,918 | 504,504 |
| Operations of Facilities | 130,000 | 125,380 | 126,000 |
| Safety and Environmental Operations | 9,961 | 6,476 | 8,967 |
| Maintenance and Repair of Facilities | 19,050 | 19,000 | 24,000 |
| Infrastructure and Safety | 40,872 | 66,350 | 54,900 |
| Capabilities Based Investments | 10,482 | 18,060 | 16,500 |
| Recapitalization | 51,354 | 84,410 | 71,400 |
| Operating | 210,365 | 235,266 | 230,367 |
| 22-D-513, Power Sources Capability, SNL | 0 | 0 | 13,000 |
| Programmatic | 0 | 0 | 13,000 |
| 15-D-611, Emergency Operations Center, SNL | 4,000 | 36,000 | 0 |
| Mission Enabling | 4,000 | 36,000 | 0 |
| I&O - Construction | 4,000 | 36,000 | 13,000 |
| Infrastructure and Operations | 214,365 | 271,266 | 243,367 |
| STA Operations and Equipment | 63,244 | 73,898 | 80,627 |
| Secure Transportation Asset | 63,244 | 73,898 | 80,627 |
| Defense Nuclear Security (DNS) | 67,088 | 70,490 | 74,386 |
| Defense Nuclear Security | 67,088 | 70,490 | 74,386 |
| Information Technology and Cyber Security | 30,004 | 34,836 | 27,812 |
| **Total Sandia National Laboratories** | **2,074,802** | **2,357,181** | **2,419,526** |
| **Savannah River Operations Office** | | | |
| Infrastructure and Safety | 0 | 0 | 1,750 |
| Recapitalization | 0 | 0 | 1,750 |
| Operating | 0 | 0 | 1,750 |
| 18-D-650, Tritium Finishing Facility, SRS | 27,000 | 9,000 | 27,000 |
| Programmatic | 27,000 | 9,000 | 27,000 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| I&O - Construction | 27,000 | 9,000 | 27,000 |
| Infrastructure and Operations | 27,000 | 9,000 | 28,750 |
| Information Technology and Cyber Security | 249 | 363 | 382 |
| **Total Savannah River Operations Office** | **27,249** | **9,363** | **29,132** |
| | | | |
| **Savannah River Site** | | | |
| B61 Life Extension Program | 3,000 | 7,000 | 17,200 |
| W80-4 Life Extension Program | 2,728 | 2,700 | 3,416 |
| W80-4 Alteration-SLCM | 0 | 0 | 50 |
| W87-1 Modification Program | 500 | 2,000 | 3,000 |
| W93 Program | 0 | 500 | 500 |
| Stockpile Major Modernization | 6,228 | 12,200 | 24,166 |
| Stockpile Sustainment | 46,988 | 43,832 | 46,503 |
| Weapons Dismantlement and Disposition | 650 | 808 | 500 |
| Production Operations | 28,193 | 24,736 | 24,789 |
| Stockpile Management | 82,059 | 81,576 | 95,958 |
| Savannah River Plutonium Operations | 410,458 | 198,875 | 126,080 |
| 21-D-511, Savannah River Plutonium Processing Facility, SRS | 0 | 241,896 | 475,000 |
| Savannah River Plutonium Modernization | 410,458 | 440,771 | 601,080 |
| Plutonium Modernization | 410,458 | 440,771 | 601,080 |
| Primary Capability Modernization | 410,458 | 440,771 | 601,080 |
| Tritium and Domestic Uranium Enrichment | 58,984 | 90,104 | 130,320 |
| Production Modernization | 469,442 | 530,875 | 731,400 |
| Assessment Science | 1,800 | 0 | 1,000 |
| Engineering and Integrated Assessments | 3,500 | 2,500 | 2,810 |
| Weapons Technology and Manufacturing Maturation | 6,286 | 6,883 | 7,804 |
| Stockpile Research, Technology, and Engineering | 11,586 | 9,383 | 11,614 |
| Operations of Facilities | 98,000 | 92,380 | 94,000 |
| Safety and Environmental Operations | 11,254 | 10,973 | 13,139 |
| Maintenance and Repair of Facilities | 31,000 | 40,000 | 43,000 |
| Infrastructure and Safety | 17,277 | 16,634 | 25,623 |
| Capabilities Based Investments | 320 | 4,200 | 2,900 |
| Recapitalization | 17,597 | 20,834 | 28,523 |
| Operating | 157,851 | 164,187 | 178,662 |
| Infrastructure and Operations | 157,851 | 164,187 | 178,662 |
| Defense Nuclear Security (DNS) | 7,688 | 8,520 | 9,064 |
| Defense Nuclear Security | 7,688 | 8,520 | 9,064 |
| Information Technology and Cyber Security | 6,026 | 7,036 | 7,071 |
| **Total Savannah River Site** | **734,652** | **801,577** | **1,033,769** |
| | | | |
| **SLAC National Accelerator Laboratory** | | | |
| Assessment Science | 120 | 0 | 0 |
| Inertial Confinement Fusion | 0 | 180 | 180 |
| Stockpile Research, Technology, and Engineering | 120 | 180 | 180 |
| **Total SLAC National Accelerator Laboratory** | **120** | **180** | **180** |
| | | | |
| **University of Rochester** | | | |
| Inertial Confinement Fusion | 0 | 0 | 75,000 |
| Stockpile Research, Technology, and Engineering | 0 | 0 | 75,000 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Total University of Rochester** | **0** | **0** | **75,000** |
| | | | |
| **Washington Headquarters** | | | |
| B61 Life Extension Program | 8,019 | 10,196 | 13,349 |
| W76-2 Modification Program | 3,606 | 0 | 0 |
| W88 Alteration Program | 3,077 | 3,212 | 6,946 |
| W80-4 Life Extension Program | 9,090 | 12,504 | 16,365 |
| W80-4 Alteration-SLCM | 0 | 0 | 300 |
| W87-1 Modification Program | 1,133 | 6,763 | 20,731 |
| W93 Program | 0 | 663 | 2,160 |
| Stockpile Major Modernization | 24,925 | 33,338 | 59,851 |
| Stockpile Sustainment | 13,192 | 21,125 | 40,283 |
| Weapons Dismantlement and Disposition | 2,067 | 1,275 | 1,530 |
| Production Operations | 14,079 | 13,198 | 22,758 |
| Stockpile Management | 54,263 | 68,936 | 124,422 |
| Los Alamos Plutonium Operations | 0 | 9,007 | 9,906 |
| 21-D-512, Plutonium Pit Production Project, LANL | 1,156 | 0 | 0 |
| Los Alamos Plutonium Modernization | 1,156 | 9,007 | 9,906 |
| Savannah River Plutonium Operations | 0 | 1,125 | 1,920 |
| Savannah River Plutonium Modernization | 0 | 1,125 | 1,920 |
| Plutonium Modernization | 17,754 | 11,267 | 13,432 |
| High Explosives & Energetics | 0 | 8,842 | 1,031 |
| Primary Capability Modernization | 17,754 | 20,109 | 14,463 |
| Secondary Capability Modernization | 31,259 | 65,510 | 54,374 |
| Uranium Reserve - NA | 0 | 75,000 | 0 |
| Tritium and Domestic Uranium Enrichment | 96,448 | 169,776 | 79,066 |
| Non-Nuclear Capability Modernization | 2,873 | 32,112 | 21,047 |
| Production Modernization | 148,334 | 287,507 | 168,950 |
| Assessment Science | 17,066 | 95,646 | 53,025 |
| Engineering and Integrated Assessments | 11,752 | 4,317 | 6,727 |
| Inertial Confinement Fusion | 7,851 | 15,920 | 14,558 |
| Advanced Simulation and Computing | 69,663 | 43,373 | 120,354 |
| Weapons Technology and Manufacturing Maturation | 4,053 | 3,724 | 5,800 |
| Stockpile Research, Technology, and Engineering | 110,385 | 162,980 | 200,464 |
| Operations of Facilities | 4,234 | 26,870 | 34,000 |
| Safety and Environmental Operations | 3,888 | 56,411 | 7,551 |
| Maintenance and Repair of Facilities | 51,669 | 100,517 | 99,000 |
| Infrastructure and Safety | 27,676 | 48,176 | 32,520 |
| Capabilities Based Investments | 15,898 | 14,597 | 26,466 |
| Planning for Programmatic Construction (Pre-CD-1) | 0 | 10,000 | 0 |
| Recapitalization | 43,574 | 72,773 | 58,986 |
| Operating | 103,365 | 256,571 | 199,537 |
| 22-D-513, Power Sources Capability, SNL | 0 | 0 | 827 |
| 21-D-510, HE Synthesis, Formulation, and Production Facility, PX | 0 | 3,000 | 0 |
| 18-D-650, Tritium Finishing Facility, SRS | 0 | 18,000 | 0 |
| 17-D-640, U1a Complex Enhancements Project, NNSS | 0 | 8,000 | 5,000 |
| 15-D-301, HE Science & Engineering Facility, PX | 74,120 | 0 | 0 |
| 04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL | 0 | 2,000 | 0 |
| Chemistry and Metallurgy Research Replacement (CMRR) | 0 | 2,000 | 0 |
| Programmatic | 74,120 | 31,000 | 5,827 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Weapons Activities BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| I&O - Construction | 74,120 | 31,000 | 5,827 |
| Infrastructure and Operations | 177,485 | 287,571 | 205,364 |
| Program Direction - STA - Federal Support | 107,660 | 123,684 | 117,060 |
| Secure Transportation Asset | 107,660 | 123,684 | 117,060 |
| Defense Nuclear Security (DNS) | 88,107 | 69,878 | 63,749 |
| Defense Nuclear Security | 88,107 | 69,878 | 63,749 |
| Information Technology and Cyber Security | 163,426 | 216,768 | 279,044 |
| Legacy Contractor Pensions (WA) | 91,200 | 101,668 | 78,656 |
| **Total Washington Headquarters** | **940,860** | **1,318,992** | **1,237,709** |
| | | | |
| **Y-12 National Security Complex** | | | |
| B61 Life Extension Program | 55,307 | 94,500 | 101,000 |
| W88 Alteration Program | 8,608 | 490 | 2,844 |
| W80-4 Life Extension Program | 52,478 | 3,306 | 43,143 |
| W80-4 Alteration-SLCM | 0 | 0 | 100 |
| W87-1 Modification Program | 4,000 | 40,000 | 100,000 |
| W93 Program | 0 | 1,000 | 1,500 |
| Stockpile Major Modernization | 120,393 | 139,296 | 248,587 |
| Stockpile Sustainment | 45,828 | 38,705 | 43,646 |
| Weapons Dismantlement and Disposition | 10,000 | 13,425 | 16,000 |
| Production Operations | 104,709 | 108,754 | 106,228 |
| Stockpile Management | 280,930 | 300,180 | 414,461 |
| Secondary Capability Modernization | 249,006 | 362,495 | 390,948 |
| Tritium and Domestic Uranium Enrichment | 25,000 | 1,667 | 11,700 |
| Production Modernization | 274,006 | 364,162 | 402,648 |
| Engineering and Integrated Assessments | 3,486 | 7,539 | 7,715 |
| Advanced Simulation and Computing | 500 | 0 | 500 |
| Weapons Technology and Manufacturing Maturation | 6,558 | 16,204 | 10,676 |
| Stockpile Research, Technology, and Engineering | 10,544 | 23,743 | 18,891 |
| Operations of Facilities | 93,207 | 101,190 | 103,000 |
| Safety and Environmental Operations | 13,851 | 18,283 | 25,396 |
| Maintenance and Repair of Facilities | 98,700 | 119,000 | 117,000 |
| Infrastructure and Safety | 72,949 | 76,805 | 54,463 |
| Capabilities Based Investments | 11,910 | 27,170 | 24,700 |
| Recapitalization | 84,859 | 103,975 | 79,163 |
| Operating | 290,617 | 342,448 | 324,559 |
| 18-D-690, Lithium Processing Facility, Y-12 | 32,000 | 109,405 | 167,902 |
| 06-D-141, Uranium Processing Facility, Y-12 | 745,000 | 734,000 | 524,000 |
| Programmatic | 777,000 | 843,405 | 691,902 |
| I&O - Construction | 777,000 | 843,405 | 691,902 |
| Infrastructure and Operations | 1,067,617 | 1,185,853 | 1,016,461 |
| Defense Nuclear Security (DNS) | 167,465 | 173,820 | 181,085 |
| 17-D-710, West End Protected Area Reduction Project, Y-12 | 25,000 | 26,000 | 23,000 |
| Construction - Defense Nuclear Security | 25,000 | 26,000 | 23,000 |
| Defense Nuclear Security | 192,465 | 199,820 | 204,085 |
| Information Technology and Cyber Security | 7,203 | 10,259 | 7,696 |
| **Total Y-12 National Security Complex** | **1,832,765** | **2,084,017** | **2,064,242** |
| | | | |
| **Total Funding by Site for Weapons Activities** | **12,457,097** | **15,345,000** | **15,484,295** |

# Defense Nuclear Nonproliferation

# Defense Nuclear Nonproliferation

**FY 2022 Congressional Budget**

**Justification Defense Nuclear**

**Nonproliferation**

**Table of Contents**

**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 [$2,260,000,000]*$2,264,000,000*, to remain available until expended: *Provided, That of the unobligated balances from prior year appropriations available under this heading specified as for "99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS" in the "Final Bill" column in the "Department of Energy" tables included under the heading "Title III-Department of Energy" in the explanatory statements accompanying prior appropriations Acts, $330,000,000 is hereby permanently cancelled*.

**Explanation of Change**

FY 2022 appropriations language reflects a change to the amount and the removal of additional aircraft procurement authority. The FY 2022 Budget Request for Defense Nuclear Nonproliferation (DNN) reflects an overall 0.2% increase from the FY 2021 Enacted level. This change is comprised of increases in the Nonproliferation and Arms Control and DNN Research and Development Programs which are offset by the completion of activities in Material Management and Minimization and Global Material Security.

**Public Law Authorizations:**

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 116-283, William M (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021
- P.L. 116-260, Consolidated Appropriations Act, 2021

## Defense Nuclear Nonproliferation[a]

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Request $ | FY 2022 Request vs FY 2021 Request (%) |
|---|---|---|---|---|---|
| **Defense Nuclear Nonproliferation** | **2,164,000** | **2,260,000** | **2,264,000** | **+4,000** | **0.18%** |

### Overview

The National Nuclear Security Administration's (NNSA) nonproliferation, counterproliferation and counterterrorism activities are critical to implementing the President's *Interim National Security Strategic Guidance* and demonstrating "renewed American nonproliferation leadership." NNSA's programs help reduce the dangers posed by nuclear weapons by extending the United States' defenses against nuclear threats far beyond its borders. These programs help prevent adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise; counter adversary efforts to acquire such weapons or materials; and respond to nuclear or radiological incidents and accidents domestically and abroad. NNSA shares knowledge, accrued through its long experience in managing special nuclear materials, with partners around the world to achieve its international nonproliferation and nuclear security goals. NNSA leverages the unique technical and scientific expertise 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.

The Defense Nuclear Nonproliferation appropriation funds five programs in the FY 2022 Budget Request. These programs, as part of a whole-of-government approach to nuclear threat reduction, 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 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, in conjunction with key capabilities operated and managed by the NNSA's Office for Information Management, ensure that a worldwide interoperable, secure, and trusted emergency communications network is in place.

The Office of Defense Nuclear Nonproliferation's efforts reduce the danger that hostile nations or terrorist groups will 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 reduces the range of potential threats facing the United States and its allies and partners.

DNN's mission is complementary to the missions of the Office of Defense Programs and the Office of Counterterrorism and Counterproliferation (CTCP). Together, they form the basis for providing a strong nuclear defense. 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.*[b]

This global threat landscape is characterized by the persistent danger 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

[a] Throughout this document, the FY 2022 Request amount does not reflect the proposed cancellation of $330 million in unobligated balances remaining from project 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS.

[b] *https://www.energy.gov/nnsa/downloads/prevent-counter-and-respond-strategic-plan-reduce-global-nuclear-threats-npcr.*

advances (including cyber-related tools) that may shorten nuclear weapon development timelines and complicate nuclear safeguards and security missions.

DNN and CTCP execute their missions in partnership with other U.S. Government agencies, most notably the Departments of State, Defense, Justice, and Homeland Security, the Intelligence Community, and the Nuclear Regulatory Commission. Internationally, DNN has a strong and long-established partnership with the International Atomic Energy Agency (IAEA). NNSA has active bilateral and multilateral program coordination mechanisms through fora 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 activities, DNN and CTCP 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 Defense Nuclear Nonproliferation appropriation account include the following:

**Material Management and Minimization (M3)**
M3 programs minimize and, when possible, eliminate weapons-usable nuclear material around the world to achieve permanent threat reduction. The FY 2022 Budget Request supports the conversion or shutdown of research reactors and isotope production facilities that use highly enriched uranium (HEU), the qualification of new low enriched uranium (LEU) fuels, the continued support of non-HEU-based molybdenum-99 (Mo-99) production facilities in the United States, the optimization of proliferation resistance in reactor designs, the removal and disposal of weapons-usable nuclear material, the continuation of activities to disposition 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 and radiological security threats. The FY 2022 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 domestically and with partner countries to improve the security of vulnerable materials and facilities and to build partners' sustainable capacity to detect, disrupt, and investigate illicit trafficking of these materials through critical pathways. GMS works with countries in bilateral partnerships, and with multilateral partners such as the IAEA, the Global Initiative to Combat Nuclear Terrorism (GICNT), 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 programs strengthen the nonproliferation and arms control regimes through innovative policy development and implementation to prevent proliferation, ensure peaceful nuclear uses, and enable verifiable nuclear reductions. The FY 2022 Budget Request supports IAEA and partner countries' efforts to implement international safeguards obligations; builds domestic and international capacity to implement export control obligations; supports the negotiation of and implement agreements and associated monitoring regimes to verifiably reduce nuclear weapons and nuclear programs; and develops approaches and strategies to address emerging nonproliferation and arms control challenges and opportunities.

**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. The program also sustains and develops foundational nonproliferation technical competencies that ensure the technical agility needed to support a broad spectrum of U.S. nonproliferation missions and anticipate threats. 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 2022 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 to sustain and develop foundational nonproliferation technical competencies by providing targeted, long-term support for enabling infrastructure, science and technology, and an expert workforce. The FY 2022 Request proposes to realign the National Technical Nuclear Forensics R&D program to a new National Technical Nuclear Forensics R&D subprogram within DNN R&D, to continue developing and maintaining 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.

**Nonproliferation Construction (supports Material Management and Minimization)**
Nonproliferation Construction consolidates construction costs for DNN projects in support of the dilute and dispose strategy for surplus plutonium disposition. The FY 2022 Budget Request supports the completion at the Savannah River Site of the first glovebox fabrication, shipment, receipt, and fabrication of the HEPA Filter Housings and Diesel Generator, completion of site preparation activities, and final design in support of Critical Decision (CD)-2/3, as well as continues long-lead procurements for the SPD Project. 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, contract and financial closeout activities for the MOX Fuel Fabrication Facility Project will be completed in FY 2022. The FY 2022 request includes no new funding for the MOX project.

**Nuclear Counterterrorism and Incident Response Program (NCTIR)**
The NCTIR program sustains the United States' nuclear counterterrorism and counterproliferation activities as well as operational nuclear incident 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 improvised nuclear devices (INDs) and lost or stolen foreign nuclear weapons. This knowledge in turn informs U.S. Government policies, regulations, and key Department of Defense (DoD) mission partners on terrorist and proliferant state nuclear threats and related contingency planning. In support of the nuclear counterterrorism mission, the FY 2022 Budget Request for NCTIR supports programs to strategically manage and deploy the DOE/NNSA Nuclear Emergency Support Team (NEST), comprised of expert scientific teams and equipment to provide a technically trained, rapid response to nuclear or radiological incidents and accidents worldwide, a nuclear forensics capability to support material and attack attribution, and to educate international partners to respond effectively to nuclear or radiological incidents in their countries. CTCP also integrates DOE/NNSA policy, planning, and operations on counterproliferation priorities, supporting urgent needs and proactively pursuing opportunities to prevent nuclear threats and develop technologies to apply to the counterproliferation mission.

Additionally, NCTIR executes the DOE/NNSA's Emergency Operations (EO) subprogram. EO provides both the structure and processes to ensure a comprehensive and integrated approach to emergency management and continuity of operations, thereby safeguarding the health and safety of workers and the public, protecting the environment, and enhancing the resilience of the Department and the Nation. In addition, EO coordinates a whole-of-community approach to mitigating, preventing, preparing for, responding to, and recovering from all-hazards emergencies, improving readiness and effectiveness of the DOE Emergency Management System on a programmatic and performance level, while promoting unity of effort and a culture of continuous improvement.

**Highlights and Major Changes in the FY 2022 Budget**
FY 2022 request includes:

- DNN programs: $1.854 billion, a decrease of $13.7 million, or .7%, from the FY 2021 Enacted level, reflecting the completion of funding for Molybdenum-99 cooperative agreements and activities to address recovery and decontamination efforts associated with the container breach and release of material in Seattle, Washington. The decreases are offset by increases due to the acceleration of a multilateral nonproliferation enrichment testing and training capability to improve current and future IAEA verification capabilities, and increases for DNN R&D to develop arms control capabilities and vulnerability assessments, to establish an emerging and disruptive technologies initiative, to establish a nuclear forensics R&D university consortium, and to accelerate the development of testbeds to sustain and develop foundation nonproliferation competencies in support of a broad spectrum of U.S. nonproliferation missions and anticipate threats.

- NCTIR: $370.8 million, a decrease of $6.7 million, or 1.8%, from the FY 2021 Enacted level. This reduction is primarily due to the realignment of management responsibility and authority for information technology and cybersecurity services and solutions for the Emergency Communications Network (ECN) from the NCTIR program to the Information Technology and Cybersecurity program within Weapons Activities. The reduction is partially offset by increases in CTCP focused on improving scientific understanding of nuclear threat devices, and expanding development of technologies to slow, halt, and prevent advancement of nuclear weapons-related efforts.
- Legacy Contractor Pensions $38.8 million, an increase of $24.5 million, or 170.4%, from the FY 2021 Enacted level reflecting the expansion of this budget line to include funding to reimburse the University of California (UC) for a portion of a settlement reached in 2019 with former UC employees of the LLNL related to health care plans, as well as funding for DNN programs' share of the unfunded liability of the Savannah River Nuclear Solutions pension plan. Benefits accrued by active employees during the year of execution will continue to be addressed through SRNS's indirect pools.

The Defense Nuclear Nonproliferation appropriation FY 2022 Budget Request supports the following key priorities:

**DNN Programs**

- Convert and/or verify the shutdown of one research reactor and isotope production facility.
- Complete the conversion of all major global Mo-99 producers.
- Identify and eliminate excess HEU and plutonium, including removing and/or confirming the disposition of 60 kilograms of material.
- Conduct a training exercise of the Mobile Packaging capabilities.
- Continue efforts to disposition plutonium from the state of South Carolina and pursue the dilute and dispose strategy to dispose of 34 metric tons of plutonium.
- Achieve four-shift operations in the K-Area Interim Surveillance (KIS) glovebox at SRS.
- Resume shipments to WIPP from the newly completed storage and waste characterization pad in K-Area at SRS.
- Complete early site preparation activities for the Surplus Plutonium Disposition (SPD) Project.
- Complete final design to support Critical Decision (CD) – 2/3, Approve Performance Baseline/Approve Start of Construction, for the SPD Project.
- Lead high-priority nuclear security engagements bilaterally and regionally to mitigate risks to nuclear and radiological security, including mitigating insider threats and improving cyber security, transportation security practices, nuclear material control and accounting, physical security, etc.
- Develop strategies for new areas of engagement including a formal countering unmanned aerial systems strategy; advanced reactors; and decommissioning.
- Provide critical mission support to the IAEA, , including strengthening the international nuclear safeguards system and supporting their expanding nuclear security activities, regional and international training courses on topics such as advanced insider and computer security; strengthening training capabilities and helping develop guidance documents; and promoting security best practices to nuclear newcomers.
- Secure an additional 55 buildings with high-priority radioactive sources (28 domestic buildings and 27 international buildings).
- Deploy and support sustainable counter nuclear smuggling solutions to detect, disrupt, and investigate the illicit trafficking of nuclear and radioactive material through critical pathways.
- Facilitate U.S. trade by 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 over 30 international partners to build global export control capacity through training, technical exchanges and train-the-trainer approaches.
- Provide nonproliferation assessments of emerging nuclear technologies and other emerging strategic risks and challenges.
- Develop policy and technical solutions for, and support the implementation of, arms control and nonproliferation treaties, agreements, and on-site denuclearization monitoring and verification activities.
- 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. nuclear explosion monitoring capabilities, including delivering the nation's space-based nuclear detonation detection payloads and related activities that support treaty monitoring and military missions.

- Sustain and develop foundational nonproliferation technical competencies that ensure the technical agility needed to support a broad spectrum of U.S. nonproliferation missions and anticipate threats.
- Advance technical nuclear forensics analysis capabilities that support U.S. Government response to a nuclear event, with an emphasis on advancing timelines to support attribution and novel approaches to material provenance.

**NCTIR Program**

- Enhance NEST capabilities to counter nuclear and radiological threats—including tools to locate, characterize, and defeat nuclear and radiological threat devices—and respond to nuclear incidents and accidents in the United States or abroad.
- Achieve Initial Operating Capability for 14 Stabilization Level V cities as part of the Capability Forward initiative to enhance regional Federal Bureau of Investigation (FBI) counter-WMD teams.
- Detect, measure, and track radioactive material in an emergency to determine contamination levels through the Aerial Measuring System.
- Provide security and assessment capabilities for non-stockpile nuclear threat device designs, including INDs.
- Implement training, develop, and validate tools, and maintain expertise for NNSA, DoD, and FBI counterterrorism, counterproliferation, and contingency planning efforts.
- Continue to evaluate technologies for counterterrorism and counterproliferation applications.
- Lead coordination of the government agencies supporting response and assessment for technical nuclear forensics.
- Advance capabilities that can significantly improve time-critical decision support, improving attribution timeliness.
- Enhance 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.
- Identify, consolidate, and analyze historical nuclear material samples of value to the technical nuclear forensics program and consolidate the National Nuclear Material Archive (NNMA) within NNSA.
- Enhance domestic and international engagements on nuclear counterterrorism and emergency preparedness and response, improving strategic communications, medical response competencies, and technical capabilities of public health, law enforcement, and emergency management authorities before, during and after a nuclear or radiological incident or accident.
- Develop and deliver training events focusing on nuclear counterterrorism and emergency preparedness and response combining virtual and in-person instruction methods to maximize the benefits of each method and increase the reach and impact of the program.
- Advance Emergency Management training, exercise, and certification programs.
- 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.
- Lead, manage, and operate the DOE/NNSA Consolidated Emergency Operations Center 24/7/365.
- Mature the Emergency Management Readiness Assurance Reporting Program.
- Lead the design and development of the DOE National Level Exercise, Eagle Horizon 2022.
- Institutionalize the Federal Mission Resilience Strategy (FMRS), to include a viable Devolution capability.
- Ensure interoperability of continuity communications systems across DOE/NNSA and with interagency partners.
- Update and validate emergency management and continuity directives, guides, and technical planning basis standards.
- Enhance the security and resilience of the Department and Nation.

**DOE Working Capital Fund (WCF) Support**

The NNSA DNN appropriation projected contribution to the DOE WCF for FY 2022 is $5,171,000. This funding covers shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

**Legacy Contractor Pensions and Settlement Payments**

NNSA is proposing to expand the scope of this budget line to include funding for the Requa settlement reached in 2019 as well as a portion of an unfunded pension liability at the Savannah River Site.

The *Requa* lawsuit involved UC employees of LLNL who retired prior to the Laboratory's transition to a new contractor on October 1, 2007. The retirees had been receiving health insurance through a UC health plan but when the LLNL contract transitioned to LLNS, the employees were offered health insurance through the new LLNL contractor, leading the retirees to file a lawsuit seeking reinstatement into the UC health plan. The parties settled the lawsuit in 2019, and a final judgment was issued in April 2020. NNSA agreed, pursuant to the legacy UC-LLNL Contract, to provide UC a portion of the total costs to settle the lawsuit, over a period of seven years through FY 2026. NNSA's responsibility for FY 2022 is $16 million.

Funding is also requested for reimbursement of DNN programs' share of the unfunded liability of the Savannah River Nuclear Solutions pension plan. The SRNS pension plan is underfunded by roughly $1.1 billion. The Department is proposing direct funding for this unfunded liability until it is fully funded. The FY 2022 Request includes a total of $218 million for this liability with 60 percent allocated to the Office of Environmental Management (EM) and 40 percent allocated to the National Nuclear Security Administration (NNSA). NNSA's portion is allocated between the DNN and Weapons Activities appropriation accounts.

This budget line also continues to include the Weapons Activities share of the DOE's annual reimbursement made to the 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 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 and settlement payments line item.

The Defense Nuclear Nonproliferation share of these costs in the FY 2022 Budget is $38,800,000.

**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 2022, the DNN appropriation projects providing for NGFP $3.3 million support and development activities.

## Defense Nuclear Nonproliferation
## Funding by Congressional Control

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Defense Nuclear Nonproliferation Appropriation** | | | | | |
| **Defense Nuclear Nonproliferation** | | | | | |
| **Material Management and Minimization** | | | | | |
| HEU Reactor Conversion | 99,000 | 0 | 0 | 0 | 0% |
| Conversion | 0 | 110,000 | 100,660 | -9,340 | -8.5% |
| Nuclear Material Removal | 32,925 | 40,000 | 42,100 | +2,100 | +5.3% |
| Material Disposition | 186,608 | 190,711 | 200,186 | +9,475 | +5.0% |
| Laboratory and Partnership Support | 45,000 | 60,000 | 0 | -60,000 | 0% |
| **Total, Material Management and Minimization** | **363,533** | **400,711** | **342,946** | **-57,765** | **-14.4%** |
| **Global Material Security** [a] | | | | | |
| International Nuclear Security | 58,000 | 78,939 | 79,939 | +1,000 | +1.3% |
| Domestic Radiological Security | 147,002 | 185,000 | 158,002 | -26,998 | -14.6% |
| International Radiological Security | 78,907 | 90,000 | 85,000 | -5,000 | -5.6% |
| Nuclear Smuggling Detection | 159,000 | 175,000 | 175,000 | 0 | 0% |
| **Total, Global Material Security** | **442,909** | **528,939** | **497,941** | **-30,998** | **-5.9%** |
| **Nonproliferation and Arms Control** | **140,000** | **148,000** | **184,795** | **+36,795** | **+24.9%** |
| **National Technical Nuclear Forensics R&D** | **0** | **40,000** | **0** | **-40,000** | **-100.0%** |
| **Defense Nuclear Nonproliferation R&D** | | | | | |
| Proliferation Detection | 299,046 | 255,000 | 269,407 | +14,407 | +5.6% |
| Nuclear Detonation Detection | 196,617 | 267,000 | 271,000 | +4,000 | +1.5% |
| Nonproliferation Fuels Development | 15,000 | 20,000 | 0 | -20,000 | -100.0% |
| National Technical Nuclear Forensics | 0 | 0 | 45,000 | +45,000 | 0% |
| Nonproliferation Stewardship Program | 22,500 | 59,900 | 87,329 | +27,429 | +45.8% |
| **Total, Defense Nuclear Nonproliferation R&D** | **533,163** | **601,900** | **672,736** | **+70,836** | **+11.8%** |
| **Nonproliferation Construction** | | | | | |
| 18-D-150, Surplus Plutonium Disposition Project | 79,000 | 148,589 | 156,000 | +7,411 | +5.0% |
| 99-D-143, Mixed Oxide (MOX) Fuel Fabrication Facility, SRS | 220,000 | 0 | 0 | 0 | 0% |
| **Total, Nonproliferation Construction** | **299,000** | **148,589** | **156,000** | **+7,411** | **+5.0%** |
| **Total, Defense Nuclear Nonproliferation Programs** | **1,778,605** | **1,868,139** | **1,854,418** | **-13,721** | **-0.7%** |

[a] The international contributions received by the GMS program shown in the FY 2020 Enacted column are a non-add. The amount received in FY 2020 totaled $13,298,143, including $543,534 from Norway, $285,280 from Finland, $7,721,370 from Canada and $4,747,959 from the United Kingdom.

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Nuclear Counterterrorism Incident Response Program** | | | | | |
| Emergency Operations | 35,545 | 36,000 | 14,597 | -21,403 | -59.5% |
| Counterterrorism and Counterproliferation | 336,550 | 341,513 | 356,185 | +14,672 | 4.3% |
| **Total, Nuclear Counterterrorism Incident Response Program** | **372,095** | **377,513** | **370,782** | **-6,731** | **-1.8%** |
| **Legacy Contractor Pensions** | **13,700** | **14,348** | **38,800** | **+24,452** | **170.4%** |
| **Total, Defense Nuclear Nonproliferation Appropriation** | **2,164,400** | **2,260,000** | **2,264,000** | **+4,000** | **0.2%** |

SBIR/STTR:

- FY 2020 Transferred: SBIR: $11,308; STTR: $0
- FY 2021 Enacted: SBIR: $13,202; STTR: $0
- FY 2022 Request: SBIR: $13,975; STTR: $0

## 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Research and Development (R&D)** | | | | | |
| Basic | 138,744 | 168,137 | 187,512 | 19,375 | 11.5% |
| Applied | 170,053 | 200,698 | 198,951 | -1,747 | -0.9% |
| Development | 84,158 | 97,091 | 99,370 | +2,279 | 2.3% |
| **Subtotal, R&D** | **392,955** | **465,926** | **485,833** | **+19,907** | **4.3%** |
| Equipment | 0 | 14,748 | 14,847 | +99 | 0.7% |
| Construction | 17,900 | 0 | 0 | 0 | 0% |
| **Total, R&D** | **410,855** | **480,674** | **500,680** | **+20,006** | **4.2%** |

## Material Management and Minimization

**Overview**

The Material Management and Minimization (M3) 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) and plutonium; removing or eliminating the world's most vulnerable weapons-usable nuclear material; and disposing of excess nuclear material in the United States. The M3 Budget Request presents an integrated approach to addressing the persistent threat posed by the global stockpile of nuclear materials.

M3 directly contributes to and plays a critical role in reducing global nuclear security threats and promoting U.S. national security. The M3 program is a key component of the Department of Energy/National Nuclear Security Administration (DOE/NNSA) integrated nonproliferation, counterterrorism, and emergency response strategies. M3 makes these strategic contributions through the conversion of research reactors and medical isotope production facilities to use non-weapons-usable nuclear material, the optimization of proliferation resistance in reactor designs, the removal of excess HEU and separated plutonium, and the disposition of HEU and plutonium.

## Material Management and Minimization
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Material Management and Minimization** | | | | | |
| HEU Conversion | 99,000 | 0 | 0 | 0 | 0% |
| Conversion | 0 | 110,000 | 100,660 | -9,340 | -8.5% |
| Nuclear Material Removal | 32,925 | 40,000 | 42,100 | +2,100 | +5.3% |
| Material Disposition | 186,608 | 190,711 | 200,186 | +9,475 | +5.0% |
| Laboratory and Partnership Support | 45,000 | 60,000 | 0 | -60,000 | -100.0% |
| **Total, Material Management and Minimization** | **363,533** | **400,711** | **342,946** | **-57,765** | **-14.4%** |

**Material Management and Minimization**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Material Management and Minimization** | |
| **Conversion:** The decrease reflects the availability of sufficient prior year uncosted balances necessary to maintain the planned FY 2022 level of effort. | **-9,340** |
| **Nuclear Material Removal:** The increase supports the training exercise for both the Mobile Uranium Facility (MUF) and the Mobile Plutonium Facility (MPF) to provide updated training and maintain readiness. | **+2,100** |
| **Material Disposition:** The 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 removal of plutonium from the state of South Carolina. | **+9,475** |
| **Laboratory and Partnership Support:** The decrease reflects sufficient available prior-year balances to support the molybdenum-99 (Mo-99) cooperative agreements. No new funds are required for the cooperative agreements. | **-60,000** |
| **Total, Material Management and Minimization** | **-57,765** |

## Material Management and Minimization
## Conversion

**Description**

The Conversion subprogram, referred to as the Convert subprogram, will continue to support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium minimization. The Convert subprogram supports the conversion of domestic and international civilian research reactors and isotope production facilities to use 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.

Currently, the Convert subprogram has converted or verified the shutdown of 107 HEU research reactors and isotope production facilities worldwide. In support of this effort, the program will continue its work to qualify high-density low enriched uranium (LEU) fuels and to demonstrate and set up 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 be converted to use existing LEU fuels. Therefore, the Convert program will procure Major Items of Equipment (MIE) to support making high-density LEU fuels to enable conversion of the USHPRRs. Beyond the USHPRR program, the Convert subprogram is continuing efforts to convert and verify the shutdown of HEU-fueled reactors around the world. In support of this effort, the program will continue to provide technical support for the European Fuel Development program. Funding will also support the continued development and implementation of the Proliferation Resistance Optimization (PRO-X) program. The Convert subprogram will identify and work with partners around the world on the design of new-build research reactors, and associated facilities, to explore technical options to reduce the ability for these facilities to be misused for proliferation purposes.

Given the significant progress by M3 to support the advancement of non-HEU-based molybdenum-99 (Mo-99) production facilities in the United States, the program will not request additional Cooperative Agreement (CA) funding. The CAs are currently funded within the Laboratory and Partnership Support (LAPS) subprogram, as is the laboratory expertise to support domestic production of Mo-99 and management of the Uranium Lease and Take-Back (ULTB) program, which leases LEU to domestic Mo-99 producers as needed. M3 intends to separate the laboratory expertise and ULTB work from the CAs, funded under the LAPS subprogram, and realign them into the Convert subprogram. This realignment will increase flexibility to overcome any final technical hurdles associated with bringing Mo-99 to market as the CA funding winds down.

Additionally, the Convert subprogram continues to support the qualification of new low enriched uranium (LEU) fuels and is supporting DOE and NNSA's uranium supply and uranium enrichment initiatives. In coordination with DOE's Office of Nuclear Energy (NE), the Convert subprogram is working to identify and repurpose unused or scrap material to produce high-assay LEU (HALEU) to ensure that HALEU can be available for research reactors, medical isotope producers, and DOE-NE's advanced reactor demonstrations. This helps ensure that the United States will continue to supply HALEU for those facilities that use LEU fuel and that LEU will be available for future conversions and new reactor builds.

**Highlights of the FY 2022 Budget Request**

- Continue to convert research reactors from the use of HEU fuel to LEU fuel, or verify the shutdown of HEU fueled research reactors, both domestically and internationally. One facility will be converted or verified as shutdown in FY 2022.
- Complete the conversion of all major global Mo-99 producers.
- Continue national laboratory technical support of domestic Mo-99 commercial partners to establish a reliable commercial supply of Mo-99 produced without HEU.

**FY 2020 Accomplishments**

- Completed a key irradiation campaign for Uranium-Molybdenum (UMo) monolithic LEU fuel which will be used to convert U.S. High Performance Research Reactors.
- Signed agreement with Argentina in February 2020 to launch international engagement on the Proliferation Resistance Optimization (PRO-X) project.
- Supported the National Institute of Radioactive Elements (IRE) in Belgium on the qualification of IRE's LEU Mo-99 production line, which resulted in Belgium supplying its first LEU-produced Mo-99 to the United States.

- Participated in an interagency effort in June 2020 with the Departments of State, Health and Human Services, Transportation and Homeland Security, to resolve Mo-99 European transportation challenges during the COVID global pandemic.

## Conversion

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Conversion $110,000,000** | **Conversion $100,660,000** | **Conversion -$9,340,000** |
| • Continue activities to support converting and/or verifying the shutdown of two facilities.<br>• Complete post-irradiation examination (PIE) of the MiniPlate-1 (MP-1) experiment.<br>• Continue fabrication of key full-size irradiation test plates for the new, high-density LEU fuel for irradiation in early 2022.<br>• Continue LEU fuel plate and assembly fabrication demonstration activities in support of converting USHPRRs.<br>• Support DOE and NNSA's HALEU supply initiatives. | • Continue activities to support converting and/or verifying the shutdown of one facility.<br>• Complete conversion of all major Mo-99 producers.<br>• Continue LEU fuel qualification and fabrication activities both domestically and internationally.<br>• Support DOE's and NNSA's HALEU supply initiatives.<br>• Provide technical support to the U.S. private sector to support establishment of a reliable domestic production capability for Mo-99 without the use of HEU.<br>• Continue the Proliferation Resistance Optimization (PRO-X) activities addressing HEU and/or plutonium to reduce the risk of potential misuse or production of weapons-useable material.<br>• Continue to implement the ULTB program. | • The decrease reflects the availability of sufficient prior year uncosted balances to allow the Program to maintain the planned FY 2022 level of effort. |

## 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 to support permanent threat reduction. Each kilogram of excess nuclear material that is removed from civilian sites worldwide reduces the risk of a terrorist or other malevolent actor acquiring HEU or plutonium for use in an improvised nuclear device. The subprogram directly advances U.S. and global HEU minimization objectives.

This subprogram consists of two primary lines of effort: 1) Nuclear Material Removal and Consolidation and 2) Mobile Packaging. Under Nuclear Material Removal and Consolidation, the Remove subprogram supports the removal, consolidation, and disposal of weapons-usable nuclear material from civilian facilities around the world. This material includes unirradiated and irradiated HEU of U.S.-origin, Russian-origin, and other origins, as well as separated plutonium. On a case-by-case basis, in support of nonproliferation objectives, some U.S.-origin LEU that previously fell under the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (also known as the U.S.-origin program), may be repatriated to the United States. The subprogram is also developing new capabilities, such as the Mobile Melt-Consolidate (MMC) system, to address inventories of weapons-usable nuclear material that do not currently have a disposition pathway and avoid bringing the material to the United States. Once operational in FY 2022, MMC will serve as a mobile platform for stabilizing excess nuclear material and converting it into a more proliferation-resistant, low-attractiveness waste form that can be readily disposed in a storage facility or repository outside the United States.

The Remove subprogram continues to evaluate excess civilian nuclear material located abroad 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 which materials 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. Additionally, the subprogram coordinates all future U.S. receipts with relevant Department of Energy stakeholders, such as the Office of Environmental Management (EM) and the Office of Nuclear Energy (NE), to enable long-term planning and appropriate resource allocation.

The Remove subprogram will continue to work closely with international partners to eliminate excess weapons-usable nuclear material and to support either repatriation or in-country solutions that best meet this objective. Throughout the COVID-19 pandemic, the Remove subprogram has continued to execute nuclear material removals and support planning for future removals, though some projects and exercises have been, or will be, delayed due to continued restrictions on international travel.

Under Mobile Packaging, the Remove subprogram maintains the capability to promptly respond to enable the safe and secure removal of nuclear material worldwide. This specialized capability focuses on addressing HEU and plutonium inventories using the Mobile Uranium Facility (MUF) and the Mobile Plutonium Facility (MPF). Both MUF and MPF include specialized teams and mobile facilities needed to conduct in-country characterization, stabilization, packaging, and removal of nuclear materials. The Mobile Packaging program undertakes full-scale training exercises with the MUF and MPF to maintain team proficiency and ensure both facilities are ready to be deployed on short notice. Two exercises, one domestic and one international, are being planned for FY 2021 and one exercise is being planned for FY 2022.

**Highlights of the FY 2022 Budget Request**

- Continue to identify and eliminate excess HEU and plutonium, including removing and/or confirming the disposition of 60 kilograms of material.
- Conduct a training exercise of the Mobile Packaging capabilities.

**FY 2020 Accomplishments**

- Completed a multi-year campaign to remove more than 160 kilograms of irradiated HEU from Canada to the United States.
- Completed the downblending of the remaining inventory of unirradiated HEU in Kazakhstan.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nuclear Material Removal $40,000,000** | **Nuclear Material Removal $42,100,000** | **Nuclear Material Removal +$2,100,000** |
| • Remove and/or confirmed the disposition of an additional 90 kilograms of HEU and/or plutonium.<br>• Sustain the Mobile Plutonium Facility (MPF) and the Mobile Uranium Facility (MUF) equipment and perform readiness exercises that practice a subset of MPF and MUF capabilities.<br>• Complete construction of the Mobile Melt-Consolidate (MMC) system; conduct testing of the completed system; carry out operational process R&D and optimization activities; develop all safety and operational documentation and procedures; and ensure the system is ready for deployment. | • Remove and/or confirm the disposition of an additional 60 kilograms of HEU and/or plutonium.<br>• Sustain the Mobile Plutonium Facility (MPF) and the Mobile Uranium Facility (MUF) equipment and perform off-site readiness exercises that practice the MPF and MUF's capabilities.<br>• Deploy the Mobile Melt-Consolidate system to support elimination of excess HEU inventories in a partner country. | • Increase supports the training exercise for both the MPF and MUF capabilities to provide updated training and to maintain readiness for deployment. |

## 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 subprogram includes activities to disposition 34 metric tons (MT) of surplus plutonium using the dilute and dispose strategy, whereby plutonium is mixed with a multicomponent adulterant and is packaged, characterized and disposed of as transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP). The subprogram also includes activities to disposition 186 metric tons (MT) of highly enriched uranium (HEU) by downblending it and making the resultant low enriched uranium available as fuel for commercial reactors or making supplies of material available for research reactors.

In addition to the efforts to disposition 34 MT of surplus plutonium, the subprogram is also supporting activities to address inventories of plutonium that were consolidated at Savannah River Site (SRS). As of the end of FY 2020, 9.5 MT of plutonium brought into the state since 2002 remain in South Carolina and are subject to the terms of an August 2020 settlement with the State of South Carolina. Under the terms of the settlement, South Carolina received a lump sum economic and impact assistance payment of $600 million and allowed DOE more time (through January 1, 2037) to safely remove the plutonium from the state without the threat of lawsuits. Under the provision of the settlement, DOE would be subject to future fines based on the accrued statutory payments from the years 2022-2036 as a percentage of the 9.5 MT of plutonium remaining in the state on January 1, 2037. Thereafter, DOE would be subject to pay a percentage of the statutorily required $100 million each year based on how much plutonium is left in the state.

In FY 2022, the Dispose subprogram will continue activities to disposition plutonium from the state of South Carolina including increasing staffing for downblend and waste characterization operations in K-Area at SRS. Several minor construction projects are underway at SRS to support the plutonium disposition effort. One minor construction project to construct a storage, characterization, and shipping pad within K-Area, essential to initiate shipments to the Waste Isolation Pilot Plant (WIPP), will complete in FY 2021. The pad will be used for storage of TRU waste containers beginning in FY 2021. Startup testing and certification of the TRU waste characterization equipment will be conducted in FY 2021 and FY 2022, with the first shipment to WIPP planned for mid-FY 2022. During the FYNSP, the Dispose subprogram will initiate hiring, training, and qualification for operators of the new gloveboxes being installed in K-Area as part of the Surplus Plutonium Disposition (SPD) line item project.

In FY 2021, NNSA initiated National Environmental Policy Act (NEPA) analysis for the 34 MT mission. In December 2020, NNSA published a Notice of Intent in the Federal Register announcing the preparation an Environmental Impact Statement (EIS) for the Surplus Plutonium Disposition Program (SPDP). A public scoping period was conducted in early 2021, which included two virtual public meetings that allowed the public to provide written and oral comments regarding the scope of the EIS analysis. The EIS is expected to be complete in FY 2023. This EIS is required for the full 34 MT mission, though previous NEPA analysis provides the coverage for all activities currently underway (including ARIES operations, the Surplus Plutonium Disposition line item project, and the downblending of 13.1 MT of surplus plutonium).

The Dispose subprogram includes other activities necessary to support the overall program to dispose of 34 MT of surplus weapons-grade plutonium including surveillance, monitoring, and packaging of surplus pits at Pantex and surplus pit disassembly and conversion of resultant metal to oxide, which is being conducted in the Advanced Recovery and Integrated Extraction System (ARIES) at LANL.

The Dispose subprogram will continue ongoing plutonium oxide production operations at LANL and procurement and installation of several Major Items of Equipment (MIE) at LANL to improve material movement efficiency, reduce worker radiation dose exposure, and address the risk of single points of failure in the ARIES process. The subprogram will increase the rate of plutonium oxide production over the next 10 years until steady-state operations are achieved. Furthermore, the Dispose subprogram will continue activities to improve PF-4 vault storage including the disposition of legacy Mixed Oxide (MOX) Fuel materials to make that space available for higher-priority materials.

In order to disposition the 34 MT of surplus plutonium, an expanded pit disassembly and processing (PDP) capability will likely be necessary. NNSA plans to initiate an Analysis of Alternatives (AoA) during FY 2021 to evaluate options to expand the PDP capability.

50 US Code 2746 requires, in cases where the estimated cost of completing a conceptual design for a construction project exceeds $5,000,000, that 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 PDP project will exceed the $5,000,000 threshold. The preliminary estimate for conceptual design to expand PDP capability within PF-4 at LANL is estimated at approximately $43,000,000, with $26,000,000 being applied in FY 2022. NNSA could initiate conceptual design activities as early as August in FY 2021, upon acquiring the prerequisite CD-0, Approval of Mission Need.

NNSA is collaborating with the National Laboratories on a Strategic Laboratory Assessment (SLA) to continuously develop opportunities for application of state-of-the-art science and technology into the surplus plutonium disposition program to ensure that the system for processing plutonium from storage through WIPP emplacement is as efficient as possible throughout the lifetime of the program. 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.

As part of the MOX termination activities to complete in FY 2021, ownership of the Waste Solidification Building (WSB) at the Savannah River Site is being transferred to the Office of Safety, Infrastructure and Operations (NA-50) within NNSA. DNN has no future programmatic need for the facility. NA-50 is responsible for maintaining enabling infrastructure and will be coordinating any potential uses of the WSB throughout NNSA.

The Dispose subprogram is also responsible for preparation of the Japan Fast Critical Assembly (FCA) plutonium fuel for disposition. DOE/NNSA continues to pursue the selected approach of electrolytic dissolution using H Canyon. 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.

Furthermore, the Dispose subprogram will focus on the development of international plutonium management strategies by developing bilateral and multilateral 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.

The subprogram has substantially reduced excess holdings of HEU throughout the DOE/NNSA complex. The subprogram is supporting the Down-blending Offering for Tritium (DBOT) contract, which runs from FY 2019 through FY 2025. Although DBOT primarily is a Defense Program (DP) contract, the Dispose subprogram is responsible for managing and funding a portion 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) for research reactors and 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 timely transition to the Uranium Processing Facility (UPF). The HEU Thorium/Building 9206, Area 5 De-inventory, and Building 9212 discards will be completed in FY 2025, with offsite shipments occurring by 2026. Prior acceleration efforts for this scope have been offset by the continued Nevada National Security Site (NNSS) pause in waste receipts from Y-12 and COVID-19 pandemic safety measures. This timeline has no impact to the overall Area-5 de-inventory or transition to UPF.

**Highlights of the FY 2022 Budget Request**

- Continue efforts to disposition plutonium from the state of South Carolina and continue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 MT of surplus plutonium.
- Achieve four-shift operations in the existing glovebox in K-Area.

- Resume shipments to WIPP from the newly completed storage and waste characterization pad in K-Area.
- Continue to eliminate surplus HEU by downblending it to LEU, or through direct disposal with a priority on legacy material to reduce operating risk in deteriorating infrastructure.

**FY 2020 Accomplishments**

- Produced 100 kg of plutonium in preparation for ultimate disposition using ARIES at LANL.
- Completed upgrades to the plutonium downblend process at Savannah River Site, improving efficiency and reducing worker radiation dose.
- Resumed plutonium downblend processing on two-shift operations.
- Issued a Supplement Analysis and Amended Record of Decision to disposition an additional 7.1 MT of excess plutonium using the dilute and dispose process. The 7.1 MT is part of the NNSA 34 MT and will enable NNSA to begin to process and disposition this material.
- Continued to disposition HEU through downblending, leveraging the DBOT contract.
- Completed closeout of the Repurposed Excess Uranium (REU) downblend contract.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Material Disposition $190,711,000** | **Material Disposition $200,186,000** | **Material Disposition +$9,475,000** |
| **U.S. Plutonium Disposition $155,946,000** | **U.S. Plutonium Disposition $182,361,000** | **U.S. Plutonium Disposition +$26,415,000** |
| • Continue to provide surveillance and packaging capabilities for surplus pits and plutonium.<br>• Continue pit disassembly and oxide conversion activities to prepare plutonium for disposition.<br>• Continue expediting the removal of plutonium from the state of South Carolina.<br>• Continue transition to the dilute and dispose strategy, including technical development and analysis.<br>• Maintain the WSB facility in a lay-up configuration while the Department determines options for future use.<br>• 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 require infrastructure and erosion control maintenance to comply with safety and environmental standards. | • Continue activities to process and dispose of plutonium from the state of South Carolina.<br>• Resume shipments to WIPP from the storage and characterization pad in K-Area.<br>• Increase pit disassembly and oxide conversion activities to prepare plutonium for disposition.<br>• Continue to provide surveillance and packaging capabilities for surplus pits and plutonium.<br>• Continue technical baseline management and maturity for the dilute and dispose strategy.<br>• Continue ongoing effort with National Laboratory partners to identify and implement improvements to increase efficiency and performance for the dilute and dispose process.<br>• Continue NEPA analysis for the 34 MT mission.<br>• Support the ongoing maintenance of critical programmatic documents. | • The 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 disposition of plutonium from the state of South Carolina. |
| **U.S. Uranium Disposition $32,886,000** | **U.S. Uranium Disposition $16,000,000** | **U.S. Uranium Disposition -$16,886,000** |
| • Downblend or ship for downblending HEU to produce LEU consistent with specifications.<br>• Continue to downblend HEU into high assay LEU metal for research reactor fuel and for Mo-99 targets.<br>• Continue cleanup of legacy material in Y-12's Building 9206, Building 9212 and the A5D to reduce risk. | • Downblend or ship for downblending HEU to produce LEU consistent with specifications.<br>• Continue to downblend HEU into high-assay LEU metal for research reactor fuel and for Mo-99 targets.<br>• Continue cleanup of legacy material in Y-12's Building 9206, Building 9212 and the A5D to reduce risk. | • The decrease reflects the use of prior year carryover balances, resulting from deferral of low-equity discard work and varying uranium spot prices, to maintain the planned Program level of effort.<br>• An increase in discards is expected to make up for disposition deferred during the NNSS pause in waste receipts and expected coronavirus impacts. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Support tracking and analyzing enriched uranium supply and demand needs and commitments of DNN mission goals.<br>• Complete HEU-Thorium discards. | • Support tracking and analyzing enriched uranium supply and demand needs and commitments to meet DNN mission goals. | |
| **International Plutonium Disposition $1,879,000** | **International Plutonium Disposition $1,825,000** | **International Plutonium Disposition -$54,000** |
| • Continue to implement plutonium management strategies with international partners. | • Continue to implement plutonium management strategies with international partners. | • No significant change. |

## Material Management and Minimization
## Laboratory and Partnership Support

**Description**

The Laboratory and Partnership Support (LAPS) Program was established by Congress to capture funding for cooperative agreements (CA) to support the domestic production of molybdenum-99 (Mo-99). No additional funding is required for the Mo-99 CAs. Building on prior-year support, the LAPS subprogram's CA partners continue to make progress toward commercially producing Mo-99 in the United States without the use of HEU. Prior-year CA funding is assisting in the deployment of several diverse non-HEU technologies and domestic facilities for Mo-99 production. In July 2020, LAPS issued a Funding Opportunity Announcement soliciting proposals from U.S. entities already undertaking projects to produce Mo-99 without HEU to bring their projects to commercial production by the end of CY 2023 and become long-term producers in the U.S. market. The LAPS subprogram has selected the recipients and anticipates awarding four new CAs later in FY 2021 with periods of performance ending by December 2023. NNSA anticipates that at least two U.S. companies will be producing Mo-99 in the United States by the end of CY 2023. Actual quantities of Mo-99 produced and distributed to U.S. patients, however, will be driven by the Mo-99 market. Additionally, the last major Mo-99 global producer is expected to convert to 100 percent LEU Mo-99 production in FY 2022, ending the need for the assistance in converting international Mo-99 facilities from using HEU to LEU targets.

**Highlights of the FY 2022 Budget Request**

- No funds are requested for Mo-99 Cooperative Agreements. Funding for laboratory expertise to support the advancement of non-HEU-based Mo-99 is being realigned to the Conversion subprogram.

**FY 2020 Accomplishments**

- Issued a Funding Opportunity Announcement (FOA) in July 2020 soliciting proposals for at least one new cooperative agreement to help accelerate the establishment domestic supplies of Mo-99.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Laboratory and Partnership Support $60,000,000** | **Laboratory and Partnership Support $0** | **Laboratory and Partnership Support -$60,000,000** |
| • 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.<br>• Award four new cooperative agreements.<br>• Continue to implement the Uranium Lease and Take Back (ULTB) program. | • No funding is requested for Mo-99 Cooperative Agreements. The laboratory technical and financial support for the Mo-99 program is being realigned under the Conversion Program. | • The decrease reflects sufficient available prior-year balances to support the molybdenum-99 (Mo-99) cooperative agreements. No new funds are required for the cooperative agreements. |

## Material Management and Minimization
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 22,819 | 8,988 | 9,061 | +73 |
| Minor Construction | N/A | N/A | 37,076 | 28,706 | 0 | -28,706 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **59,895** | **37,694** | **9,061** | **-28,633** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 10,238 | 3,028 | 668 | -2,360 |
| Simple Pit Cutter, LANL | 13,211 | 9,648 | 1,853 | 1,710 | 0 | -1,710 |
| Material Intro Hood #1, LANL | 6,346 | 0 | 5,000 | 1,346 | 0 | -1,346 |
| Maintain Oxidation Capability, LANL (previously Replace DMO-2 Capability, LANL) | 8,632 | 0 | 5,728 | 2,904 | 0 | -2,904 |
| Install Second Calorimeter, LANL | 5,793 | 0 | 0 | 0 | 5,793 | +5,793 |
| Hot Roll Mill, INL (BWXT) | 2,600 | 0 | 0 | 0 | 2,600 | +2,600 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **22,819** | **8,988** | **9,061** | **+73** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 2,976 | 22,046 | 0 | -22,046 |
| 105-K Perimeter Entry Control Facility (ECF-3), SR | 17,100 | 0 | 17,100 | 0 | 0 | 0 |
| Characterizaton and Storage Pad, SR | 19,922 | 18,922 | 1,000 | 0 | 0 | 0 |
| Mobile Melt-Consolidate System, SR | 9,706 | 5,485 | 0 | 4,221 | 0 | -4,221 |
| 105-K Material Access Area (MAA) Entry Control Facility (ECF) Expansion, SR | 18,439 | 0 | 16,000 | 2,439 | 0 | -2,439 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **37,076** | **28,706** | **0** | **-28,706** |
| **Total, Capital Summary** | **N/A** | **N/A** | **59,895** | **37,694** | **9,061** | **-28,633** |

## Global Material Security

**Overview**

The Global Material Security (GMS) program directly contributes to national security efforts to reduce global nuclear and radiological security threats. GMS 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), the Global Initiative to Combat Nuclear Terrorism (GICNT), 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 four subprograms: International Nuclear Security (INS), Domestic Radiological Security (DRS), International Radiological Security (IRS), and Nuclear Smuggling Detection and Deterrence (NSDD).

## Global Material Security
## Funding[a]

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Global Material Security** | | | | | |
| International Nuclear Security | 58,000 | 78,939 | 79,939 | +1,000 | +1.3% |
| Domestic Radiological Security | 147,002 | 185,000 | 158,002 | -26,998 | -14.6% |
| International Radiological Security | 78,907 | 90,000 | 85,000 | -5,000 | -5.6% |
| Nuclear Smuggling Detection and Deterrence | 159,000 | 175,000 | 175,000 | 0 | 0% |
| **Total, Global Material Security** | **442,909** | **528,939** | **497,941** | **-30,998** | **-5.9%** |

[a] The international contributions received by the GMS program in FY 2020 totaled $13,298,143 including $7,721,370 from Canada, $4,747,959 from the United Kingdom, $543,534 from Norway, and $285,280 from Finland.

**Global Material Security**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Global Material Security** | |
| **International Nuclear Security:** No major change. | **+1,000** |
| **Domestic Radiological Security:** Decrease reflects the completion of activities in FY 2021 to address recovery and decontamination efforts associated with the container breach and release of material in Seattle, Washington. | **-26,998** |
| **International Radiological Security:** Decrease reflects the completion of several high-priority radiological security projects including radioactive source replacements and security enhancement activities in FY 2021. | **-5,000** |
| **Nuclear Smuggling Detection and Deterrence:** No change. | **0** |
| **Total, Global Material Security** | **-30,998** |

## 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 present risks or opportunities 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. INS is developing a strategy to promote nuclear security best practices with countries interested in pursuing civil nuclear energy programs. INS is also partnering with U.S. industry on Security-by-Design activities to enhance security of advanced reactor designs. This is part of a broader DOE/NNSA effort to support U.S. industry on nuclear nonproliferation and nuclear security.

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, insider threat mitigation programs, including strong nuclear security culture, and performance evaluation.

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, INTERPOL, several non-government organizations, and U.S. industry. In particular, 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 as well as major conferences. INS also partners with the IAEA to develop nuclear security support centers (NSSCs) that help maintain expertise and serve as resources for nuclear security capacity building.

**Highlights of the FY 2022 Budget Request**

- Continue to deepen existing bilateral relationships with more than 55 countries, through virtual engagements or in-person technical exchanges and training, on a wide range of nuclear security topics (e.g., physical security, insider threat mitigation, transportation security, nuclear material accounting and control, cyber security).
- Continue to implement upgrades at nuclear facilities in Ukraine, Belarus, Jordan, and Democratic Republic of Congo based on a thorough assessments of threats and vulnerabilities.

- Continue to provide equipment to several partner countries to sustain or supplement previous investments by the Office of Radiological Security, which reflects INS's updated strategy to pursue capacity building with countries that have other nuclear facilities such as research reactors.
- Continue analysis and developing innovative risk mitigation approaches for a range of fuel cycle facilities, including advanced reactors/small modular reactors (SMR), and for emerging nuclear security challenges, such as drones, cyber security, and artificial intelligence.
- Continue partnership with the IAEA to enhance training capabilities, develop guidance, and conduct outreach to nuclear newcomers.
- Continue to partner with INTERPOL to identify and develop training for law enforcement agencies that engage with or support nuclear facilities worldwide.
- Implement a strategy to raise nuclear security awareness for countries seeking new civil nuclear energy programs.
- Continue to partner with U.S. industry on Security-by-Design activities to enhance security of advanced reactor designs. Expand efforts to promote the roles of women in nuclear security and develop the next generation of nuclear security experts.

**FY 2020 Accomplishments**

- Demonstrated resiliency and adaptability during the 2020 pandemic that supported continuity of international engagements and execution of the INS mission.
- Expanded bilateral cooperation on a wide range of nuclear security topics with over 40 countries.
- Implemented upgrades at nuclear facilities in Ukraine, Nigeria, Armenia, and Morocco based on thorough assessments of threats and vulnerabilities.
- Given travel constraints related to COVID, held more than 100 virtual exchanges with over 35 bilateral partners on a range of nuclear security issues, including insider threat mitigation, response, transportation security, counter unmanned aerial systems, cyber security, and sabotage mitigation.
- Continued partnership with IAEA to support implementation of two international training courses and revision of IAEA technical guidance.
- Worked with the IAEA to strengthen and support the NSSCs, advisory missions, and educational programs, and provided subject matter expert assistance to build sustainable, effective global nuclear security.
- Partnered to organize the International Symposium for Information Circular (INFCIRC) 909/Transport Security.
- Championed several side events and booths at the 2020 International Conference on Nuclear Security including INCIRC 908 (Insider Threat Mitigation), the Sustainability/30G IAEA guidance, INFCIRC 909 (Transportation Security), and the Cyber Village.
- Established the International Working Group for INFCIRC 908/Insider Threat Mitigation and INS Women in Nuclear Security initiative.
- Organized a regional workshop on Insider Threat Mitigation in Ukraine for over 100 participants from 20 neighboring countries.
- Established the INS civil nuclear security project to support U.S. industry in security by design for advanced reactors/SMRs.
- Continued Over the Horizon assessments of emerging threats and technologies and completed investigations into impacts of technologies such as Artificial Intelligence on nuclear security.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **International Nuclear Security $78,939,000** | **International Nuclear Security $79,939,000** | **International Nuclear Security +$1,000,000** |
| • Collaborate with international partners to conduct six regional workshops related to cyber security for nuclear facilities, transport security, and insider threat mitigation.<br>• Expand and deepen bilateral engagement with approximately 50 total countries, including nuclear newcomers.<br>• Commence upgrades on four sites in high-risk environments.<br>• Partner to sustain upgrades at sites completed in previous years.<br>• 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.<br>• Secure nuclear material in five partner countries.<br>• Lead U.S. international engagement with over 10 partners on solutions to counter the threat that unmanned aerial systems may pose to nuclear facilities.<br>• 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. | • Build nuclear security capacity in 55+ countries and conduct regional workshops on nuclear security issues. Continue adapting to a virtual training and engagement environment due to COVID-19, including launching a Learning Management System for foreign partners.<br>• Continue to implement upgrades at four nuclear facilities in high-risk environments to mitigate vulnerabilities.<br>• Continue partnering to sustain upgrades at sites completed in previous years.<br>• Continue sustaining previous investments by the Office of Radiological Security to support updated INS strategic goals for research reactors. Secure nuclear material sites and materials in transit.<br>• Conduct new bilateral engagements with countries on security by design best practices for civil nuclear power and advanced reactors, with a focus on physical protection, cyber security, nuclear material accounting and control, and response.<br>• Support for IAEA international training courses and workshops, expert positions, guidance development, as well as engagement with nuclear newcomers.<br>• Support INTERPOL's law enforcement training efforts to improve engagement/support of nuclear facilities worldwide.<br>• Support the World Institute for Nuclear Security (WINS) in areas such as emerging threats and technology engagements.<br>• Develop strategies, tools, and processes for cyber security, insider threat mitigation, and other | • Additional funds will be used for increased activities with nuclear newcomers, decommissioning engagements, and security-by-design activities with industry partners. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | dynamic nuclear security functional areas, as well as new areas of engagement including countering unmanned aerial systems, artificial intelligence, and other emerging technical areas. Expand initiatives to promote the roles of women in nuclear security and develop the next generation of nuclear security experts. | |

## Global Material Security
## Domestic Radiological Security

**Description**

The Domestic Radiological Security (DRS) subprogram supports U.S. national security and plays an important role in preventing radiological terrorism at home by working with partners to secure high-risk radioactive materials that could be used in acts 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.

DRS 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, DRS 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. DRS 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. DRS 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, DRS 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.

DRS protects high-activity radioactive materials located at vulnerable locations (e.g. hospitals, universities) in the United States. DRS works in close cooperation with licensees, industry partners, state regulators, and the Nuclear Regulatory Commission. DRS implements state-of-the art security solutions to protect radioactive material at volunteer sites. Additionally, DRS deploys mobile source transit systems for sources used in the well-logging and radiography industries.

DRS's removes excess, unwanted, and disused radioactive sources that pose a potential risk to national security, public health, and safety through the Off-Site Source Recovery Program (OSRP). DRS 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. DRS 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 Cesium Irradiator Replacement Project (CIRP). DRS is on track to eliminate cesium-137 blood irradiators in the United States by December 31, 2027, as outlined in the FY 2019 National Defense Authorization Act. Participation in CIRP is voluntary; the program fully covers the costs of the recovery of the radioactive source through OSRP and provides a financial incentive towards the purchase price of a new non-radioisotopic device.

In 2016, DRS integrated this three-pronged approach to reducing radiological risk under the 2020 Cities Initiative, which focused on the 20 largest cities in the United States. The new RadSecure 100 Initiative, an initiative commencing in FY 2021, expands these efforts to more American cities.

The RadSecure 100 Initiative brings to the 100 largest metropolitan areas in the United States the same scalable radiological security trainings and activities (voluntary security enhancements for radioactive sources in use, incentives to replace radioactive sources with more secure alternatives, and trainings to law enforcement responders) that DRS brought to the 20 largest metropolitan areas under the 2020 Cities Initiative from 2016 to 2020. The new initiative includes an increased focus on security enhancements for mobile sources, local law enforcement response activities, transportation security, and insider threat awareness.

**Highlights of the FY 2022 Budget Request**

- Continue to support the transition from high-activity radioactive sources to 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.
- Enhance domestic capabilities to manage disused sources safely and securely.

**FY 2020 Accomplishments**

- Continued contamination remediation efforts at, and reconstruction of, the building affected by the breached cesium-137 source in Seattle, Washington.
- Replaced 39 devices domestically that use high-activity radioactive sources with non-radioisotopic alternative technologies.
- Expanded education and outreach to encourage a broader adoption of technologies that do not use high-activity radioactive sources.
- Under the 2020 Cities Initiative, continued to secure the remaining volunteer buildings with high-risk quantities of cesium-137 and cobalt-60 in major metropolitan areas of the United States.
- In the top 20 largest U.S. metropolitan areas, increased coordination between sites that have high-priority radioactive material and local law enforcement agencies responsible for protecting those sites.
- Deployed six mobile source tracking systems for use on field-deployed sources.
- Secured a total of 13 buildings domestically with high-priority radioactive sources.
- Continued to collaborate with industry on “security by design” to make source-based devices and facilities inherently more secure in the manufacturing process.
- Worked with appropriate authorities and sites to sustain previously installed security upgrades domestically.
- Continued the removal of over 730 excess and unwanted sealed sources from locations throughout the United States.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Domestic Radiological Security $185,000,000** | **Domestic Radiological Security $158,002,000** | **Domestic Radiological Security -$26,998,000** |
| • Replace 70 devices domestically that use high-activity radioactive sources with non-radioisotopic alternative technologies.<br>• Remove an additional 600 excess and unwanted sealed sources from locations throughout the United States.<br>• Secure an additional 30 buildings domestically with high-priority radioactive sources.<br>• Expand deployment of security and tracking solutions for mobile sources and work with new industry partners to develop security solutions for other makes and models of mobile sources.<br>• Lead cybersecurity initiatives at high-priority radioactive material sites in the United States, providing partners with best practices, training, and other technical assistance.<br>• Work with industry and regulators to enhance security of high-activity radioactive sources during transportation across the United States.<br>• Continue expanding the security by design cooperation with industry to make source-based devices and facilities inherently more secure.<br>• 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. | • Replace 70 cesium devices domestically with alternative technologies under CIRP and expand the Reduce mission to include replacing cobalt devices.<br>• Remove an additional 500 excess and unwanted sealed sources from locations in the United States.<br>• Secure an additional 28 buildings domestically with high-priority radioactive sources.<br>• Through the RadSecure 100 Initiative, continue to expand response training and coordination efforts with local law enforcement in additional major cities in the United States.<br>• Work with industry and regulators to enhance security of high-activity radioactive sources during transportation across the United States.<br>• Continue to focus on cyber security, insider threat mitigation, and security culture in the United States, providing partners with training and other technical assistance to keep radioactive materials secure.<br>• Work to reduce backlog of cesium blood irradiator recoveries caused by delays introduced by the COVID pandemic and the Seattle accident.<br>• Work to complete the priority site physical protection upgrades and engagements with industry partners that were impacted by the COVID pandemic. | • Decrease reflects the completion of activities in FY 2021 to address recovery and decontamination efforts associated with the container breach and release of material in Seattle, Washington. |

## Global Material Security
## International Radiological Security

**Description**

The International Radiological Security (IRS) 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 acts 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.

IRS 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, IRS 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. IRS 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. IRS 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, IRS 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.

IRS protects high-activity radioactive materials located at vulnerable locations (e.g. hospitals, universities) in high-priority countries worldwide. IRS works in close cooperation with national, regional, and multilateral partners including the IAEA. IRS implements state-of-the-art security solutions to protect radioactive material at volunteer sites. Additionally, IRS deploys mobile source transit systems for sources used in the well-logging and radiography industries.

Where appropriate, IRS 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 basis, IRS also repatriates high-risk U.S.-origin sources from international locations.

IRS 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. IRS prioritizes 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.

**Highlights of the FY 2022 Budget Request**

- Enhance capabilities and optimize solutions to manage disused sources safely and securely internationally and build international partner capacity to manage disused sources themselves.
- Continue to support the transition from high-activity radioactive sources to 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.

**FY 2020 Accomplishments**

- Demonstrated resiliency and adaptability during the 2020 pandemic that supported continuity of international engagements and execution of the IRS mission.
- Focused on securing and eliminating cesium-based devices in priority countries worldwide through tailored protect, remove, or reduce strategies.

- Replaced 11 devices internationally that use high-activity radioactive sources with non-radioisotopic alternative technologies.
- Expanded education and outreach to encourage a broader adoption of technologies that do not use high-activity radioactive sources.
- Deployed the mobile source tracking systems for use on field-deployed sources.
- Secured an additional 14 buildings internationally with high-priority radioactive sources.
- Continued to collaborate with industry on “security by design” to make source-based devices and facilities inherently more secure in the manufacturing process.
- Worked with appropriate authorities and sites to sustain previously installed security upgrades internationally.
- Recovered and disposed or securely stored disused or orphaned radioactive sources in other countries.
- Initiated In-Device Delay installations at Gamma Knife facilities internationally.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **International Radiological Security $90,000,000** | **International Radiological Security $85,000,000** | **International Radiological Security -$5,000,000** |
| • Replace 15 devices internationally that use high-activity radioactive sources with non-radioisotopic alternative technologies.<br>• Secure an additional 30 buildings internationally with high-priority radioactive sources.<br>• 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.<br>• Lead cybersecurity initiatives at high-priority radioactive material sites around the world, providing partners with best practices, training, and other technical assistance.<br>• Work with industry and regulators to enhance international security of high-activity radioactive sources during transportation.<br>• Continue expanding the security-by-design cooperation with industry to make source-based devices and facilities inherently more secure.<br>• Provide law enforcement with the capability to train their officers on the threat of radioactive materials and how to respond to the potential theft of radioactive materials. | • Secure an additional 27 buildings with high-priority radioactive sources internationally.<br>• Replace 15 cesium devices internationally with alternative technologies and expand the Reduce mission to include replacing cobalt devices.<br>• Remove 200 disused radioactive sources for disposition or long-term storage.<br>• Work to complete the priority site physical protection upgrades and engagements with industry partners that were impacted by the COVID pandemic.<br>• Support the secure and peaceful use of advanced nuclear technologies by facilitating access to non-radioisotopic alternative technologies, which can be achieved through device installations, infrastructure improvements, outreach, and education.<br>• Continue to participate in a major international effort to create the first international industry standard for security of medical devices with radioactive sources.<br>• Work with industry and regulators to enhance security of high-activity radioactive sources during international transportation.<br>• Continue to focus on cyber security, insider threat mitigation, and security culture development around the world, providing partners with training and other technical assistance to keep radioactive materials secure.<br>. | • Decrease reflects the completion of several high-priority radiological security projects including radioactive source replacements and security enhancement activities in FY 2021. |

## 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 across five performance areas: policies and procedures, operations, training, maintenance, and assessment. 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 (WCO), 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 seaports
- Along 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 investigation support capabilities to include capacity building focused on isotopic identification and analysis of detected material. Together, these tools contribute to building a practical, comprehensive, and effective counter nuclear smuggling capability.

**Highlights of the FY 2022 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 partner agencies' capabilities in five performance areas critical to achieving baseline counter nuclear smuggling operability: policies and procedures, operations, training, maintenance, and assessment.

**FY 2020 Accomplishments**

- Demonstrated resiliency and adaptability during the 2020 pandemic that supported continuity of international engagements and execution of the NSDD mission.
- Provided 16 additional mobile and man-portable systems for use at internal checkpoints in countries along known smuggling routes.
- Strengthened radiation detection and interdiction capabilities of green border security teams and improved surveillance capabilities near sensitive and high-risk areas on green borders by completing three Green Border Security Initiative projects.

- Provided enhanced capabilities to interior law enforcement and intelligence agencies responding to counter smuggling information alerts and investigations.
- Provided radiation detection capabilities for targeted screening at high-risk airports in the Middle East.
- Provided identification, inspection, and radiation detection tools for interdiction of small maritime vessels in the Indian Ocean and the Arabian Sea.
- Established seven new bilateral partner country engagements to strengthen nuclear investigation support capabilities, bringing the total number of current investigation support engagements to 33 partner countries.
- Conducted outreach engagements in over 25 countries in South and Southeast Asia, Africa, and the Middle East.
- Equipped an additional 17 official crossing points to close key gaps in the global nuclear detection architecture in six countries and connected radiation detection sites to national communications systems in three countries.
- Continued to support capacity building activities in five performance areas in prioritized countries where systems have been installed but are not yet indigenously sustained.
- Transitioned 51 radiation detection systems to indigenous sustainment and maintained engagements to encourage continued commitment, maintain visibility, and share best practices.
- Conducted over 20 events, workshops, or exercises to advance partner country capabilities in radiation detection, equipment maintenance, and investigation support.
- Conducted over 50 training courses to advance partner country capabilities in operating, maintaining, and managing radiation detection measures, to include investigations.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nuclear Smuggling Detection and Deterrence**<br>**$175,000,000** | **Nuclear Smuggling Detection and Deterrence**<br>**$175,000,000** | **Nuclear Smuggling Detection and Deterrence**<br>**$0** |
| Deploy counter nuclear smuggling systems at 59 interdiction points including:<br>• Complete a total of 47 projects along points of entry, enhancing radiation detection capabilities at: 36 large-scale border crossing points, five man-portable Passenger Rail Initiative deployments, two seaports, and four airports.<br>• Enhance frontier area interdiction and inspection capabilities by completing nine projects providing radiation localization and identification equipment, along with ancillary interdiction equipment, to enforcement units by completing: eight Green Border Security Initiative projects and one Maritime Vector Partnership project.<br>• Strengthen interdiction, inspection, and investigation capabilities of internal security and law enforcement units by completing three pilot projects providing radiation detection equipment, ancillary equipment, and human resource development.<br>• Conduct over 30 drills, workshops, or exercises and complete over 50 training courses, to advance partner country capabilities in operating, maintaining, and managing radiation detection measures, to include investigations.<br>• Continue to support capacity building activities in prioritized partner countries to promote and evaluate system operability. | Deploy counter nuclear smuggling systems at 55 interdiction points including:<br>• Complete a total of 39 projects along points of entry, enhancing radiation detection capabilities at: 23 large-scale border crossing points, five man-portable Passenger Rail Initiative deployments, six seaports, and five airports.<br>• 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: eight Green Border Security Initiative projects and two Maritime Vector Partnership projects.<br>• Strengthen interdiction, inspection, and investigation capabilities of internal security and law enforcement units by completing six projects providing radiation detection equipment, ancillary equipment, and human resource development.<br>• Continue to support capacity building activities in five performance areas in prioritized partner countries to promote system operability.<br>• Continue assessments of partners' baseline counter nuclear smuggling operability.<br>• Conduct over 30 drills, workshops, or exercises and complete over 50 training courses to advance partner country capabilities in operating, maintaining, and | • No change. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | managing radiation detection measures, to include investigations.<br>• Initiate new, high-priority engagements with law enforcement, intelligence, and border security agencies in the Sahel and Southeast Asia.<br>• Establish regional technical and maintenance providers in new areas to further sustainability efforts and pursue new investigation support partnerships, including with nuclear newcomer states. | |

## Global Material Security
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 0 | 0 | 0 | 0 |
| Minor Construction | N/A | N/A | 8,000 | 0 | 0 | 0 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **8,000** | **0** | **0** | **0** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 0 | 0 | 0 | 0 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **0** | **0** | **0** | **0** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 0 | 0 | 0 | 0 |
| Enhanced Training Center (ETC), Y-12 | 18,000 | 10,000 | 8,000 | 0 | 0 | 0 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **8,000** | **0** | **0** | **0** |
| **Total, Capital Summary** | **N/A** | **N/A** | **8,000** | **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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Nonproliferation and Arms Control** | | | | | |
| International Nuclear Safeguards | 57,000 | 62,235 | 98,181 | +35,946 | +57.8% |
| Nuclear Export Controls | 36,000 | 35,710 | 36,623 | +913 | +2.6% |
| Nuclear Verification | 34,000 | 33,745 | 36,991 | +3,246 | +9.6% |
| Nonproliferation Policy | 13,000 | 16,310 | 13,000 | -3,310 | -20.3% |
| **Total, Nonproliferation and Arms Control** | **140,000** | **148,000** | **184,795** | **+36,795** | **+24.9%** |

**Nonproliferation and Arms Control**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Nonproliferation and Arms Control** | |
| **International Nuclear Safeguards:** The increase in funding will accelerate the development of the nonproliferation enrichment testing and training platform for use by the International Atomic Energy Agency (IAEA). Activities include repurposing the existing facility, developing operational procedures and training approaches, and preparing it for commissioning in early FY 2024. Funding also will be used to enhance nonproliferation opportunities with foreign partners through targeted peaceful uses engagement projects. | **+35,946** |
| **Nuclear Export Controls:** No significant changes. | **+913** |
| **Nuclear Verification:** The increase in funding will enable the development and maintenance of a nuclear test site verification team, as well as the development of plans for a "stretch verification concept." Funding for the test site verification team will build readiness for future U.S.-led on-site monitoring and verification. Activities will include developing, testing, and evaluating test site verification procedures and technologies; training and exercising U.S. test site verification team members and specialized equipment; and conducting operations planning to maintain short-notice readiness for U.S.-led monitoring and verification of nuclear weapons test sites and associated denuclearization efforts around the world. | **+3,246** |
| **Nonproliferation Policy:** The decrease in funding results from the completion of several major nonproliferation policy studies, as well as a return to baseline funding for Track 1.5 engagements in Southeast Asia and the Middle East. | **-3,310** |
| **Total, Nonproliferation and Arms Control** | **+36,795** |

## 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, promotes Safeguards by Design elements with the U.S. nuclear industry, 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 implement its monitoring and verification mandate in Iran.

**Highlights of the FY 2022 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 its IAEA safeguards commitments and applicable United Nations Security Council resolutions.
- Enhance the capabilities of the nonproliferation enrichment testing and training platform to develop and test technologies and approaches for transfer to the IAEA and in collaboration with select international partners.
- Strengthen the U.S. safeguards technology and human capital base to meet projected U.S. and IAEA resource requirements.
- Develop and incorporate Safeguards by Design elements into advanced reactor designs through targeted engagements with advanced reactor stakeholders (i.e., NRC, DOE-NE, industry, national labs).
- 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 international partners to enable effective and efficient IAEA safeguards implementation around the world.
- Demonstrate first method for long-range secure battery-free data transmission, applied to surveillance of dry storage casks in transport.
- Demonstrate first method for rapidly and directly analyzing uranium particles in environmental swipe samples in the field.
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through capacity building in nuclear safeguards.
- Enhance nonproliferation opportunities with international partners through targeted peaceful uses engagement projects.

**FY 2020 Accomplishments**

- Transferred nine safeguards technology tools, including two to an international partner and seven to the IAEA.
- Maintained implementation of safeguards obligations at DOE facilities through remote means, after the onset of the COVID-19 pandemic.
- Transitioned multiple domestic and international safeguards engagement workshops to remote/virtual delivery.
- Initiated pilot projects with U.S. nuclear medical societies to provide targeted peaceful uses assistance with partner countries.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **International Nuclear Safeguards $62,235,000** | **International Nuclear Safeguards $98,181,000** | **International Nuclear Safeguards +$35,946,000** |
| • 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.<br>• Transfer five safeguards tools to foreign partners or international organizations to meet identified safeguards deficiencies.<br>• Continue developing a nonproliferation enrichment testing and training platform for the development and testing of technologies approaches for transfer to the IAEA.<br>• 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.<br>• Enhance partnerships with the IAEA and advanced nuclear partners to field test advanced safeguards technologies to enhance state declarations and optimize safeguards resource allocations.<br>• 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) integrate features into advanced reactor designs to facilitate the application of IAEA safeguards; (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.<br>• Transfer five safeguards tools to international partners or organizations to meet identified safeguards deficiencies.<br>• Continue developing a nonproliferation enrichment testing and training platform for the development and testing of technologies for transfer to the IAEA.<br>• Improve safeguards concepts and approaches for new facilities and fuel cycles and analyze the implications of emerging technology to international safeguards applications.<br>• Develop and incorporate Safeguards by Design elements into U.S. advanced reactor designs to improve opportunities for international deployment.<br>• Conduct two safeguards technology field tests with advanced nuclear partners to enhance state declarations and optimize safeguards resource allocations.<br>• 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. | • The increase in funding will accelerate the development of the nonproliferation enrichment testing and training platform for use by the International Atomic Energy Agency (IAEA). Activities include repurposing the existing facility, developing operational procedures and training approaches, and preparing it for commissioning in early FY 2024. Funding also will be used to enhance nonproliferation opportunities with foreign partners through targeted peaceful uses engagement projects. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Support non-power peaceful uses activities in the developing world as a means to further enhance safeguards implementation and regulatory effectiveness.<br>• Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories.<br>• 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.<br>• 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.<br>• 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.<br>• Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations.<br>• Lead four 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.<br>• Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories.<br>• 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.<br>• 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.<br>• 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.<br>• Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations.<br>• Lead four U.S. Government assessments of the physical protection of U.S.-obligated nuclear materials at foreign facilities.<br>• Implement lessons learned from the COVID-19 pandemic to facilitate remote or virtual engagements when necessary and where practical and continue to improve e-learning opportunities to expand outreach capabilities. | |

## 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 2022 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 raise awareness of export compliance responsibilities, assist in developing strategies for complying with all U.S. export control laws and regulations, and provide export compliance training to federal employees, their staff and contractors at DOE & NNSA HQ, Field & Site Offices, and sites and facilities.

**FY 2020 Accomplishments**

- Developed and implemented a new process for conducting export license application adjudication during COVID-19. This new process allows NC to continue to meet its Executive Order mandate to adjudicate license cases received from the Department of Commerce within a 30-day window.
- Conducted approximately 30 export control training events for U.S. enforcement agencies and international partners, while adapting training approaches to deliver more online training in FY 2021.
- Partnered with the Departments of State, Commerce, Homeland Security, and Justice to hold an executive dialogue on strategic trade control (STC) issues with the Government of Ukraine.
- Completed approximately 6,000 technical reviews of U.S. export licenses for nuclear and dual-use commodities and approximately 800 technical analyses for interdiction cases and unique analytical products regarding proliferation trends.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nuclear Export Controls $35,710,000** | **Nuclear Export Controls $36,623,000** | **Nuclear Export Controls +$913,000** |
| • 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.<br>• 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 U.S. Customs and Border Protection's (CBP) National Targeting Center. Provide technical reach back to U.S. export enforcement agencies.<br>• 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.<br>• 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.<br>• Maintain and support information technology systems to support export control licensing, | • Engage over 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.<br>• 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.<br>• Incorporate lessons learned from the COVID-19 pandemic, continue the investment and development of remote engagement courses and capabilities as part of a blended learning approach (in-person and remote engagements) to deploy with foreign and domestic partners.<br>• 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.<br>• Support the U.S. Government enforcement community by providing approximately 2,000 | • No significant changes. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| interdiction analysis, and the multilateral nonproliferation export control regimes.<br>• 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.<br>• 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. | technical analyses for interdiction cases per year and unique analytical products regarding proliferation trends.<br>• Maintain and support information technology systems to support export control licensing, interdiction analysis, and the multilateral nonproliferation export control regimes.<br>• Provide technical reviews of proposed transfers of items, materials, goods, and technology to Iran in accordance with applicable United Nations Security Council resolutions.<br>• Continue to implement ECAP which deploys export control awareness training across DOE and NNSA facilities targeted at the Federal workforce, provides export compliance assistance and guidance, and coordinates 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 2022 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 other arms control agreements.
- Maintain technical and manpower readiness for future U.S.-led monitoring and verification of denuclearization activities through strategic tool maintenance and regular verification team exercise and training events.
- 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.
- Develop and maintain a nuclear test site verification team to build readiness for future U.S.-led on-site monitoring and verification activities.

**FY 2020 Accomplishments**

- Implemented DOE/NNSA treaty/agreement obligations and authorities, including DOE obligations under the Plutonium Production Reactor Agreement (PPRA), the Chemical Weapons Convention, and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).
- Supported negotiations, compliance analysis, and implementation of the New Strategic Arms Reduction Treaty (New START) and other arms control agreements.
- Supported work to address the long-term technical challenges of nuclear disarmament verification.
- Maintained technical and manpower readiness for future U.S.-led monitoring and verification of denuclearization activities through strategic tool maintenance and regular verification team exercise and training events.
- Continued development of a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so, determine and assess key event parameters.
- Began developing a nuclear test site verification team to build readiness for future U.S.-led on-site monitoring and verification activities.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nuclear Verification $33,745,000** | **Nuclear Verification $36,991,000** | **Nuclear Verification +$3,246,000** |
| • Support U.S. implementation and compliance analyses and policy development for the New START Treaty and the Open Skies Treaty, and ensured DOE/NNSA equities and interests are protected.<br>• 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 River Site.<br>• 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.<br>• 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.<br>• 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, the Chemical Weapons Convention, and other arms control agreements, and ensure DOE/NNSA equities and interests are protected.<br>• Implement U.S. and DOE/NNSA legal obligations under the Chemical Weapons Convention, including maintaining accreditation of the Organization for the Prohibition of Chemical Weapons (OPCW) laboratory at LLNL.<br>• 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 River Site.<br>• 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.<br>• Provide seismic monitoring capacity-building under the Seismic Cooperation Program to foreign partner institutions to enhance their abilities to detect and analyze possible nuclear | • The increase in funding will enable the development and maintenance of a nuclear test site verification team, as well as the development of plans for a "stretch verification concept." Funding for the test site verification team will build readiness for future on-site monitoring and verification. Activities will include developing, testing, and evaluating test site verification procedures and technologies; training and exercising U.S. test site verification team members and specialized equipment; and conducting operations planning to maintain short-notice readiness for U.S.-led monitoring and verification of nuclear weapons test sites and associated denuclearization efforts around the world. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| of nuclear weapons material production programs and associated denuclearization efforts around the world.<br>• 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.<br>• 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.<br>• 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. | explosions, as well as mitigate geophysical hazards.<br>• 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 of nuclear weapons material production programs and associated denuclearization efforts around the world.<br>• 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.<br>• 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.<br>• Expand training and e-learning where possible to maintain on-site verification readiness capabilities. | |

**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 future nuclear developments and to evolve programmatic responses accordingly.

**Highlights of the FY 2022 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 to 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.

**FY 2020 Accomplishments**

- Processed over 30 Part 810 specific authorization applications and requests for amendments, including end-use and technical reviews and reviewed over 600 specific authorization reports and notifications for compliance with Part 810.
- Finalized Federal Register Notice and Communications Plan for the regulatory rule change to impose monetary civil penalties for violations of the 10 CFR Part 810 as directed by the FY 2019 NDAA.
- Conducted Track 1.5 engagements in South Asia, East Asia, and the Middle East to reduce the danger of nuclear war and discourage the spread of nuclear weapons in critical regions.
- Expanded the reach of South Asia-focused social media and web-based projects to promote U.S. interests in the region to 3.5 million viewers.
- Completed development on version 1.1 of the NSG Information Sharing System Web Application.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nonproliferation Policy $16,310,000** | **Nonproliferation Policy $13,000,000** | **Nonproliferation Policy -$3,310,000** |
| • Process approximately 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.<br>• Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination.<br>• Continue Part 810 Process Improvement procedures, focusing on expanding external outreach and reducing processing times.<br>• 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.<br>• Continue to grow South Asia-focused social media and web-based projects to promote U.S. interests in the region.<br>• Continue work with the 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.<br>• Execute a U.S.-led advanced nuclear technology review of the NSG control lists.<br>• Continue NSG industry outreach activities to establish a consistent dialog with industry on the | • Process approximately 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.<br>• Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination.<br>• Implement the Part 810 enforcement program, including the imposition of monetary civil penalties.<br>• 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.<br>• Continue NSG industry outreach activities to establish a consistent dialog with industry on the impacts of technological and commercial developments on the NSG Guidelines.<br>• Maintain and upgrade the NSG Information Sharing System.<br>• 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.<br>• Continue to grow South Asia-focused social media and web-based projects to promote U.S. interests in the region. | • The decrease in funding results from the completion of several major nonproliferation policy studies, as well as a return to baseline funding for Track 1.5 engagements in Southeast Asia and the Middle East. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| impacts of technological and commercial developments on the NSG Guidelines.<br>• Continue upgrading the NISS Web and Mobile Applications.<br>• Conduct analyses of the impact of NPT-related developments on U.S. nonproliferation interests.<br>• Support implementation of U.S. deliverables for the 2025 NPT Review Cycle.<br>• Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding Administrative Arrangements.<br>• Lead the preparations for the U.S.-Republic of Korea 123 Agreement under the High-Level Bilateral Commission.<br>• Conduct analyses of accountancy information in support of the implementation of 23 bilateral 123 Agreements. | • Support implementation of U.S. deliverables for the 2025 NPT Review Cycle and associated nonproliferation, disarmament, and peaceful uses objectives.<br>• Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding Administrative Arrangements.<br>• Lead the preparations for the U.S.-Republic of Korea 123 Agreement under the High-Level Bilateral Commission.<br>• Conduct analyses of accountancy information in support of the implementation of 24 bilateral 123 Agreements.<br>• Conduct studies and analyses on current and future nonproliferation challenges.<br>• Advance program goals in a limited travel environment, including through delivery of online trainings and engagements, and continued development of existing virtual platforms. | |

## Defense Nuclear Nonproliferation
## National Technical Nuclear Forensics R&D

**Overview**

Technical nuclear forensics is the collection, analysis, and evaluation of pre-detonation and post-detonation nuclear and other radioactive materials, devices, and debris, as well as the immediate effects created by a nuclear detonation. NNSA established DNN's National Technical Nuclear Forensics R&D program in FY 2021 to take on a more active leadership role in nuclear forensics, in partnership with the operational technical nuclear forensics subprogram within NNSA's Nuclear Counterterrorism and Incident Response program.

The FY 2022 Budget Request maintains that role and transfers the DNN National Nuclear Technical Forensics R&D program to a new National Nuclear Technical Forensics R&D subprogram within DNN R&D.

## National Technical Nuclear Forensics R&D
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **National Technical Nuclear Forensics R&D** | **0**[a] | **40,000** | **0**[b] | **-40,000** | **-100.0%** |

Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR):

- FY 2020 Transferred: SBIR: $0; STTR: $0
- FY 2021 Projected: SBIR: $916; STTR: $0
- FY 2022 Request: SBIR: $0; STTR: $0

[a] Prior to FY 2021, funding for technical nuclear forensics R&D was funded under the Nuclear Detonation Detection subprogram within DNN R&D.

[b] Funding for technical nuclear forensics R&D is requested in FY 2022 under the new National Technical Nuclear Forensics R&D subprogram within DNN R&D.

**National Technical Nuclear Forensics R&D**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted |
|---|---|
| **Defense Nuclear Nonproliferation** | |
| **National Technical Nuclear Forensics R&D:** Funding for technical nuclear forensics R&D is requested in FY 2022 under the new National Technical Nuclear Forensics R&D subprogram within DNN R&D. | **-40,000** |
| **Total, National Technical Nuclear Forensics R&D** | **-40,000** |

**Description**

Funding for technical nuclear forensics R&D is requested in FY 2022 under the new National Technical Nuclear Forensics R&D subprogram within DNN R&D.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted |
|---|---|---|
| **National Technical Nuclear Forensics R&D**<br>**$40,000,000** | **National Technical Nuclear Forensics R&D**<br>**$0** | **National Technical Nuclear Forensics R&D**<br>**-$40,000,000** |
| • 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.<br>• Address research priorities that support the technical capability of operational assets and verification and validation activities.<br>• 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.<br>• Reduce timelines and uncertainties in priority measurements.<br>• Inform future capability requirements by assessing the benefits of incorporating emerging technical methods during operational exercises, baseline assessments, and other targets of opportunity.<br>• 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.<br>• 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 | • Funding for National Technical Nuclear Forensics R&D is requested in FY 2022 under the National Technical Nuclear Forensics R&D subprogram within DNN R&D. [$45,000,000] | • The decrease reflects the transfer of funding from the DNN National Nuclear Technical Forensics R&D program to a new National Nuclear Technical Forensics R&D subprogram within DNN R&D. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted |
|---|---|---|
| the nuclear forensics, nuclear science, and stockpile stewardship communities.<br>• Identify specific persistent markers or taggants that do not impact material performance, and develop feasible approaches, including advanced manufacturing techniques, for injecting markers into fabrication process steps.<br>• Discover signatures related to origin, provenance, and design intent of interdicted nuclear material and weapons material components.<br>• Design and implement technical methods that reveal a material's prior processing steps, surface treatments, contacts with other surfaces, and storage conditions.<br>• Explore analytical techniques to characterize recent changes to environmental conditions or exposure to contaminants.<br>• 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 National Technical Nuclear Forensics R&D
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 0 | 7,110 | 0 | -7,110 |
| Minor Construction | N/A | N/A | 0 | 0 | 0 | 0 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **0** | **7,110** | **0** | **-7,110** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 0 | 7,110 | 0 | -7,110 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **0** | **7,110** | **0** | **-7,110** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 0 | 0 | 0 | 0 |
| Minor Construction | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **0** | **0** | **0** | **0** |
| **Total, Capital Summary** | **N/A** | **N/A** | **0** | **7,110** | **0** | **-7,110** |

## 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. In addition, DNN R&D sustains and develops foundational nonproliferation technical competencies that ensure the technical agility needed to support a broad spectrum of U.S. nonproliferation missions and anticipate threats.

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 program also supports foundational capabilities that can be leveraged across nonproliferation, counterterrorism, and emergency response mission areas. In addition, DNN R&D sustains and develops foundational nonproliferation technical competencies by providing targeted, long-term support for enabling infrastructure, science and technology, and an expert workforce. 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 2022 request transfers the FY 2021 DNN National Nuclear Technical Forensics R&D program to a new National Nuclear Technical Forensics R&D subprogram within DNN R&D. Under this subprogram, DNN R&D supports technical nuclear forensics 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.

## Defense Nuclear Nonproliferation Research and Development (DNN R&D)
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Defense Nuclear Nonproliferation R&D** | | | | | |
| Proliferation Detection | 299,046 | 255,000 | 269,407 | +14,407 | +5.6% |
| Nuclear Detonation Detection | 196,617 | 267,000 | 271,000 | +4,000 | +1.5% |
| Nonproliferation Fuels Development | 15,000 | 20,000 | 0 | -20,000 | -100.0% |
| National Technical Nuclear Forensics | 0[a] | 0[b] | 45,000 | +45,000 | 0% |
| Nonproliferation Stewardship Program | 22,500 | 59,900 | 87,329 | +27,429 | +45.8% |
| **Total, Defense Nuclear Nonproliferation R&D** | **533,163** | **601,900** | **672,736** | **+70,836** | **+11.8%** |

Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR):

- FY 2020 Transferred: SBIR: $11,308; STTR: $0
- FY 2021 Projected: SBIR: $12,286; STTR: $0
- FY 2022 Request: SBIR: $13,975; STTR: $0

[a] Prior to FY 2021, technical nuclear forensics R&D was funded under the Nuclear Detonation Detection subprogram within DNN R&D.

[b] In FY 2021, technical nuclear forensics R&D is funded under the DNN National Technical Nuclear Forensics R&D program.

**Defense Nuclear Nonproliferation Research and Development**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Defense Nuclear Nonproliferation Research and Development** | |
| **Proliferation Detection (PD):** The increase reflects the establishment of an emerging and disruptive technologies initiative within Proliferation Detection, and the expansion of activities to develop arms control capabilities and vulnerability assessments. | **+14,407** |
| **Nuclear Detonation Detection (NDD):** No major change. | **+4,000** |
| **Nonproliferation Fuels Development:** No funding is requested to continue this activity in FY 2022. | **-20,000** |
| **National Technical Nuclear Forensics R&D:** The increase reflects the transfer of funding from the DNN National Technical Nuclear Forensics R&D program in FY 2021 to this new subprogram within DNN R&D. The increase also reflects the establishment of a new nuclear forensics R&D university consortium, as part of DNN R&D's University Consortia for Nuclear Nonproliferation, to conduct research and development in science, engineering, and other disciplines to address basic research shortfalls and train the next generation of experts needed to support NNSA's technical nuclear forensics missions. | **+45,000** |
| **Nonproliferation Stewardship Program (NSP):** The increase accelerates continued testbed development addressing immediate capability shortfalls in support of nonproliferation missions and accelerates the development of a modern computing ecosystem that supports advanced material production modeling and simulation capabilities in the DOE Laboratory complex. The increase also accelerates additional targeted, long-term activities building foundational technical competencies needed for high-priority nonproliferation applications, including in weaponization. | **+27,429** |
| **Total, Defense Nuclear Nonproliferation Research and Development** | **+70,836** |

**Description**

The Proliferation Detection (PD) 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.

As part of DNN R&D's University Consortia for Nuclear Nonproliferation, PD supports 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 2022 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, expanding current efforts focusing on arms control and warhead verification and monitoring R&D.
- 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.
- Initiate new arms control and warhead verification and monitoring R&D activities to advance expected arms reduction technical frameworks and enable improved vulnerability assessments.

**FY 2020 Accomplishments**

- Successfully leveraged DP's Stockpile Stewardship activity at the Nevada National Security Site's (NNSS) Big Explosives Experimental Facility (BEEF) and U1a to collect signatures from subcritical experiments.
- Completed planning and preliminary field tests for PE-1, the first integrated field experiment at the Low-Yield Nuclear Monitoring testbed at NNSS, designed to improve U.S. capabilities to detect and characterize low-yield and evasively conducted underground nuclear explosions.
- Demonstrated an autonomously tipped and cued system of sensors designed to persistently collect data against nuclear facilities of interest.
- Conducted a successful field experiment at NNSS focused on testing newly constructed proliferator-relevant equipment.
- Advanced the state-of-the-art for applying artificial intelligence and advanced data analytics to the nuclear nonproliferation problem, demonstrated using real-world interagency datasets.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Proliferation Detection $255,000,000** | **Proliferation Detection $269,407,000** | **Proliferation Detection +$14,407,000** |
| • 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; 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; and accelerate the timeline for large-scale field experimentation to identify and verify signatures of nuclear-related high-explosive tests, collecting against a device that will be built using advanced manufacturing techniques.<br>• 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. Expand ongoing efforts focusing on arms control and warhead verification and monitoring R&D, including initiation of projects to improve the ability to verify warhead declarations under future arms control treaties; to investigate potential new, alternative methods of verify treaties; and to identify arms control gaps and potential future R&D. | • 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.<br>• 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.<br>• Continue expanded efforts focusing on arms control and warhead verification and monitoring R&D, and initiate activities to advance expected arms reduction technical frameworks and enable improved vulnerability assessments to expand U.S. technical options and flexibility in future negotiations.<br>• Continue to support three university consortia to address basic gaps in nuclear nonproliferation and treaty compliance monitoring. | • The increase reflects the establishment of an emerging and disruptive technologies initiative within Proliferation Detection.<br>• The increase also supports new arms control and warhead verification and monitoring R&D activities to advance expected arms reduction technical frameworks and enable improved vulnerability assessments. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| • Support three university consortia to address basic gaps in nuclear nonproliferation and treaty compliance monitoring. | • Establish an emerging and disruptive technologies initiative within Proliferation Detection, focused on building expertise with emerging technologies in the context of varied nuclear nonproliferation missions, to prevent technological surprise and provide opportunities to support nonproliferation and national security more broadly. | |

**Defense Nuclear Nonproliferation Research and Development**
**Nuclear Detonation Detection**

**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 2022 Budget Request**

- Produce nuclear detonation detection satellite payloads in accordance with the negotiated schedule with the Department of the Air Force (DAF).
- 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.

**FY 2020 Accomplishments**

- Supported launches of two GPS-III satellites, containing Global Burst Detector (GBD) payloads, and associated early on-orbit testing.
- Began developing a new testbed to support field experiments designed to improve U.S. capabilities to detect and characterize low yield and evasively conducted underground nuclear explosions.
- Received an R&D 100 Award recognizing advances in radioxenon detection achieved by the subprogram's ground-based nuclear detonation detection research.
- Participated in a nuclear forensics community operational exercise of a post-detonation event, demonstrating the value of new technical methods.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nuclear Detonation Detection $267,000,000** | **Nuclear Detonation Detection $271,000,000** | **Nuclear Detonation Detection +$4,000,000** |
| • Fabricate GBD nuclear detonation detection payloads and test assets for GPS block IIIF satellites in accordance with the negotiated schedule with the DAF. 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.<br>• 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.<br>• Advance 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 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.<br>• 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.<br>• 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.<br>• Begin development of Source Physics Experiment III, aiming to improve the capability to discriminate underground nuclear explosions from natural earthquakes. | • No major change. |

**Description**
Efforts in DNN R&D to design and develop new high-density, high-assay LEU fuels are concluded with FY 2021 funding.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nonproliferation Fuels Development $20,000,000** | **Nonproliferation Fuels Development $0** | **Nonproliferation Fuels Development -$20,000,000** |
| • Continue research and development into high-density, high-assay LEU fuels. | • No funding requested. | • No funding is requested to continue this activity in FY 2022. |

**Description**

The National Technical Nuclear Forensics R&D subprogram supports the 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. The subprogram's R&D includes the collection, analysis, and evaluation of pre-detonation and post-detonation nuclear and other radioactive materials, devices, and debris, as well as the immediate effects created by a nuclear detonation. It also sustains subject matter expertise to support exercises, mentoring, training, expert reach-back, and real-world contingency operations.

The FY 2022 request transfers the FY 2021 DNN National Nuclear Technical Forensics R&D program to this new National Nuclear Technical Forensics R&D subprogram within DNN R&D.

**Highlights of the FY 2022 Budget Request**

- Develop advanced technical nuclear forensics analysis capabilities that support U.S. Government response to a nuclear or radiological event.
- Establish a new nuclear forensics R&D university consortium, as part of DNN R&D's University Consortia for Nuclear Nonproliferation, to conduct research and development in science, engineering, and other disciplines to address basic research shortfalls and train the next generation of experts needed to support NNSA's technical nuclear forensics missions.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **National Technical Nuclear Forensics $0** | **National Technical Nuclear Forensics $45,000,000** | **National Technical Nuclear Forensics +$45,000,000** |
| • National Technical Nuclear Forensics R&D is funded in FY 2021 under the DNN National Technical Nuclear Forensics R&D program. [$40,000,000] | • 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.<br>• Address research priorities that support the technical capability of operational assets and verification and validation activities.<br>• 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.<br>• Reduce timelines and uncertainties in priority measurements.<br>• Inform future capability requirements by assessing the benefits of incorporating emerging technical methods during operational exercises, baseline assessments, and other targets of opportunity.<br>• 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.<br>• 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.<br>• Identify specific persistent markers or taggants that do not impact material performance, and | • The increase reflects the transfer of funding for technical nuclear forensics R&D from the DNN National Nuclear Technical Forensics R&D program to this new subprogram within DNN R&D.<br>• The increase also establishes a new nuclear forensics R&D university consortium, partnered with DOE National Laboratories, to conduct research and development in science, engineering, and other disciplines to address basic research shortfalls and train the next generation of experts needed to support NNSA's technical nuclear forensics missions. |

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| | develop feasible approaches, including advanced manufacturing techniques, for injecting markers into fabrication process steps.<br>• Discover signatures related to origin, provenance, and design intent of interdicted nuclear material and weapons material components.<br>• Design and implement technical methods that reveal a material's prior processing steps, surface treatments, contacts with other surfaces, and storage conditions.<br>• Explore analytical techniques to characterize recent changes to environmental conditions or exposure to contaminants.<br>• 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.<br>• Establish a new nuclear forensics R&D university consortium, partnered with DOE National Laboratories, to conduct research and development in science, engineering, and other disciplines to address basic research shortfalls and train the next generation of experts needed to support NNSA's technical nuclear forensics missions. | |

## Defense Nuclear Nonproliferation Research and Development
## Nonproliferation Stewardship Program

**Description**

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 recognizes that 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. To ensure the technical agility needed to support nonproliferation missions and anticipate 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 2022 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 anticipate threats through relevant science and technology, testbeds and research environments, and modern expertise needed for high-priority nonproliferation applications, including nonproliferation competencies in uranium and weaponization sciences and engineering.

**FY 2020 Accomplishments**

- Initiated the first quadrennial Nonproliferation Competency Baseline study to determine nonproliferation priorities and capabilities gaps.
- Initiated infrastructure upgrades and hardware initiatives to create a modern computing ecosystem that supports advanced material production modeling and simulation capabilities in the DOE Laboratory complex.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Nonproliferation Stewardship Program $59,900,000** | **Nonproliferation Stewardship Program $87,329,000** | **Nonproliferation Stewardship Program +$27,429,000** |
| • Support testbed development needed to address immediate capability shortfalls in support of nonproliferation missions.<br>• Support infrastructure upgrades and hardware initiatives to create a comprehensive, physics-based computational model that can predict the output of an entire uranium enrichment system based on the specific design of a single machine.<br>• 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.<br>• Conduct program planning, including establishment of a strategic implementation plan to build and sustain foundational nonproliferation technical competencies. | • Continue testbed development addressing immediate capability shortfalls in support of nonproliferation missions.<br>• Continue infrastructure upgrades and hardware initiatives to create a modern computing ecosystem that supports advanced material production modeling and simulation capabilities in the DOE Laboratory complex.<br>• Continue supporting targeted, long-term activities building foundational technical competencies needed for high-priority nonproliferation applications, including in uranium and plutonium sciences and engineering, by developing testbeds and research environments, conducting relevant science and technology, and building modern expertise.<br>• Conduct annual reviews evaluating progress toward building foundational nonproliferation technical competencies. | • The increase accelerates continued testbed development addressing immediate capability shortfalls in support of nonproliferation missions.<br>• The increase accelerates by the development of a modern computing ecosystem that supports advanced material production modeling and simulation capabilities in the DOE Laboratory complex.<br>• The increase also accelerates additional targeted, long-term activities building foundational technical competencies needed for high-priority nonproliferation applications, including in weaponization, by developing testbeds and research environments, conducting relevant science and technology, and building modern expertise. |

## Defense Nuclear Nonproliferation Research and Development
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 46,332 | 47,352 | 48,394 | +1,042 |
| Minor Construction | N/A | N/A | 24,677 | 0 | 0 | 0 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **71,009** | **47,352** | **48,394** | **+1,042** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 46,332 | 47,352 | 48,394 | +1,042 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **46,332** | **47,352** | **48,394** | **+1,042** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 0 | 0 | 0 | 0 |
| LYNM PE-1 - Infrastructure Upgrades, NNSS | 6,777 | 0 | 6,777 | 0 | 0 | 0 |
| Nonproliferation Testbed Tunnel Excavation, NNSS | 17,900 | 0 | 17,900 | 0 | 0 | 0 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **24,677** | **0** | **0** | **0** |
| **Total, Capital Summary** | **N/A** | **N/A** | **71,009** | **47,352** | **48,394** | **+1,042** |

## 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.

The Department is 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 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Nonproliferation Construction** | | | | | |
| **U.S. Construction** | | | | | |
| **99-D-143, Mixed Oxide (MOX) Fuel Fabrication Facility, SRNS** | | | | | |
| MOX Total Estimated Cost (TEC) | 0 | 0 | 0 | 0 | 0% |
| MOX Other Project Costs (OPC) | 220,000 | 0 | 0 | 0 | 0% |
| **Subtotal, 99-D-143, Mixed Oxide Fuel Fabrication Facility** | **220,000** | **0** | **0** | **0** | **0%** |
| **18-D-150, Surplus Plutonium Disposition Project (SPD), SRNS** | | | | | |
| SPD Total Estimated Cost (TEC) | 54,000 | 118,000 | 145,784 | +27,784 | +23.5% |
| SPD Other Project Costs (OPC) | 25,000 | 30,589 | 10,216 | -20,373 | -66.6% |
| **Subtotal, 18-D-150, Surplus Plutonium Disposition Project** | **79,000** | **148,589** | **156,000** | **+7,411** | **+5.0%** |
| **Subtotal, U.S. Construction** | **299,000** | **148,589** | **156,000** | **+7,411** | **+5.0%** |
| **Total, Nonproliferation Construction** | **299,000** | **148,589** | **156,000** | **+7,411** | **+5.0%** |

**Nonproliferation Construction Projects**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Nonproliferation Construction Projects** | |
| **U.S. Construction:** | |
| **18-D-150, Surplus Plutonium Disposition (SPD) Project:** The increase supports the completion of a final design for Critical Decision (CD) 2/3, Approve Performance Baseline and Start of Construction and additional site preparation activities. | **+$7,411** |
| **Total, Nonproliferation Construction Projects** | **+$7,411** |

**Nonproliferation Construction**
**U.S. Construction**

**Description**
The Nonproliferation Construction program will continue contract and financial closeout for 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.

NNSA continues transition of the stewardship and disposition of the MOX project's property, plant, equipment and records by the Management and Operating (M&O) contractor. The Department 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 Services contract. The settlement amount was $186 million and completed closeout nearly two years ahead of projections. The comprehensive settlement agreement resolved all legal issues with the exception of potential claims under the False Claims Act, or for any civil or criminal fraud. Final physical project termination and asset disposition remains on schedule to completed by FY 2021. Close out activities (contractual and financial) will be completed in FY 2022 with available prior year balances.

In FY 2021, the SPD project will complete CD-3A Phase 1 early site preparation and complete the CD-3A Phase 2 long-lead equipment approval process to initiate procurement activities. The project will also complete the final design and project documentation required to continue additional site preparation activities or other subprojects as deemed appropriate.

In FY 2022, the SPD project will complete design of all major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, fire detection/suppression, security, etc.). In addition, the project will complete the 90% formal design review and will achieve CD-2/3 to start construction. The first glovebox will be fabricated and shipped along with the HEPA Filter Housings and Diesel Generator. The project will complete Site Preparation activities which include all remaining demolition and removal activities, final security modifications required for construction, and remaining preparations to enable installation of the second floor at the beginning of construction with the installation of gloveboxes immediately following. The project will also continue supporting National Environmental Policy Act (NEPA) requirements, technology maturation, risk management, and project management.

**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.

**Highlights of the FY 2022 Budget Request**
- Complete early site preparation activities for the SPD Project.
- Complete final design to support Critical Decision (CD) – 2/3, Approve Performance Baseline/Approve Start of Construction, for the SPD Project.
- Complete contract and financial closeout for the MOX project with available prior-year balances.

**FY 2020 Accomplishments**
- Completed final contract settlement on the MOX project.
- Completed disposition of all MOX property remaining at vendor shops when the MOX Services contract was terminated.
- Completed entering over 10 million units of MOX personal property into the government screening process.

- Completed a structural review of the MFFF building and determined that the structure can be used for a future nuclear mission.
- Reduced the MOX Complex Area footprint by over 1.5 million square feet through the disposition of personal and real property.
- Completed CD-1 and CD-3A approval for the SPD Project.
- Completed design for the long-lead equipment for the SPD Project.
- Initiated field work for site preparation, demolition and removal, and security modifications for the SPD Project.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **U.S. Construction $148,589,000** | **U.S. Construction $156,000,000** | **U.S. Construction +$7,411,000** |
| **18-D-150, Surplus Plutonium Disposition (SPD) Project $148,589,000** | **18-D-150, Surplus Plutonium Disposition (SPD) Project $156,000,000** | **18-D-150, Surplus Plutonium Disposition (SPD) Project +$7,411,000** |
| **SPD OPC $30,589,000** | **SPD OPC $10,216,000** | **SPD OPC -$20,373,000** |
| • Supports activities such as project management and project controls support, procurement support, design authority activities, operations and security support, and start-up planning. | • Continue to support activities such as project management and project controls support, procurement support, design authority activities, operations and security support, and start-up planning using funding reprogrammed from MOX. | • Decrease reflects the reduction of other project cost (OPC) activities as the project moves into the next critical decision (CD) phase. |
| **SPD TEC $118,000,000** | **SPD TEC $145,784,000** | **SPD TEC +27,784,000** |
| • Supports Preliminary Design.<br>• Continues design of gloveboxes and specialized engineered electrical equipment.<br>• Completes the final design and project documentation required to support a third phase of CD-3A. | • Continue long-lead procurements.<br>• Complete final design for CD-2/3.<br>• Complete approval of CD-2/3.<br>• Complete fabrication and delivery of first glovebox. | • Increase supports continuation of long-lead procurements, additional site preparation activities, and the completion of final design for CD-2/3. |

## Nonproliferation Construction
## Construction Projects Summary

(Dollars in Thousands)

| | Total | Prior Years[a] | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **18-D-150 Surplus Plutonium Disposition Project, SRS** | | | | | | |
| Total Estimated Cost (TEC) | 474,710 | 0 | 54,000 | 118,000 | 145,784 | 27,784 |
| Other Project Cost (OPC) | 145,382 | 37,482 | 25,000 | 30,589 | 10,216 | -20,373 |
| **Total Project Cost, 18-D-150 Surplus Plutonium Disposition Project, SRS** | **620,092** | **37,482** | **79,000** | **148,589** | **156,000** | **+7,411** |
| **99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS** | | | | | | |
| Total Estimated Cost (TEC) | 5,503,520 | 5,503,520 | 0 | 0 | 0 | 0 |
| Other Project Cost (OPC) | 796,333 | 576,333 | 220,000 | 0 | 0 | 0 |
| **Total Project Cost, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS** | **6,299,853** | **6,079,853** | **220,000** | **0** | **0** | 0 |
| **Total All Construction Projects** | | | | | | |
| Total Estimated Cost (TEC) | 5,978,230 | 5,503,520 | 54,000 | 118,000 | 145,784 | +27,784 |
| Other Project Cost (OPC) | 941,715 | 613,815 | 245,000 | 30,589 | 10,216 | -20,373 |
| **Total Project Cost (TPC) All Construction Projects** | **6,919,945** | **6,117,335** | **299,000** | **148,589** | **156,000** | **+7,411** |

[a] Prior Year OPCs have been updated from the FY 2021 Nonproliferation Construction CJ to reflect actuals.

**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 2022 Request for the Surplus Plutonium Disposition project is $156M. Outyear funding requirements may change when the project is baselined in FY 2022.

The top end of the cost range is $620M, with a schedule complete range of FY 2026 to FY 2028.

Funding for this project is controlled at the Total Project Cost (TPC) level. Project funds may be used for design, construction, or other project costs.

**Significant Changes**[a]
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2021 CPDS and is not a new start. 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.

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, a fourth phase will be included as part of the CD-3A phased package to include additional long lead procurement items to support the early completion of the project.

A Federal Project Director (FPD) has been assigned to this project.

In FY 2021, the project will complete CD-3A Phase 1 early site preparation, as well as complete the CD-3A Phase 2 long-lead equipment approval process and initiate procurements activities. The project will also complete the final design and project documentation required to continue additional site preparation activities and subprojects.

In FY 2022, the project will complete design of all major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, fire detection/suppression, security, etc.). In addition, the project will complete the 90% formal design review, complete the final design in advance of CD-2/3, Approval of Project Baseline and Initiation of Construction, and will achieve CD-2/3 to start construction. The first glovebox will be fabricated and shipped along with the HEPA Filter Housings and Diesel Generator. The project will complete site preparation activities which includes all remaining demolition and removal activities, final security modifications required for construction, and remaining preparations to enable installation of the second floor at the beginning of construction with the installation of gloveboxes immediately following.

In FY 2022, the project will also complete environmental documents and permits, fire protection documents, and obtain approval from the Head of Field Element. Additionally, the project will complete nuclear safety and criticality documentation, obtain approval from the Safety Basis Approval Authority, complete the operations plan, and final vulnerability and dose assessments. The project will continue risk and project management, and planning for testing, start-up, and operations.

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.

[a] Funding and schedules shown throughout the CPDS are estimates and consistent with the high end of the cost range.

**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 |
| FY 2022 | 10/31/1997 | 9/30/2019 | 12/19/2019 | 4QFY2022 | 2QFY2022 | 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 |
| FY 2022 | 4QFY2022 | 2/13/2020 |

**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 |
| FY 2022 | 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 conceptual design. A Risk Management Plan (RMP) and a Risk and Opportunity Assessment Report (ROAR) were approved for the project and are updated as needed. 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 strategy 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**

[a] Key Performance Parameters will be finalized upon approval of the project baseline.

**3. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2020 | 29,000 | 29,000 | 21,140 |
| FY 2021 | 39,000 | 39,000 | 29,109 |
| FY 2022 | 21,189 | 21,189 | 38,940 |
| **Total Design** | **89,189** | **89,189** | **89,189** |
| Construction | | | |
| FY 2020 | 25,000 | 25,000 | 18,750 |
| FY 2021 | 79,000 | 79,000 | 67,288 |
| FY 2022 | 124,595 | 124,595 | 88,490 |
| Outyears | 156,926 | 156,926 | 210,993 |
| **Total, Construction** | **385,521** | **385,521** | **385,521** |
| Total Estimated Costs (TEC) | | | |
| FY 2020 | 54,000 | 54,000 | 39,890 |
| FY 2021 | 118,000 | 118,000 | 96,397 |
| FY 2022 | 145,784 | 145,784 | 127,430 |
| Outyears | 156,926 | 156,926 | 210,993 |
| **Total TEC** | **474,710** | **474,710** | **474,710** |
| Other Project Costs[a] | | | |
| FY 2017[c] | 5,750 | 5,750 | 4,225 |
| FY 2018[c] | 6,732 | 6,732 | 7,415 |
| FY 2019 | 25,000 | 25,000 | 20,267 |
| FY 2020 | 25,000 | 25,000 | 25,000 |
| FY 2021 | 30,589 | 30,589 | 27,590 |
| FY 2022 | 10,216 | 10,216 | 10,470 |
| Outyears | 42,095 | 42,095 | 50,415 |
| **Total OPC** | **145,382** | **145,382** | **145,382** |
| **Total Project Costs (TPC)** | | | |
| FY 2017[c] | 5,750 | 5,750 | 4,225 |
| FY 2018[c] | 6,732 | 6,732 | 7,415 |
| FY 2019 | 25,000 | 25,000 | 20,267 |
| FY 2020[b] | 79,000 | 79,000 | 64,890 |
| FY 2021 | 148,589 | 148,589 | 123,987 |
| FY 2022 | 156,000 | 156,000 | 137,900 |
| Outyears | 199,021 | 199,021 | 261,408 |
| **Grand Total** | **620,092** | **620,092** | **620,092** |

[a] Budget authority shown for FY 2017 through FY 2019 for other project costs was 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.
[c] FY 2017 and 2018 actual costs corrected from the FY 2020 and FY 2021 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 | 80,314 | N/A |
| Contingency | 8,875 | 8,875 | N/A |
| **Total, Design** | **89,189** | **89,189** | **N/A** |
| Construction | | | |
| Site Work | 61,255 | 61,255 | N/A |
| Long Lead Equipment | 21,329 | 21,329 | N/A |
| Equipment | 21,737 | 21,737 | N/A |
| Other Construction | 209,150 | 209,150 | N/A |
| Contingency | 72,050 | 72,050 | N/A |
| **Total, Construction** | **385,521** | **385,521** | **N/A** |
| **Total Estimated Cost** | **474,710** | **474,710** | **N/A** |
| *Contingency, TEC* | **80,925** | **80,925** | **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 | 25,905 | N/A |
| Other OPC Costs | N/A | N/A | N/A |
| NNSA Other Direct Costs | 19,600 | 19,600 | N/A |
| Execution/Start-up Phase | 11,139 | 11,139 | N/A |
| Startup and Training | 18,111 | 18,111 | N/A |
| CD-3A Phase - Support | 7,430 | 7,430 | N/A |
| CD-3A Phase Design OPC Support | 6,452 | 6,452 | N/A |
| Preliminary / Final Design Phase OPC Support | 43,659 | 43,659 | N/A |
| Contingency | 10,746 | 10,746 | N/A |
| **Total, OPC** | **145,382** | **145,382** | **N/A** |
| *Contingency, OPC* | 10,746 | 10,746 | N/A |
| **Total Project Cost** | **620,092** | **620,092** | **N/A** |
| ***Total Contingency (TEC+OPC)*** | **91,671** | **91,671** | **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 | Outyears | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 15,000 | 47,000 | 46,000 | 56,000 | 85,000 | 62,000 | 62,000 | 0 | 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 | 14,750 | 59,000 | 59,000 | 59,000 | 74,750 | 62,000 | 62,000 | 0 | 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 | 37,482 | 79,000 | 65,000 | 74,750 | 62,000 | 62,000 | 62,000 | 0 | 588,803 |
| 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 | 37,482 | 79,000 | 148,589 | 115,705 | 101,779 | 101,192 | 36,345 | 0 | 620,092 |
| FY 2022 | TEC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | 156,926 | 156,926 |
| | OPC | N/A | N/A | N/A | N/A | TBD | TBD | TBD | 42,095 | 42,095 |
| | TPC | 37,482 | 79,000 | 148,589 | 156,000 | TBD | TBD | TBD | 199,021 | 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 to use the Savannah River Site Management and Operating (M&O) contractor for the design and construction of the SPD Project.

## Nuclear Counterterrorism and Incident Response Program

**Overview**

Protecting the United States and its citizens from nuclear terrorism and incidents or accidents involving the release of radiological material is an enduring mission for the National Nuclear Security Administration (NNSA). The NNSA Nuclear Counterterrorism and Incident Response (NCTIR) Program evaluates and assesses nuclear and radiological threats and 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** provides both the structure and processes to ensure a comprehensive and integrated approach to emergency management and continuity of operations, thereby safeguarding the health and safety of workers and the public, protecting the environment, and enhancing the resilience of the Department and the Nation. In addition, EO coordinates a whole-of-community approach to mitigating, preventing, preparing for, responding to, and recovering from all-hazards emergencies, improving readiness and effectiveness of the DOE Emergency Management System on a programmatic and performance level, while promoting unity of effort and a culture of continuous improvement. In FY 2021, responsibility and oversight for the Emergency Communication Network (ECN) shifted to the NNSA Office for Information Management. The FY 2022 Budget Request reflects the proposed realignment of funding to the Information Technology and Cybersecurity Program within Weapons Activities.

- 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, or mitigate the consequences of nuclear and radiological incidents and accidents in the United States and abroad. The following subprograms support CTCP:

    - The Nuclear Incident Response (NIR)/ Nuclear Emergency Support Team (NEST) subprogram provides flexible and effective response and technical reachback capabilities for any nuclear/radiological incident or accident in the United States or abroad by applying the unique technical expertise in NNSA's nuclear security enterprise. These missions require that highly trained response personnel and specialized technical equipment are ready to deploy to provide an integrated response for nuclear weapon accidents, counter-weapons of mass destruction (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 maintains the operational capability for the pre-detonation device technical nuclear forensics program and provides operational support to the post-detonation and Bulk Special Nuclear Materials (SNM) Analysis technical nuclear forensics programs. The NTNF subprogram maintains mission readiness, institutionalizes roles and responsibilities, and provides operational support for pre-detonation and post-detonation nuclear forensics and attribution processes. NNSA work in this area includes training and exercises for responders, equipment procurement, maintenance, logistics, technical integration, readiness to deploy pre- and post-detonation response teams, readiness of device assessment teams, and readiness to conduct bulk actinide laboratory analysis of nuclear or radiological material as well as maintaining the National Nuclear Material Archive (NNMA) which, through identifying and analyzing high value target samples, supports NTNF analysis of interdicted materials. 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. This subprogram develops and sustains 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 collaborate with interagency partners to provide a whole-of-government response. Nuclear forensics is often the only method of attributing the origin of these threats. Combined with strategic communications with our partners and allies, this national capability provides deterrence of state-supported nuclear terrorism and other "unattributed nuclear events," strengthens nuclear security and

nonproliferation norms, informs conventional consequence management operations, and enables decision makers to hold adversaries accountable.

- The Counterterrorism Response and Capacity Building subprogram leverages NNSA's technical expertise to strengthen preparedness and capabilities to respond to all manner of radiological or nuclear incidents, accidents, and terrorism 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 Threat Science subprogram provides the nation's technical capability to understand and defeat nuclear threat devices, including improvised nuclear devices (IND), radiological dispersal devices (RDD), and lost or stolen foreign nuclear weapons, as well as to develop foundational technologies supporting nuclear counterproliferation efforts. Nuclear Threat Science maintains this technical capability by 1) assessing nuclear threat device concepts; 2) evaluating protection requirements for nuclear materials; 3) conducting classified Nuclear Threat Reduction (NTR) technical and policy exchanges with the United Kingdom and France; and 4) improving WMD device defeat capabilities. Technical work on device assessment also supports the Department of Defense (DoD), Federal Bureau of Investigation (FBI), and Intelligence Community in policy, planning, analytic, and operational capabilities.

## Nuclear Counterterrorism and Incident Response Program
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Nuclear Counterterrorism & Incident Response Program** | | | | | |
| Emergency Operations | 35,545 | 36,000 | 14,597 | -21,403 | -59.5% |
| Counterterrorism and Counterproliferation | | | | | |
| Nuclear Incident Response / Nuclear Emergency Support | 202,149 | 206,558 | 207,700 | +1,142 | +0.6% |
| National Technical Nuclear Forensics | 19,110 | 40,000 | 41,140 | +1,140 | +2.9% |
| Counterterrorism Response and Capacity Building | 9,105 | 9,655 | 10,200 | +545 | +5.6% |
| Nuclear Threat Science | 70,686 | 85,300 | 97,145 | +11,845 | +13.9% |
| AMS Recapitalization | 35,500 | 0 | 0 | | |
| Subtotal, Counterterrorism and Counterproliferation | **336,550** | **341,513** | **356,185** | **+14,672** | **+4.3%** |
| **Total, Nuclear Counterterrorism & Incident Response Program** | **372,095** | **377,513** | **370,782** | **-6,731** | **-1.8%** |

**Nuclear Counterterrorism and Incident Response Program**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|
| **Nuclear Counterterrorism and Incident Response Program** | |
| **Emergency Operations:** The decrease reflects the realignment of management responsibility and authority for IT and Cyber services and solutions for the Emergency Communications Network (ECN) from the NCTIR program to the IT and Cybersecurity program within Weapons Activities. | **-21,403** |
| **Counterterrorism and Counterproliferation:** Sustains and improves scientific understanding of nuclear threat devices and supports and expands development of technologies to slow, halt, and prevent advancement of nuclear weapons-related efforts (+$11.845M); sustains and enhances Nuclear Emergency Support Team (NEST) emergency response capabilities (+$1.142M); sustains current nuclear forensics response capabilities and continues increasing NNSA's role in the forensics community (+1.140M); and increases the number and scope of high-priority international training and outreach activities (+$0.545M). | **+14,672** |
| **Total, Nuclear Counterterrorism and Incident Response Program** | **-6,731** |

## Nuclear Counterterrorism and Incident Response Program
## Emergency Operations

**Description**

The Emergency Operations subprogram is DOE's Office of Primary Interest (OPI) for several unique and mandated Emergency Management and Continuity capabilities including:

- Consolidated Emergency Operations Center
- Unified Coordination Group
- Continuity of Government Programs
- Enduring Constitutional Government Programs
- Federal Mission Resilience Strategy

The FY 2022 Budget Request will focus HQ EO activities and resources across four subprograms:

- The Emergency Management Policy subprogram develops and implements emergency management policy, directives, guidance, and plans for DOE and NNSA, assists Headquarters, Field Elements, and facility contractors in implementing effective emergency management programs in compliance with DOE policies, and leads the exchange of Management and Operating (M&O) best practices via the Emergency Management Issues Special Interest Group (EMI-SIG).

- The Emergency Management Programs subprogram implements, manages, and coordinates a readiness assurance program to ensure the DOE emergency management program is executed in accordance with directives, regulations, policies, and applicable laws. The program develops, leads, and evaluates national level exercises, performs periodic oversight functions on behalf of Field Element Managers in accordance with the Chief of Defense Nuclear Safety and facilitates cross-cutting emergency management related collaboration via the Federal Officials Emergency Management Advisory Committee (EMAC).

- The Continuity Programs subprogram executes DOE and NNSA Continuity of Operations (COOP), Continuity of Government (COG), and Enduring Constitutional Government (ECG) programs to advance the National Continuity Policy, and ensures availability and interoperability of continuity communications systems across DOE/NNSA. In addition, the subprogram, along with interagency partners, deploys continuity capabilities during "with-notice" or "no-notice" emergencies and National Special Security Events, including the Presidential Inauguration and State of the Union Address, and in accordance with Executive Order 13961, "Governance And Integration Of Federal Mission Resilience", advances implementation of the Federal Mission Resilience Strategy (FMRS) across the enterprise

- The Consolidated Emergency Operations Center (CEOC) subprogram operates and maintains the Department's Emergency Watch Office, a single point-of-contact regarding local and national emergencies, heightened international tension, Departmental emergencies, natural disasters, and acts of terrorism. The program ensures that the Secretary of Energy, the Deputy Secretary, the Administrator, Program Secretarial Officers, and Field and Site Managers are kept fully and currently informed about emergency matters, serves as Unified Coordination Structure (UCS) Activation and Coordination Element (ACE), and staffs a cadre of Emergency Management Specialists responsible for whole-of-department emergency management support.

**Highlights of the FY 2022 Budget Request**

- Lead, manage, and operate the DOE/NNSA Consolidated Emergency Operations Center.
- Mature the Emergency Management Readiness Assurance Reporting Program.
- Advance emergency management, continuity of operations, and technical qualification programs.
- Lead the design and development of the DOE National Level Exercise, Eagle Horizon 2022.
- Institutionalize the Federal Mission Resilience Strategy (FMRS), to include a viable Devolution capability.
- Ensure interoperability of emergency communications systems across DOE/NNSA and with interagency partners.
- Update and validate emergency management and continuity directives, guides, and technical planning basis standards.
- Enhance the security and resilience of the Department and Nation.

**FY 2020 Accomplishments**

- Led COVID-19 pandemic emergency management response and recovery planning.
- Developed over 500 Pandemic Situation Reports and Senior Leadership Briefings.
- Delivered comprehensive COVID-19 Common Operating Picture to all headquarters elements, labs, plants, and sites, their surrounding communities, and the interagency.
- Established and led an NNSA COVID-19 Recovery Working Group.
- Drafted substantial portions of NNSA's COVID-19 Recovery Plan.
- Developed the DOE Reopening Reporting Criteria “Stoplight Chart.”
- Institutionalized the Emergency Management Readiness Assurance Reporting Tool.
- Driver of Federal Mission Resilience Strategy (FMRS) across the Department and the inter-agency.
- Ensured interoperability of continuity communications systems across DOE/NNSA and with interagency partners.
- Updated and validated emergency management and continuity orders, directives, guides, and technical planning basis standards.

**Activities and Explanation of Changes**

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Emergency Operations $36,000,000** | **Emergency Operations $14,597,000** | **Emergency Operations -$21,403,000** |
| • Execute Continuity of Operations and Government Programs.<br>• Implement a Unified Coordination Structure.<br>• Provide ECN dedicated communications capabilities in support of the global emergency management and response mission of the DOE/NNSA and its Government partners.<br>• 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.<br>• 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 Continuity of Government Programs.<br>• Implement the Unified Coordination Structure.<br>• Operate the Consolidated Emergency Operations Center.<br>• Expand Emergency Management Site Liaison Programs.<br>• Promote and assess readiness across all DOE/NNSA Headquarters/Labs/ Plants/ and Sites' Emergency Management Programs.<br>• Integrate Federal Mission Resilience Strategy into Departmental day-to-day operations.<br>• Revise DOE Order 151.1 D "Comprehensive Emergency Management System."<br>• Revise DOE Order 150.1A "Continuity Programs." | • Decrease reflects transfer of the Emergency Communications Network (ECN) to IT and Cybersecurity program within Weapons Activities. |

**Description**

The Counterterrorism and Counterproliferation (CTCP) subprogram provides technical expertise, practical tools, and scientifically informed policy recommendations 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 and respond to 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, respond to, and where possible mitigate nuclear or radiological incidents domestically and abroad. NNSA's strategic approach to 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 the Department of Homeland Security (DHS), the Federal Emergency Management Agency (FEMA), the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), DoD, FBI, and the Intelligence Community 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. CTCP accomplishes this mission by ensuring the appropriate infrastructure is in place to provide command, control, coordination, and communications of NNSA nuclear incident response assets. Incident response personnel must be properly organized, trained, and equipped to rapidly deploy in response to 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 or radiological 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. This Budget Request continues implementation of the Capability Forward initiative, provides support for comprehensive program activities to enhance the capabilities of regional FBI counter-WMD teams to take decisive action against a WMD device, and will enhance 14 cities with decisive WMD defeat capabilities, accelerating life-saving responses to nuclear and radiological threats.

Funding in the FY 2022 Request will continue to address NEST public health and safety capability needs. 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 the operational capability for the pre-detonation device technical nuclear forensics program and provides operational support to the post-detonation and Bulk Special Nuclear Materials (SNM) Analysis technical nuclear forensics programs. The NTNF subprogram maintains mission readiness, institutionalizes roles and responsibilities, and provides operational support for pre-detonation and post-detonation nuclear forensics and attribution programs. NNSA's work in this area includes training and exercises for responders, equipment procurement, maintenance, logistics, technical integration, readiness to deploy pre- and post-detonation response teams, readiness of device assessment teams, and readiness to conduct laboratory analysis of nuclear or radiological material. This nuclear forensics funding also allows for further development of the National Nuclear Material Archive (NNMA) to ensure historical samples of nuclear materials of value may be identified, prioritized, stored, and analyzed. Comparative analysis of these materials significantly aids the evaluation of interdicted pre-detonation materials or post-detonation samples and thus enhance technical nuclear forensics capabilities for attribution.

These programs develop and maintain operational and scientific expertise at the National Laboratories to support whole-of-government nuclear forensics response activities and the associated attribution. Credible nuclear forensics capabilities constitute an essential element of the nation's nuclear deterrence strategy, helping to dissuade foreign states from supporting or facilitating non-state actors' acquisition of nuclear materials, either wittingly or unwittingly. National-level requirements to support nuclear forensics are outlined in presidential policies that specify interagency roles and responsibilities to maintain mission readiness and provide capabilities for operational response, analysis, and assessment in support of attribution. NNSA activities in this area include training and exercises for responders and equipment procurement and maintenance to ensure the capability to activate laboratory teams and deploy response teams, as well as continued development of the NNMA to identify, analyze, and store valuable historical samples of nuclear materials.

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.

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 Threat Science** subprogram provides the nation's technical capability to understand and defeat nuclear threat devices, including improvised nuclear devices (INDs), radiological dispersal devices (RDD), and lost or stolen foreign nuclear weapons. Nuclear Threat Science maintains and advances this technical capability through partnerships with NNSA's nuclear weapons design laboratories and production facilities and through technically and policy exchanges with the United Kingdom and France. Nuclear Threat Science also conducts focused science on explosive and nuclear material behaviors. In particular, Nuclear Threat Science performs integrated experiments as part of risk assessments of nuclear materials and nuclear threat devices in support of interagency and international partners. Collectively, this work shapes the United States' understanding of nuclear terrorism threats and nuclear proliferation threats. This understanding is used to support policies and procedures to improve nuclear material protection and the technical capabilities available for crisis operations.

The Nuclear Threat Science subprogram informs policies and procedures across multiple departments and agencies and is coordinated across NNSA and within the U.S. interagency to ensure maximum alignment with agreed-upon joint goals and ongoing programs.

This FY 2022 Budget Request enhances NNSA's laboratory capabilities (e.g., modeling/simulation, tools, expertise) for highly specialized nuclear threat science assessments, while improving predictive capabilities in support of crisis operations. Nuclear Threat Science will conduct scientific studies, including integrated experiments with the NNSA Office of Defense Programs, to ensure that material security and risk management policies and missions are informed by defensible and relevant assessments of potential threats. This subprogram 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 Budget 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 and nuclear proliferation risks.

**Highlights of the FY 2022 Budget Request**

- Conduct Stabilization operations activities and continue implementation of the Capability Forward initiative to enhance regional FBI counter-WMD teams' ability to defeat WMD devices by providing specialized technology and training. 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 increase the number of U.S. cities covered by this enhanced capability. 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 potential 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.
- Procure 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, prioritize, consolidate, and analyze historical nuclear material samples of value within the NNMA.
- Advance the nation's technical capability to: understand and defeat nuclear threat devices, including INDs, RDDs, and lost or stolen nuclear weapons; advise on protection requirements for nuclear materials; and prevent nuclear terrorism through Nuclear Threat Reduction exchange with the United Kingdom and France.
- Conduct integrated experiments and increase focused science on explosive and nuclear material behaviors to support technical assessments of nuclear materials and nuclear threat devices based on U.S. Government priorities in coordination with 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.

**FY 2020 Accomplishments**

- Continued execution of the Capability Forward initiative to enhance the FBI's regional counter-WMD capabilities to defeat WMD devices. Under this initiative, NNSA provides advanced equipment and conducts training and operations to accelerate life-saving responses to a WMD event. Fourteen major U.S. cities will receive these advanced capabilities by FY 2022.
- NNSA took possession of three new fixed-wing Aerial Measuring System (AMS) aircraft, replacing aircraft with an average age of 36 years. An element of NEST, AMS provides rapid, wide-area assessments of inadvertent or intentional releases of radioactive materials in the environment.
- Initiated AMS Phase II recapitalization efforts to replace two aging two rotary-wing aircraft, with delivery of new aircraft expected in FY 2022.
- Provided NEST preparatory consequence management planning in support of NASA's Mars 2020 Launch.
- Maintained NEST readiness to respond to a nuclear or radiological emergency.
- Continued NEST equipment recapitalization, innovation, and delivery of equipment to responders, including integrating new AMS aircraft into NEST operations and training.
- Established the NNMA, which, through identifying, prioritizing, consolidating, and analyzing historical material samples, helps enable attribution through analysis of interdicted material.
- Completed identification of first-year items for the NNMA, preserving valuable materials for the nuclear forensics mission.
- Achieved increased confidence and accuracy in predictive modeling capabilities and new energetic disablement tools in support of the nuclear render safe mission.
- Conducted 15 training events with international partners, the IAEA, and NATO, focusing on technical aspects of a response to radiological and nuclear threats, including aerial measuring, medical response, plume modeling, and the security of major public events.
- Conducted two bilateral workshops with a foreign partner's senior leaders to improve each country's national nuclear counterterrorism and response policies.
- Conducted five domestic Silent Thunder and international tabletop exercises and scenario-based policy discussions to improve counterterrorism and emergency preparedness and response capabilities within the United States and globally.
- Implemented NEST Public Health and Safety Program plan.
- Completed three nuclear material studies to advance material security and risk management policies.

- Conducted 11 workshops on crisis and risk communication best practices for public information officers, first responders, and technical experts.
- Continued to develop and test new tools that support render safe, search, detection, and remediation.
- Implemented cross-classification communications capabilities within NEST response assets.

**Activities and Explanation of Changes**

| FY 2021 Enacted | Total FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| **Counterterrorism and Counterproliferation $341,513,000** | **Counterterrorism and Counterproliferation $356,185,000** | **Counterterrorism and Counterproliferation +$14,672,000** |
| ***Nuclear Incident Response/Nuclear Emergency Support Team $206,558,000*** | ***Nuclear Incident Response/Nuclear Emergency Support Team $207,700,000*** | ***Nuclear Incident Response/Nuclear Emergency Support Team +$1,142,000*** |
| • 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.<br>• Provide technical assistance to a Lead Federal Agency to search for or detect illicit radiological or nuclear material.<br>• Continue collection and expert analysis of radiological material signatures through DOE Radiological Triage Program.<br>• 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.<br>• Sustain WMD defeat capabilities for an identified critical mission area. This effort includes predictive capability.<br>• 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 Exchange (NUWAIX), and other DoD-led exercises in which DOE/NNSA is not the lead.<br>• Implement advanced training for consequence management response teams and home teams based on requirements of updated mission | • Rapidly respond to locate and identify radiological/nuclear devices and prevent these devices from detonating: Rapidly respond to evaluate and recover any damaged U.S. nuclear weapons.<br>• Detect nuclear or radiological materials during high-profile events or in response to a threat. Lead the Federal Government's monitoring and technical assessment efforts after a nuclear or radiological incident or accident.<br>• Procurement of mission critical equipment to recapitalize equipment that has exceeded its useful life.<br>○ Priorities include handheld and vehicle-borne radiation detection equipment, high resolution spectroscopic identification systems, correlated neutron detectors, high-energy radiography equipment, and contamination survey meters.<br>• Continue to enhance render safe capabilities of current Stabilization cities in conjunction with the FBI.<br>• Provide improved technical equipment and additional training to address the increased demand for radiological/nuclear device stabilization capabilities.<br>• Provide training and maintain equipment to sustain and enhance the ability of specialized | • Sustains and enhances NEST emergency response:<br>○ Maintains NEST operational tempo.<br>○ Continues NEST equipment recapitalization efforts. |

| FY 2021 Enacted | Total FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| analyses that reflect lessons learned from responses and exercises. Sustain data communications systems for communications between the field teams and home teams.<br>• 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.<br>• 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.<br>• Work jointly with the federal coordinating agency, which is usually DHS/FEMA, during any radiological accident or incident.<br>• 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.<br>• Continue recapitalization efforts for critical incident response equipment that is beyond its planned life cycle.<br>• Sustain capability for existing and increased number of stabilization cities including training and equipment maintenance.<br>• Deploy to additional cities and upgrade infrastructure and specialized technical equipment, as needed. | regional teams (Stabilization teams) to respond to a nuclear terrorism threat.<br>• Development of science and technologies that are most promising to improve the quality or speed of nuclear terrorism threat response. | |

| FY 2021 Enacted | Total FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ***National Technical Nuclear Forensics***<br>***$40,000,000*** | ***National Technical Nuclear Forensics***<br>***$41,140,000*** | ***National Technical Nuclear Forensics***<br>***+$1,140,000*** |
| • Provide technical and operational capabilities in support of the U.S. Government interagency NTNF program.<br>• Lead and coordinate the interagency Nuclear Forensics Steering Committee.<br>• Advance analysis methodologies for interdicted materials.<br>• Maintain readiness to respond to pre- and post-detonation nuclear events.<br>• Participate in one Ground Collection Task Force field exercise and one enhanced training event.<br>• Fully support two Post-Detonation device assessment training and exercise events.<br>• Conduct two DFEAT exercises.<br>• 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.<br>• Continue LANL PF-4/TA-55 plans and procedure development in support of Pre-Detonation Device Program requirements.<br>• Continue operational capability enhancements for Bulk Special Nuclear Materials Analysis Program (BSAP).<br>• Identify, consolidate, and analyze historical nuclear material samples for the NNMA.<br>• 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.<br>• Lead and coordinate the interagency nuclear forensics mission.<br>• Advance analytic techniques for interdicted materials, air samples, and prompt signals.<br>• Maintain readiness to respond to pre- and post-detonation nuclear events.<br>• Participate in one Ground Collection Task Force field exercise and one enhanced training event.<br>• Fully support two Post-Detonation device assessment training and exercise events.<br>• Conduct two DFEAT exercises.<br>• 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.<br>• Maintain LANL PF-4/TA-55 in support of Pre-Detonation Device Program requirements.<br>• Continue operational capability enhancements for BSAP laboratories at LANL and LLNL.<br>• Identify, consolidate, and analyze historical nuclear material samples to address known NNMA gaps.<br>• Lead U.S. nuclear forensics technical collaboration efforts with the UK under the Nuclear Threat Reduction channel. | • Maintains current nuclear forensics response capabilities.<br>• Continues NNSA's growth in nuclear forensics responsibilities within the interagency.<br>• Continues post detonation device assessment capability development. |

| FY 2021 Enacted | Total FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ***Counterterrorism Response and Capacity Building $9,655,000*** | ***Counterterrorism Response and Capacity Building $10,200,000*** | ***Counterterrorism Response and Capacity Building +$545,000*** |
| • Design virtual content and conduct three *Silent Thunder* domestic WMD counterterrorism tabletop exercises (TTXs).<br>• Design seven new virtual training courses to expand knowledge base for domestic and international radiological first responders.<br>• Conduct virtual courses focused on radiological incident response fundamentals and crisis communications to build capacity for NATO allies.<br>• Conduct 20 virtual radiological crisis communications courses for domestic and international first responders.<br>• Design virtual course content and conduct an *Eminent Discovery* international radiological/nuclear terrorism interdiction response TTX.<br>• Conduct two international incident preparedness and response technical exchange workshops.<br>• Engage key international partners bilaterally to coordinate nuclear and radiological incident preparedness and response.<br>• Conduct joint IAEA training courses on incident and nuclear security preparedness and response.<br>• 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.<br>Conduct operational training and support missions for foreign major public events. | • Conduct 16 advanced partnership engagements, specialized technical exchanges, and workshops.<br>• Conduct seven *Silent Thunder* domestic WMD counterterrorism TTXs.<br>• Develop a combined virtual training and in-person instruction program for increased reach and impact for both domestic and international training.<br>• Address additional demand for Policy & Partnership events and sustain strategic outreach.<br>• Conduct 13 international nuclear and radiological training courses, operational support, and provide technical support.<br>• Address additional demand for Preparedness & Operations events.<br>• Conduct 15 multilateral and bilateral scenario-based policy discussions, CT domestic and international TTXs.<br>• Integrate Counterterrorism Response & Capacity Building Respond initiatives with the DNN Prevent-Counter mission and support activities. | • Increases number and scope of priority international training and outreach activities. |

| FY 2021 Enacted | Total FY 2022 Request | Explanation of Changes<br>FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|
| ***Nuclear Threat Science***<br>***$85,300,000***<br>• Perform high-precision threat device modeling and experiments.<br>• Continue Tier Threat Modeling Archive Validation project.<br>• Conduct technical assessment in support of USG nuclear material security efforts. | ***Nuclear Threat Science***<br>***$97,145,000***<br>• Maintain capability to perform assessments of nuclear threat devices.<br>• Maintain the integrity of sensitive nuclear threat related information protected under the Sigma 20 program, while protecting the information from unauthorized disclosure.<br>• Manage classified bilateral nuclear counterterrorism technical exchanges with the UK and France and provide leadership to the trilateral P3 Nuclear Threat Reduction framework.<br>• Execute integrated experiments to validate nuclear threat assessments.<br>• Develop predictive modeling tools and nuclear threat device training for the WMD defeat community and other operational partners.<br>• Conduct foundational science to support technical assessments of nuclear materials, explosives, and nuclear threat device designs in support of operational partners and the intelligence and security communities.<br>• Research technologies in support of U.S. government CTCP strategic priorities. | ***Nuclear Threat Science***<br>***+$11,185,000***<br>• Sustains and improves scientific understanding of nuclear threat devices.<br>• Improves unique nuclear information security and nuclear assessment capabilities, and integrated experiments on high priority materials.<br>• Supports and expands development of technologies to slow, halt, and prevent incipient proliferators from advancing nuclear weapons-related efforts<br>• Establishes a laboratory-based cadre of experts to advise on application of the technologies. |

## Nuclear Counterterrorism and Incident Response Program
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 1,539 | 1,573 | 1,608 | +35 |
| Minor Construction | N/A | N/A | 10,046 | 2,704 | 2,763 | +59 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **11,585** | **4,277** | **4,371** | **+94** |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 1,539 | 1,573 | 1,608 | +35 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **1,539** | **1,573** | **1,608** | **+35** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 2,646 | 2,704 | 2,763 | +59 |
| New Stabilization Training Facility (9940 Site), SNL | 7,400 | 0 | 7,400 | 0 | 0 | 0 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **10,046** | **2,704** | **2,763** | **+59** |
| **Total, Capital Summary** | **N/A** | **N/A** | **11,585** | **4,277** | **4,371** | **+94** |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Argonne National Laboratory** | | | |
| Domestic Radiological Security | 640 | 194 | 166 |
| International Radiological Security | 1,019 | 1,962 | 1,853 |
| Nuclear Smuggling Detection and Deterrence | 456 | 204 | 204 |
| Global Material Security | 2,115 | 2,360 | 2,223 |
| Conversion (formerly HEU Reactor Conversion) | 28,994 | 18,460 | 19,050 |
| Nuclear Material Removal | 1,500 | 1,800 | 950 |
| Material Disposition | 0 | 20 | 200 |
| Laboratory and Partnership Support | 2,912 | 2,340 | 0 |
| Material Management and Minimization | 33,406 | 22,620 | 20,200 |
| Nonproliferation & Arms Control | 10,581 | 9,554 | 10,001 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 875 | 0 |
| Proliferation Detection R&D | 2,611 | 3,090 | 3,265 |
| Nuclear Detonation Detection | 100 | 0 | 0 |
| Nonproliferation Fuels Development | 4,800 | 4,400 | 0 |
| Nonproliferation Stewardship Program | 0 | 375 | 375 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 985 |
| Defense Nuclear Nonproliferation R&D | 7,511 | 7,865 | 4,625 |
| Emergency Operations | 225 | 59 | 241 |
| Counterterrorism and Counterproliferation | 2,891 | 2,942 | 3,341 |
| Nuclear Counterterrorism & Incident Response | 3,116 | 3,001 | 3,582 |
| **Total Argonne National Laboratory** | **56,729** | **46,275** | **40,631** |
| **Brookhaven National Laboratory** | | | |
| International Nuclear Security | 170 | 0 | 0 |
| Domestic Radiological Security | 0 | 401 | 342 |
| International Radiological Security | 100 | 100 | 94 |
| Nuclear Smuggling Detection and Deterrence | 1,191 | 1,125 | 1,125 |
| Global Material Security | 1,461 | 1,626 | 1,561 |
| Conversion (formerly HEU Reactor Conversion) | 494 | 350 | 250 |
| Material Management and Minimization | 494 | 350 | 250 |
| Nonproliferation & Arms Control | 2,747 | 3,266 | 3,556 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 564 | 0 |
| Proliferation Detection R&D | 4,615 | 5,771 | 6,097 |
| Nuclear Detonation Detection | 250 | 0 | 0 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 635 |
| Defense Nuclear Nonproliferation R&D | 4,865 | 5,771 | 6,732 |
| Counterterrorism and Counterproliferation | 2,692 | 2,624 | 3,022 |
| Nuclear Counterterrorism & Incident Response | 2,692 | 2,624 | 3,022 |
| **Total Brookhaven National Laboratory** | **12,259** | **14,201** | **15,121** |
| **Carlsbad Area Office** | | | |
| Counterterrorism and Counterproliferation | 41 | 39 | 438 |
| Nuclear Counterterrorism & Incident Response | 41 | 39 | 438 |
| **Total Carlsbad Area Office** | **41** | **39** | **438** |
| **Consolidated Business Center** | | | |
| Material Disposition | 100 | 0 | 0 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Material Management and Minimization | 100 | 0 | 0 |
| **Total Consolidated Business Center** | **100** | **0** | **0** |
| **Fermi National Accelerator Laboratory** | | | |
| Proliferation Detection R&D | 500 | 750 | 792 |
| Defense Nuclear Nonproliferation R&D | 500 | 750 | 792 |
| **Total Fermi National Accelerator Laboratory** | **500** | **750** | **792** |
| **Idaho National Laboratory** | | | |
| International Nuclear Security | 3,668 | 3,485 | 3,529 |
| Domestic Radiological Security | 12,333 | 10,780 | 9,207 |
| International Radiological Security | 418 | 1,550 | 1,464 |
| Nuclear Smuggling Detection and Deterrence | 11 | 0 | 0 |
| Global Material Security | 16,430 | 15,815 | 14,200 |
| Conversion (formerly HEU Reactor Conversion) | 40,546 | 40,740 | 38,970 |
| Nuclear Material Removal | 4,250 | 8,710 | 9,550 |
| Material Management and Minimization | 44,796 | 49,450 | 48,520 |
| Nonproliferation & Arms Control | 3,682 | 2,136 | 2,757 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 937 | 0 |
| Proliferation Detection R&D | 5,974 | 5,945 | 6,281 |
| Nuclear Detonation Detection | 100 | 0 | 0 |
| Nonproliferation Fuels Development | 5,400 | 8,340 | 0 |
| Nonproliferation Stewardship Program | 450 | 450 | 450 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 1,054 |
| Defense Nuclear Nonproliferation R&D | 11,924 | 14,735 | 7,785 |
| Counterterrorism and Counterproliferation | 5,089 | 5,469 | 5,868 |
| Nuclear Counterterrorism & Incident Response | 5,089 | 5,469 | 5,868 |
| **Total Idaho National Laboratory** | **81,921** | **88,542** | **79,130** |
| **Kansas City National Security Complex (KCNSC)** | | | |
| Material Disposition | 2,705 | 3,125 | 3,500 |
| Material Management and Minimization | 2,705 | 3,125 | 3,500 |
| Nonproliferation & Arms Control | 2,365 | 2,628 | 2,838 |
| Proliferation Detection R&D | 115 | 1,050 | 1,109 |
| Nonproliferation Stewardship Program | 500 | 0 | 0 |
| Defense Nuclear Nonproliferation R&D | 615 | 1,050 | 1,109 |
| Counterterrorism and Counterproliferation | 43,366 | 37,869 | 38,267 |
| Nuclear Counterterrorism & Incident Response | 43,366 | 37,869 | 38,267 |
| **Total Kansas City National Security Complex (KCNSC)** | **49,051** | **44,672** | **45,714** |
| **Lawrence Berkeley National Laboratory** | | | |
| Nonproliferation & Arms Control | 325 | 836 | 957 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 50 | 0 |
| Proliferation Detection R&D | 6,055 | 8,055 | 8,510 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 56 |
| Defense Nuclear Nonproliferation R&D | 6,055 | 8,055 | 8,566 |
| Counterterrorism and Counterproliferation | 160 | 320 | 718 |
| Nuclear Counterterrorism & Incident Response | 160 | 320 | 718 |
| **Total Lawrence Berkeley National Laboratory** | **6,540** | **9,261** | **10,241** |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Lawrence Livermore National Laboratory** | | | |
| International Nuclear Security | 8,830 | 7,279 | 7,371 |
| Domestic Radiological Security | 0 | 470 | 401 |
| International Radiological Security | 4,716 | 4,991 | 4,714 |
| Nuclear Smuggling Detection and Deterrence | 4,090 | 3,856 | 3,856 |
| Global Material Security | 17,636 | 16,596 | 16,342 |
| Conversion (formerly HEU Reactor Conversion) | 0 | 500 | 0 |
| Material Disposition | 100 | 0 | 100 |
| Material Management and Minimization | 100 | 500 | 100 |
| Nonproliferation & Arms Control | 24,180 | 26,466 | 26,859 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 11,643 | 0 |
| Proliferation Detection R&D | 49,123 | 29,497 | 31,164 |
| Nuclear Detonation Detection | 9,279 | 22,742 | 23,083 |
| Nonproliferation Stewardship Program | 4,450 | 6,950 | 12,770 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 13,098 |
| Defense Nuclear Nonproliferation R&D | 62,852 | 59,189 | 80,115 |
| Emergency Operations | 624 | 89 | 635 |
| Counterterrorism and Counterproliferation | 51,652 | 66,949 | 69,848 |
| Nuclear Counterterrorism & Incident Response | 52,276 | 67,038 | 70,483 |
| **Total Lawrence Livermore National Laboratory** | **157,044** | **181,432** | **193,899** |
| **Los Alamos National Laboratory** | | | |
| International Nuclear Security | 4,594 | 3,121 | 3,161 |
| Domestic Radiological Security | 23,935 | 84,522 | 72,187 |
| International Radiological Security | 1,370 | 1,665 | 1,573 |
| Nuclear Smuggling Detection and Deterrence | 10,525 | 9,578 | 9,578 |
| Global Material Security | 40,424 | 98,886 | 86,499 |
| Conversion (formerly HEU Reactor Conversion) | 800 | 450 | 880 |
| Nuclear Material Removal | 170 | 300 | 200 |
| Material Disposition | 61,700 | 68,475 | 86,640 |
| Laboratory and Partnership Support | 1,610 | 1,325 | 0 |
| Material Management and Minimization | 64,280 | 70,550 | 87,720 |
| Nonproliferation & Arms Control | 21,486 | 23,164 | 57,664 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 10,565 | 0 |
| Proliferation Detection R&D | 50,186 | 35,689 | 37,705 |
| Nuclear Detonation Detection | 68,993 | 88,660 | 89,988 |
| Nonproliferation Stewardship Program | 450 | 450 | 2,410 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 11,886 |
| Defense Nuclear Nonproliferation R&D | 119,629 | 124,799 | 141,989 |
| Counterterrorism and Counterproliferation | 53,638 | 66,145 | 69,044 |
| Nuclear Counterterrorism & Incident Response | 53,638 | 66,145 | 69,044 |
| **Total Los Alamos National Laboratory** | **299,457** | **394,109** | **442,916** |
| **National Energy Technology Lab** | | | |
| International Nuclear Security | 0 | 763 | 773 |
| Global Material Security | 0 | 763 | 773 |
| Material Disposition | 750 | 650 | 750 |
| Material Management and Minimization | 750 | 650 | 750 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Nonproliferation & Arms Control | 50 | 56 | 60 |
| **Total National Energy Technology Lab** | **800** | **1,469** | **1,583** |
| | | | |
| **Nevada National Security Site** | | | |
| International Radiological Security | 611 | 880 | 831 |
| Global Material Security | 611 | 880 | 831 |
| Nuclear Material Removal | 218 | 0 | 3,000 |
| Material Management and Minimization | 218 | 0 | 3,000 |
| Nonproliferation & Arms Control | 262 | 308 | 315 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 120 | 0 |
| Proliferation Detection R&D | 27,702 | 14,985 | 15,832 |
| Nuclear Detonation Detection | 593 | 20,139 | 20,441 |
| Nonproliferation Stewardship Program | 11,000 | 8,000 | 13,850 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 135 |
| Defense Nuclear Nonproliferation R&D | 39,295 | 43,124 | 50,258 |
| Emergency Operations | 21,424 | 24,329 | 0 |
| Counterterrorism and Counterproliferation | 39,671 | 38,751 | 39,149 |
| Nuclear Counterterrorism & Incident Response | 61,095 | 63,080 | 39,149 |
| **Total Nevada National Security Site** | **101,481** | **107,512** | **93,553** |
| | | | |
| **NNSA Albuquerque Complex** | | | |
| International Nuclear Security | 2,600 | 2,375 | 2,405 |
| Domestic Radiological Security | 17,294 | 7,105 | 6,069 |
| International Radiological Security | 5,321 | 7,806 | 7,372 |
| Nuclear Smuggling Detection and Deterrence | 78,540 | 79,185 | 79,185 |
| Global Material Security | 103,755 | 96,471 | 95,031 |
| Conversion (formerly HEU Reactor Conversion) | 0 | 0 | 500 |
| Nuclear Material Removal | 6,000 | 2,025 | 1,000 |
| Laboratory and Partnership Support | 1,267 | 0 | 0 |
| Material Management and Minimization | 7,267 | 2,025 | 1,500 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 496 | 0 |
| Proliferation Detection R&D | 27,381 | 17,500 | 18,489 |
| Nuclear Detonation Detection | 19,757 | 6,105 | 6,196 |
| Nonproliferation Stewardship Program | 0 | 14,601 | 14,601 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 558 |
| Defense Nuclear Nonproliferation R&D | 47,138 | 38,206 | 39,844 |
| 99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS | 400 | 0 | 0 |
| 18-D-150, Surplus Plutonium Disposition Project, SRS | 0 | 600 | 305 |
| Nonproliferation Construction | 400 | 600 | 305 |
| **Total NNSA Albuquerque Complex** | **158,560** | **137,798** | **136,680** |
| | | | |
| **NNSA Production Office (NPO)** | | | |
| Conversion (formerly HEU Reactor Conversion) | 500 | 0 | 0 |
| Material Disposition | 22,135 | 22,425 | 5,000 |
| Material Management and Minimization | 22,635 | 22,425 | 5,000 |
| **Total NNSA Production Office (NPO)** | **22,635** | **22,425** | **5,000** |
| | | | |
| **Oak Ridge Institute for Science & Education** | | | |
| Counterterrorism and Counterproliferation | 3,126 | 2,300 | 2,698 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Nuclear Counterterrorism & Incident Response | 3,126 | 2,300 | 2,698 |
| **Total Oak Ridge Institute for Science & Education** | **3,126** | **2,300** | **2,698** |
| | | | |
| **Oak Ridge National Laboratory** | | | |
| International Nuclear Security | 12,427 | 10,254 | 10,384 |
| Domestic Radiological Security | 4,577 | 5,936 | 5,070 |
| International Radiological Security | 6,091 | 7,453 | 7,039 |
| Nuclear Smuggling Detection and Deterrence | 10,373 | 14,118 | 14,118 |
| Global Material Security | 33,468 | 37,761 | 36,611 |
| Conversion (formerly HEU Reactor Conversion) | 700 | 1,375 | 2,300 |
| Nuclear Material Removal | 5,350 | 6,452 | 7,300 |
| Material Disposition | 4,500 | 2,647 | 4,300 |
| Laboratory and Partnership Support | 1,415 | 2,595 | 0 |
| Material Management and Minimization | 11,965 | 13,069 | 13,900 |
| Nonproliferation & Arms Control | 19,895 | 21,594 | 21,889 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 3,673 | 0 |
| Proliferation Detection R&D | 28,241 | 31,661 | 33,450 |
| Nuclear Detonation Detection | 1,290 | 433 | 439 |
| Nonproliferation Fuels Development | 4,800 | 7,000 | 0 |
| Nonproliferation Stewardship Program | 4,450 | 13,819 | 19,809 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 4,133 |
| Defense Nuclear Nonproliferation R&D | 38,781 | 52,913 | 57,831 |
| Counterterrorism and Counterproliferation | 5,746 | 7,769 | 8,167 |
| Nuclear Counterterrorism & Incident Response | 5,746 | 7,769 | 8,167 |
| **Total Oak Ridge National Laboratory** | **109,855** | **136,779** | **138,398** |
| | | | |
| **Office of Scientific & Technical Information** | | | |
| Nuclear Detonation Detection | 41 | 70 | 71 |
| Defense Nuclear Nonproliferation R&D | 41 | 70 | 71 |
| **Total Office of Scientific & Technical Information** | **41** | **70** | **71** |
| | | | |
| **Pacific Northwest National Laboratory** | | | |
| International Nuclear Security | 4,064 | 12,292 | 12,448 |
| Domestic Radiological Security | 26,463 | 30,211 | 25,802 |
| International Radiological Security | 35,200 | 42,502 | 40,141 |
| Nuclear Smuggling Detection and Deterrence | 43,837 | 54,941 | 54,941 |
| Global Material Security | 109,564 | 139,946 | 133,332 |
| Conversion (formerly HEU Reactor Conversion) | 21,900 | 22,950 | 22,500 |
| Nuclear Material Removal | 0 | 150 | 350 |
| Material Disposition | 100 | 2,900 | 4,200 |
| Laboratory and Partnership Support | 0 | 462 | 0 |
| Material Management and Minimization | 22,000 | 26,462 | 27,050 |
| Nonproliferation & Arms Control | 21,326 | 20,181 | 20,567 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 4,746 | 0 |
| Proliferation Detection R&D | 29,356 | 23,637 | 24,972 |
| Nuclear Detonation Detection | 6,622 | 19,165 | 19,453 |
| Nonproliferation Stewardship Program | 450 | 450 | 2,409 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 5,340 |
| Defense Nuclear Nonproliferation R&D | 36,428 | 43,252 | 52,174 |

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| 18-D-150, Surplus Plutonium Disposition Project, SRS | 3,921 | 1,282 | 2,700 |
| Nonproliferation Construction | 3,921 | 1,282 | 2,700 |
| Emergency Operations | 1,453 | 254 | 1,400 |
| Counterterrorism and Counterproliferation | 3,469 | 3,346 | 3,745 |
| Nuclear Counterterrorism & Incident Response | 4,922 | 3,600 | 5,145 |
| **Total Pacific Northwest National Laboratory** | **198,161** | **239,469** | **240,968** |
| **Pantex Plant** | | | |
| Material Disposition | 2,968 | 6,000 | 3,800 |
| Material Management and Minimization | 2,968 | 6,000 | 3,800 |
| Nonproliferation & Arms Control | 359 | 376 | 400 |
| Counterterrorism and Counterproliferation | 2,530 | 2,606 | 2,805 |
| Nuclear Counterterrorism & Incident Response | 2,530 | 2,606 | 2,805 |
| **Total Pantex Plant** | **5,857** | **8,982** | **7,005** |
| **Princeton Plasma Physics Laboratory** | | | |
| Proliferation Detection R&D | 300 | 760 | 803 |
| Defense Nuclear Nonproliferation R&D | 300 | 760 | 803 |
| **Total Princeton Plasma Physics Laboratory** | **300** | **760** | **803** |
| **Richland Operations Office** | | | |
| Counterterrorism and Counterproliferation | 1,818 | 2,002 | 2,401 |
| Nuclear Counterterrorism & Incident Response | 1,818 | 2,002 | 2,401 |
| **Total Richland Operations Office** | **1,818** | **2,002** | **2,401** |
| **Sandia National Laboratories** | | | |
| International Nuclear Security | 12,127 | 11,589 | 11,736 |
| Domestic Radiological Security | 18,287 | 16,752 | 14,307 |
| International Radiological Security | 14,647 | 18,235 | 17,222 |
| Nuclear Smuggling Detection and Deterrence | 8,149 | 9,175 | 9,175 |
| Global Material Security | 53,210 | 55,751 | 52,440 |
| Conversion (formerly HEU Reactor Conversion) | 660 | 750 | 700 |
| Material Disposition | 2,320 | 0 | 350 |
| Material Management and Minimization | 2,980 | 750 | 1,050 |
| Nonproliferation & Arms Control | 9,643 | 11,980 | 12,200 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 1,634 | 0 |
| Proliferation Detection R&D | 40,840 | 31,064 | 32,819 |
| Nuclear Detonation Detection | 84,307 | 105,091 | 106,665 |
| Nonproliferation Stewardship Program | 450 | 450 | 450 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 1,838 |
| Defense Nuclear Nonproliferation R&D | 125,597 | 136,605 | 141,772 |
| Counterterrorism and Counterproliferation | 54,681 | 61,082 | 63,980 |
| Nuclear Counterterrorism & Incident Response | 54,681 | 61,082 | 63,980 |
| **Total Sandia National Laboratories** | **246,111** | **267,802** | **271,442** |
| **Savannah River Operations Office** | | | |
| Conversion (formerly HEU Reactor Conversion) | 0 | 934 | 0 |
| Nuclear Material Removal | 350 | 350 | 150 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Material Disposition | 3,764 | 2,500 | 3,324 |
| Material Management and Minimization | 4,114 | 3,784 | 3,474 |
| 18-D-150, Surplus Plutonium Disposition Project, SRS | 72 | 81 | 0 |
| Nonproliferation Construction | 72 | 81 | 0 |
| **Total Savannah River Operations Office** | **4,186** | **3,865** | **3,474** |
| | | | |
| **Savannah River Site** | | | |
| International Nuclear Security | 108 | 25 | 25 |
| Nuclear Smuggling Detection and Deterrence | 0 | 11 | 11 |
| Global Material Security | 108 | 36 | 36 |
| Conversion (formerly HEU Reactor Conversion) | 3,600 | 6,125 | 4,600 |
| Nuclear Material Removal | 9,540 | 15,223 | 14,200 |
| Material Disposition | 66,030 | 42,922 | 55,050 |
| Laboratory and Partnership Support | 1,075 | 1,295 | 0 |
| Material Management and Minimization | 80,245 | 65,565 | 73,850 |
| Nonproliferation & Arms Control | 5,931 | 7,797 | 8,211 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 1,729 | 0 |
| Proliferation Detection R&D | 6,163 | 11,207 | 11,840 |
| Nuclear Detonation Detection | 646 | 0 | 0 |
| Nonproliferation Stewardship Program | 0 | 575 | 575 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 1,943 |
| Defense Nuclear Nonproliferation R&D | 6,809 | 11,782 | 14,358 |
| 18-D-150, Surplus Plutonium Disposition Project, SRS | 74,000 | 143,364 | 150,254 |
| Nonproliferation Construction | 74,000 | 143,364 | 150,254 |
| Counterterrorism and Counterproliferation | 3,140 | 3,090 | 3,488 |
| Nuclear Counterterrorism & Incident Response | 3,140 | 3,090 | 3,488 |
| **Total Savannah River Site** | **170,233** | **233,363** | **250,197** |
| | | | |
| **SLAC National Accelerator Laboratory** | | | |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 729 | 0 |
| Proliferation Detection R&D | 1,200 | 1,007 | 1,064 |
| Nuclear Detonation Detection | 415 | 0 | 0 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 820 |
| Defense Nuclear Nonproliferation R&D | 1,615 | 1,007 | 1,884 |
| **Total SLAC National Accelerator Laboratory** | **1,615** | **1,736** | **1,884** |
| | | | |
| **Washington Headquarters** | | | |
| International Nuclear Security | 6,442 | 25,020 | 25,336 |
| Domestic Radiological Security | 28,981 | 23,332 | 19,927 |
| International Radiological Security | 9,044 | 2,456 | 2,319 |
| Nuclear Smuggling Detection and Deterrence | 1,828 | 2,797 | 2,797 |
| Global Material Security | 46,295 | 53,605 | 50,379 |
| Conversion (formerly HEU Reactor Conversion) | 7 | 15,016 | 6,500 |
| Nuclear Material Removal | 1,023 | 1,640 | 1,000 |
| Material Disposition | 8,669 | 21,644 | 15,792 |
| Laboratory and Partnership Support | 35,971 | 51,613 | 0 |
| Material Management and Minimization | 45,670 | 89,913 | 23,292 |
| Nonproliferation & Arms Control | 12,199 | 12,252 | 10,787 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 1,288 | 0 |

**DEPARTMENT OF ENERGY**
**Funding by Site**
Defense Nuclear Nonproliferation BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| Proliferation Detection R&D | 11,220 | 32,047 | 33,857 |
| Nuclear Detonation Detection | 3,544 | 4,595 | 4,664 |
| Nonproliferation Fuels Development | 0 | 260 | 0 |
| Nonproliferation Stewardship Program | 0 | 13,480 | 13,480 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 1,449 |
| Defense Nuclear Nonproliferation R&D | 14,764 | 50,382 | 53,450 |
| 99-D-143, Mixed Oxide Fuel Fabrication Facility, SRS | 219,600 | 0 | 0 |
| 18-D-150, Surplus Plutonium Disposition Project, SRS | 1,007 | 3,262 | 2,741 |
| Nonproliferation Construction | 220,607 | 3,262 | 2,741 |
| Emergency Operations | 11,819 | 11,269 | 12,321 |
| Counterterrorism and Counterproliferation | 60,019 | 33,940 | 34,736 |
| Nuclear Counterterrorism & Incident Response | 71,838 | 45,209 | 47,057 |
| Legacy Contractor Pensions (DNN) | 13,700 | 14,348 | 38,800 |
| **Total Washington Headquarters** | **425,073** | **270,259** | **226,506** |
| | | | |
| **Waste Isolation Pilot Plant** | | | |
| Material Disposition | 2,240 | 4,240 | 6,880 |
| Material Management and Minimization | 2,240 | 4,240 | 6,880 |
| Nonproliferation & Arms Control | 350 | 391 | 400 |
| **Total Waste Isolation Pilot Plant** | **2,590** | **4,631** | **7,280** |
| | | | |
| **Y-12 National Security Complex** | | | |
| International Nuclear Security | 2,970 | 2,736 | 2,771 |
| Domestic Radiological Security | 14,492 | 5,297 | 4,524 |
| International Radiological Security | 370 | 400 | 378 |
| Nuclear Smuggling Detection and Deterrence | 0 | 10 | 10 |
| Global Material Security | 17,832 | 8,443 | 7,683 |
| Conversion (formerly HEU Reactor Conversion) | 799 | 2,350 | 4,410 |
| Nuclear Material Removal | 4,524 | 3,350 | 4,400 |
| Material Disposition | 8,527 | 13,163 | 10,300 |
| Laboratory and Partnership Support | 750 | 370 | 0 |
| Material Management and Minimization | 14,600 | 19,233 | 19,110 |
| Nonproliferation & Arms Control | 4,619 | 5,015 | 5,334 |
| National Technical Nuclear Forensics (NTNF) R&D | 0 | 951 | 0 |
| Proliferation Detection R&D | 7,464 | 1,285 | 1,358 |
| Nuclear Detonation Detection | 680 | 0 | 0 |
| Nonproliferation Stewardship Program | 300 | 300 | 6,150 |
| National Technical Nuclear Forensics R&D | 0 | 0 | 1,070 |
| Defense Nuclear Nonproliferation R&D | 8,444 | 1,585 | 8,578 |
| Counterterrorism and Counterproliferation | 2,821 | 4,270 | 4,470 |
| Nuclear Counterterrorism & Incident Response | 2,821 | 4,270 | 4,470 |
| **Total Y-12 National Security Complex** | **48,316** | **39,497** | **45,175** |
| | | | |
| **Total Funding by Site for Defense Nuclear Nonproliferation** | **2,164,400** | **2,260,000** | **2,264,000** |

# 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, [$1,684,000,000] $1,866,705,000, to remain available until expended[, of which, $91,000,000 shall be transferred to "Department of Energy—Energy Programs—Nuclear Energy", for the Advanced Test Reactor]: Provided, That of such amount, [$51,700,000] $55,579,000 shall be available until September 30, [2022]2023, for program direction: Provided further, That of the unobligated balances from prior year appropriations available under this heading, $6,000,000 is hereby permanently cancelled.

## Explanation of Changes

Changes from the FY 2021 enacted language consist of changes to the requested funding amount and the period of availability of program direction funding. The FY 2022 Budget Request reflects a 10.8% increase from FY 2021 Enacted levels (not including the ATR transfer). Increased funding in FY 2022 relative to FY 2021 supports reinvesting in research and development in support of today's fleet and future capabilities, modernizing infrastructure, and reducing legacy environmental liabilities. Increased funding relative to prior years also supports the Spent Fuel Handling Recapitalization Project.

**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. 116-283, William M (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021
- P.L. 116-260, Consolidated Appropriations Act, 2021

## Naval Reactors[a][b]

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| Naval Reactors | 1,648,396 | 1,684,000 | 1,866,705 | +182,705 | 10.8% |
| **Total, Naval Reactors** | **1,648,396** | **1,684,000** | **1,866,705** | **+182,705** | **10.8%** |

### Overview

The Naval Reactors (NR) appropriation includes funding for activities that respond directly to the National Security Strategy of the United States and the Administration'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) 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 2022 Budget Request

Naval Reactors' request of $1,866,705,000 in FY 2022 is for continued achievement of its core objective of ensuring the safe and reliable operation of the Nation's nuclear fleet.

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

The Naval Reactors appropriation projected contribution to the DOE WCF for FY 2022 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.

### 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 $1,381,838 in FY 2022 to support this program.

[a] The FY 2022 Request amount does not reflect the proposed cancellation of $6,000,000 in unobligated balances remaining from completed construction projects within Naval Reactors.

[b] Throughout this document, funding does not reflect the mandated transfer of $88.5 million in FY 2020 and $91.0 million in FY 2021 to the Office of Nuclear Energy for operation of the Advanced Test Reactor.

## Naval Reactors
## Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Naval Reactors** | | | | | |
| Naval Reactors Operations and Infrastructure | 553,591 | 530,600 | 594,017 | +63,417 | +12.0% |
| Naval Reactors Development | 516,205 | 568,000 | 640,684 | +72,684 | +12.8% |
| S8G Prototype Refueling | 170,000 | 135,000 | 126,000 | -9,000 | -6.7% |
| *Columbia*-Class Reactor Systems Development | 75,500 | 64,700 | 55,000 | -9,700 | -15.0% |
| Program Direction | 50,500 | 51,700 | 55,579 | +3,879 | +7.5% |
| Construction | 282,600 | 334,000 | 395,425 | +61,425 | +18.4% |
| **Subtotal, Naval Reactors** | **1,648,396** | **1,684,000** | **1,866,705** | **+182,705** | **+10.8%** |
| **Total, Naval Reactors** | **1,648,396** | **1,684,000** | **1,866,705** | **+182,705** | **+10.8%** |

## Naval Reactors Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Naval Reactors** | | | | | |
| **Naval Reactors Operations and Infrastructure** | | | | | |
| Research Reactor Facility Operations and Maintenance | 122,580 | 142,900 | 152,110 | +9,210 | +6.4% |
| MARP Defueling and Layup | 6,954 | 7,098 | 15,493 | +8,395 | +118.3% |
| Laboratory Facility Regulation, Compliance and Protection | 132,463 | 138,859 | 140,405 | +1,546 | +1.1% |
| Nuclear Spent Fuel Management | 136,437 | 124,013 | 139,646 | +15,633 | +12.6% |
| Radiological/Environmental Remediation and Demolition | 103,877 | 76,325 | 92,463 | +16,138 | +21.1% |
| Test Engineering Infrastructure Support | 0 | 0 | 17,200 | | |
| Capital Equipment | 2,000 | 0 | 100 | +100 | 0% |
| General Plant Projects | 49,280 | 41,405 | 36,600 | -4,805 | -11.6% |
| **Total, Naval Rectors Operations and Infrastructure** | **553,591** | **530,600** | **594,017** | **+63,417** | **+12.0%** |
| **Naval Reactors Development** | | | | | |
| Ship Construction and Maintenance Support | 46,067 | 34,800 | 39,000 | +4,200 | +12.1% |
| Nuclear Reactor Technology | 163,908 | 182,600 | 207,800 | +25,200 | +13.8% |
| Reactor Systems and Component Technology | 208,750 | 258,600 | 297,876 | +39,276 | +15.2% |
| Advanced Test Reactor Operations | 88,500 | 91,000 | 89,108 | -1,892 | -2.1% |
| Capital Equipment | 8,980 | 1,000 | 6,900 | +5,900 | +590.0% |
| **Total, Naval Reactors Development** | **516,205** | **568,000** | **640,684** | **+72,684** | **+12.8%** |
| **S8G Prototype Refueling** | 170,000 | 135,000 | 126,000 | -9,000 | -6.7% |
| ***Columbia*-Class Reactor Systems Development** | 75,500 | 64,700 | 55,000 | -9,700 | -15.0% |
| **Program Direction** | 50,500 | 51,700 | 55,579 | +3,879 | +7.5% |
| **Construction** | 282,600 | 334,000 | 395,425 | +61,425 | +18.4% |
| **Subtotal, Naval Reactors** | **1,648,396** | **1,684,000** | **1,866,705** | **+182,705** | **+10.8%** |
| **Total, Naval Reactors** | **1,648,396** | **1,684,000** | **1,866,705** | **+182,705** | **+10.8%** |

**Naval Reactors**
**Explanation of Major Changes**
**(Dollars in Thousands)**

| Naval Reactors | FY 2022 Request vs FY 2021 Enacted |
|---|---|
| **Naval Reactors Operations and Infrastructure:** This increase (+12%) supports progression toward targeted goals for investment in decontamination and decommissioning efforts, continued investment in recapitalizing infrastructure, increasing efforts to prepare for delivery of the Naval Spent Fuel Handling Facility, and maintaining support of prototype maintenance activities. Additionally, this request provides visibility on laboratory and testing facilities infrastructure support through a new subprogram. | +63,417 |
| **Naval Reactors Development:** This increase (+13%) supports development of the methods, models, materials, components, and systems required for future platforms to achieve enhanced capability, improved affordability, and sustained reliability and provide continuous support to U.S. Navy fleet operations. | +72,684 |
| **S8G Prototype Refueling:** This decrease (-7%) is consistent with the project's revised funding profile and supports refueling overhaul execution and completion in early FY 2023. | -9,000 |
| ***Columbia*-class Reactor Systems Development:** This decrease (-15%) is consistent with the project's planned funding profile and supports FY 2022 production, analysis, and testing execution. | -9,700 |
| **Program Direction:** This funding increase (+8%) supports progress toward meeting authorized FTE levels, in addition to increases for personnel and pay related costs, travel requirements, and IT hardware and maintenance operations. | +3,879 |
| **Construction:** This increase (+18%) supports resources required to fund the Spent Fuel Handling Project updated Total Project Cost, in addition to funding two new start major construction projects at the Knolls site. | +61,425 |
| **Total, Naval Reactors** | **+182,705** |

**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 Niskayuna, 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. Providing technical infrastructure support at laboratory facilities enabling technical work supporting the operations of the fleet as well as design and development efforts.

7. Design and procurement of capital equipment.

8. 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 the safe reception, handling, preparation, packaging, and temporary storage of NSNF coming from the nuclear powered fleet and prototypes. 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. The subprogram also supports nuclear powered warship deployments by managing Naval Reactors NSNF shipping container capacity for aircraft carrier and submarine refueling overhauls and defueling inactivation operations; conducts destructive and non-destructive examinations of expended naval cores and irradiated test specimens from the Advanced Test Reactor located at the Idaho National Laboratory; and manages 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.

Technical Infrastructure and Operations Support

The mission of this subprogram is to support laboratory and testing facilities at NNL to enable the technical work supporting the operations of the naval nuclear fleet, as well as engineering and development efforts required to ensure continued performance, safety and reliability, and resolution of emergent fleet problems. This includes preparation and maintenance of infrastructure at program laboratory sites (e.g., laboratory space/building, test loops, hot cells) to support Program technical work (e.g., testing, engineering and analysis, design, and examinations). The upfront work needed to prepare laboratory facilities is distinct from operating the systems or test programs within such facilities (e.g., actual execution/performance of the test once a test loop has been prepared). Technical infrastructure such as test loops are large in size and require significant infrastructure (e.g., building dimensions, utilities, ASME Boiler and Pressure Vessel Code calculations) support in order to prepare the tests for safe operations. The skills required to engineer and maintain technical infrastructure are similar to the skills used to support general facility infrastructure (e.g., general office buildings), and test engineers work collaboratively with site facilities engineers to maintain safe and reliable test operation.

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).

Minor Construction

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. Minor construction 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.

**Highlights and Major Changes in the FY 2022 Budget Request**

The increase of $63,417,000 supports progression toward targeted goals for investment in decontamination and decommissioning efforts, continued investment in recapitalizing infrastructure, increasing efforts to prepare for delivery of the Naval Spent Fuel Handling Facility, and maintaining support of prototype maintenance activities. Additionally, this request provides visibility on laboratory and testing facilities infrastructure support through a new subprogram.

**FY 2020 Accomplishments**

- Commenced detailed planning for MARF defueling and final system layup.
- Commenced detailed planning for servicing facility modifications to support MARF defueling.
- Packaged 13 spent fuel canisters into dry storage to support meeting time requirements in an agreement with the State of Idaho for NSNF located in water pool storage.
- Mechanically processed 54 NSNF modules for placement into dry storage to support legal requirements in the agreement with the State of Idaho.
- Loaded 44 sleeves of NSNF for packaging method B disposal to support legal requirements in the agreement with the State of Idaho.
- Received, unloaded, and returned for next use or ultimate disposal of 9 shipping containers of NSNF to support aircraft carrier and submarine refuelings/defuelings and inactivation operations.
- Completed demolition of buildings 629, 659, 666, and 667 at NRF.
- Completed removal of the Waste Processing Building aboveground structure at Bettis.

**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 in naval reactors that are crucial to delivering superior navy fleet operations and dominance in the maritime domain to counter the increasing threats from our adversaries. These efforts include:

1. Supporting naval operations and strategic mission needs by providing technical support to the fleet and ensuring safe reactor operations through engineering solutions to emergent reactor plant issues, enabling 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 reduce lifecycle costs and improves performance.

3. Designing and maintaining the major reactor plant components and plant systems required for technologically superior naval nuclear propulsion.

4. Operating the Advanced Test Reactor (ATR) (performed by DOE Office of Nuclear Energy) and performing irradiation testing for ongoing evaluation of new material applications and core designs.

5. Designing and procuring capital equipment in support of the work above.

Ship Construction & Maintenance Support

The mission of the Ship Construction & Maintenance Support (SCMS) subcategory is to directly 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. While overall fleet support efforts are funded across all Naval Reactors Development (NRD) subprograms (excluding the Advanced Test Reactor), SCMS supports direct efforts. This includes analyses to extend the reactor operational life of a ship, reactor servicing technical support, new instrumentation and control system qualification prior to ship installation, emergent problem resolution arising during propulsion plant component manufacturing, installation, testing or operation, and continued technical validation of a ship's reactor performance and safety basis through operational life of the ship. Also, maintenance of the reactor plants involves designing equipment and systems to safely handle new fuel and highly radioactive spent fuel including safely maintaining plant components, and resolving emergent obsolescence issues. These efforts are closely associated with the more comprehensive technology efforts that underpin NR's fleet support efforts in NRT and RSCT.

Nuclear Reactor Technology

The mission of this subcategory is to develop and deploy core material systems that improve nuclear safety, stealth capability, tactical ability, and reactor plant capability and performance; and to support the qualification of the manufacture of those systems at the naval nuclear core vendor. The materials testing executed using Nuclear Reactor Technology resources forms the basis for naval nuclear reactor operational capability, which has enabled over 65 years of safe nuclear reactor operations while increasing reactor plant performance and reducing platform lifecycle cost. This research and development capability informs new design decisions and enables timely response to issues encountered in the operating fleet. Advanced fuel and poison development efforts, including specimen manufacture, irradiation testing, and post irradiation examination, are executed using resources from this subcategory. Lastly, this subcategory supports the examination of expended fuel modules and irradiated core components at the Expended Core Facility located at the Naval Reactors Facility, which is part of the Idaho National Laboratory. This examination capability provides real performance data on hardware to ultimately understand both long-term material behavior and design impacts.

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, reactor coolant pumps, valves) as well as plant systems (e.g., instrumentation and control). This subcategory provides the support and expertise necessary to ensure the satisfactory operation of reactor plant components

in the naval nuclear fleet and prototypes, to design and implement the *Virginia*-class and *Ford*-class reactor plant components, and to develop higher power density, faster to build, and more affordable components for technology insertion applications in existing ship classes. The major objectives of instrumentation and control component and system development are to deliver the next generation of instrumentation, control, and electrical equipment for naval nuclear propulsion applications to improve ship mission capabilities, reactor safety, and widen the advanced technology gap over our adversaries. This subcategory also enables the Program's advanced technology incubator effort to accelerate the pace of R&D that holds promise for step-change advancements and asymmetrical warfighting advantages for naval nuclear propulsion.

Advanced Test Reactor Operations

The mission of this subcategory is to provide a prototypical thermal irradiation environment to support core design, manufacturing development, fleet support, and analytical model development for reactor materials and nuclear fuels. The ATRis a test reactor facility owned by the DOE Office of Nuclear Energy and operated by its contractor. Naval Reactors has sole use of five of nine ATR test loops. Funding in this subprogram provides for operation, engineering, maintenance and other support activities associated with Naval Reactors-specific ATR use, in addition to a portion of the ATR's base operations.

Capital Equipment

The mission of this subcategory is to provide the critical technical tools and equipment to ensure that Naval Reactors can achieve its mission. This subprogram includes both MIE (major items of equipment) and non-MIE. 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, developing new technologies).

**Highlights and Major Changes in the FY 2022 Budget Request**

The increase of $72,684,000 supports development of the methods, models, materials, components, and systems required for future platforms to achieve enhanced capability, improved affordability, and sustained reliability and provides continuous support to U.S. Navy fleet operations. This increase comes at a pivotal time for the NR Program, in which over the last decade, the need for generational investment in infrastructure, which is not yet complete, required a reduction in our mid- to long- term technology development efforts. During this time, historic technology development efforts were leveraged to support *Columbia*-class design and existing nuclear powered submarines and aircraft carriers in the fleet. In order to correct for previously suppressed levels of technology R&D, Naval Reactors must identify and develop cutting-edge technologies to aggressively improve propulsion plant capability and dramatically reduce design, acquisition, and lifecycle cost and timespans. This investment in R&D is a critical step in maintaining the Navy's dominance in the maritime domain.

**FY 2020 Accomplishments**

- Core design and analysis supported continued safe and reliable operation of reactors across the fleet.
- Performed and coordinated expended core examinations. These examinations determined performance of actual operating naval cores.
- Continued development of new manufacturing processes to reduce component lifecycle costs and improve their in-service performance.
- Performed operations, maintenance and engineering support work for the ATR including three 60-day irradiation test cycles and one 7-day transient test.
- Safely shipped and received 9 Naval Reactors program irradiation test trains.

**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 required 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 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 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 2023 to support operator training and proof-of-concept for the *Columbia*-Class core. Naval Reactors requests $126,000,000 for this effort in FY 2022.

**Highlights and Major Changes in the FY 2022 Budget Request**
The decrease of $9,000,000 is consistent with the project's revised funding profile and supports refueling overhaul execution and completion in early FY 2023.

**FY 2020 Accomplishments**
- Completed removal of spent nuclear fuel.
- Completed engineering assessments supporting plant modifications.

**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 the *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 class operational availability, 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* will continue in FY 2022 and beyond to include oversight of the manufacture of lead ship reactor plant components including the core, and conduct the requisite safety analysis for the lead ship reactor plant.

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 $55,000,000 for this effort in FY 2022.

**Highlights and Major Changes in the FY 2022 Budget Request**

The decrease of $9,700,000 is consistent with the project's planned funding profile and supports FY 2022 production, analysis, and testing execution.

## 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 2022 Budget Request

The increase for the Naval Reactors Program Direction budget supports progress towards meeting authorized FTE levels, in addition to increases for personnel and pay related costs, travel requirements, and IT hardware and maintenance operations.

### FY 2020 Accomplishments

- Provided for all facets of administrative control and oversight of the Naval Nuclear Propulsion Program ("Naval Reactors"), including developing and overseeing substantial modifications and improvements to management and work policies necessitated by the COVID-19 pandemic.

## Naval Reactors
## Program Direction Funding

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Naval Reactors** | | | | | |
| **Headquarters** | | | | | |
| Salaries and Benefits | 26,550 | 27,877 | 28,817 | +940 | +3.4% |
| Travel | 1,150 | 480 | 510 | +30 | +6.3% |
| Other Related Expenses | 2,560 | 2,663 | 4,020 | +1,357 | +51.0% |
| **Total, Headquaraters** | **30,260** | **31,020** | **33,347** | **+2,327** | **+7.5%** |
| **Naval Reactors Laboratory Field Office** | | | | | |
| Salaries and Benefits | 1,770 | 18,584 | 19,212 | +628 | +3.4% |
| Travel | 600 | 320 | 340 | +20 | +6.3% |
| Other Related Expenses | 1,940 | 1,776 | 2,680 | +904 | +50.9% |
| **Total, Naval Reactors Laboratory Field Office** | **4,310** | **20,680** | **22,232** | **+1,552** | **+7.5%** |
| **Program Direction** | | | | | |
| Salaries and Benefits | 44,250 | 46,461 | 48,029 | +1,568 | +3.4% |
| Travel | 1,750 | 800 | 850 | +50 | +6.3% |
| Other Related Expenses | 4,500 | 4,439 | 6,700 | +2,261 | +50.9% |
| **Total, Program Direction** | **50,500** | **51,700** | **55,579** | **+3,879** | **+7.5%** |
| **Federal FTEs** | 246 | 246 | **246** | 0 | **0%** |

## Naval Reactors
## Program Direction - Other Related Expenses

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Other Related Expenses** | | | | | |
| Transportation | 683 | 674 | 675 | +1 | +0.1% |
| Communications, Utilities, and Miscellaneous Changes | 364 | 359 | 356 | -3 | -0.8% |
| Other Services from Federal Sources | 596 | 588 | 964 | +376 | +63.9% |
| Advisory and Assistance Services | 168 | 166 | 195 | +29 | +17.5% |
| Operations and Mantenance of Facilities | 263 | 259 | 432 | +173 | +66.8% |
| Operations and Maitenance of Equipment | 640 | 631 | 953 | +322 | +51.0% |
| Supplies and Materials | 266 | 262 | 534 | +272 | +103.8% |
| Equipment | 761 | 751 | 2,091 | +1,340 | +178.4% |
| Working Capital Funding | 759 | 749 | 500 | -249 | -33.2% |
| **Total, Other Related Expenses** | **4,500** | **4,439** | **6,700** | **+2,261** | **+50.9%** |

## Program Direction

### Activities and Explanation of Changes

| FY 2021 Enacted | FY 2022 Request | Explanation of Changes FY 2022 Request vs FY 2021 Enacted |
|---|---|---|
| **Salaries and Benefits $46,461,000** | **Salaries and Benefits $48,029,000** | **Salaries and Benefits +$1,586,000** |
| • 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. | • 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. | • Reflects an increase for personnel and pay related costs as well as anticipated costs of benefits. |
| **Travel $800,000** | **Travel $850,000** | **Travel +$50,000** |
| • Perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety.<br>• 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. | • Performed oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety.<br>• 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. | • Reflects expected travel requirement to execute oversight activities. |
| **Other Related Expenses $4,439,000** | **Other Related Expenses $6,700,000** | **Other Related Expenses +$2,261,000** |
| • Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work.<br>• Support planned upgrades and maintenance of video teleconferencing equipment, security investigation of Federal personnel, and training requirements. | • Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work.<br>• Supported planned upgrades and maintenance of video teleconferencing equipment, security investigation of Federal personnel, and training requirements. | • Increase supports IT and maintenance operations. |

## Naval Reactors
## Capital Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))** | | | | | | |
| Capital Equipment >$500K (including MIE) | N/A | N/A | 10,980 | 1,000 | 7,000 | +6,000 |
| Minor Construction | N/A | N/A | 49,280 | 41,405 | 36,600 | -4,805 |
| **Total, Capital Operating Expenses** | **N/A** | **N/A** | **60,260** | **42,405** | **43,600** | **+1,195** |
| | | | | | | |
| **Capital Equipment > $500K (including MIE)** | | | | | | |
| Total Non-MIE Capital Equipment (>$500K and <$5M) | N/A | N/A | 5,480 | 1,000 | 1,500 | +500 |
| High Performance Computer (2020 Buy) | 5,500 | 0 | 5,500 | 0 | 0 | 0 |
| High Performance Computer (2022 Buy) | 5,500 | 0 | 0 | 0 | 5,500 | 5,500 |
| **Total, Capital Equipment (including MIE)** | **N/A** | **N/A** | **10,980** | **1,000** | **7,000** | **+6,000** |

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **Minor Construction Projects (Total Estimated Cost (TEC)** | | | | | | |
| Total Minor Construction Projects (TEC <$5M) | N/A | N/A | 18,397 | 6,405 | 6,971 | +566 |
| BL AMTL Upgrade EMTF Infrastructure | 7,900 | 500 | 3,080 | 0 | 560 | +560 |
| KL Legacy Eliminating Office Building | 19,000 | 0 | 0 | 19,000 | 0 | -19,000 |
| KL RML HVAC Upgrade Design | 18,230 | 0 | 1,945 | 0 | 0 | 0 |
| KS Service Water and Sanitary Sewer Upgrade | 6,754 | 469 | 6,285 | 0 | 0 | 0 |
| KS CAS Relocation | 6,100 | 445 | 0 | 300 | 0 | -300 |
| KS High Yard 30 Upgrade | 8,433 | 0 | 623 | 0 | 7,810 | +7,810 |
| KS S8G Weather Resistant Enclosure | 7,700 | 1,250 | 6,450 | 0 | 0 | 0 |
| NRF Northeast Boundary Area | 13,700 | 1,200 | 12,500 | 0 | 0 | 0 |
| NRF D&D Supporting Infrastructure | 15,700 | 0 | 0 | 15,700 | 0 | -15,700 |
| KL Data Center Power and Capacity Upgrades | 12,911 | 0 | 0 | 0 | 1,259 | +1,259 |
| KL Radio Upgrade | 17,800 | 0 | 0 | 0 | 1,000 | +1,000 |
| BL A7 Office Building | 19,000 | 0 | 0 | 0 | 19,000 | +19,000 |
| **Total, Minor Construction Projects** | **N/A** | **N/A** | **49,280** | **41,405** | **36,600** | **-4,805** |
| **Total, Capital Summary** | **N/A** | **N/A** | **60,260** | **42,405** | **43,600** | **+1,195** |

## Naval Reactors
## Construction Projects Summary

(Dollars in Thousands)

| | Total | Prior Years | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) |
|---|---|---|---|---|---|---|
| **22-D-532, KL Security Upgrades** | | | | | | |
| Total Estimated Cost (TEC) | | | | | | |
| Other Project Cost (OPC) | 31,800 | 0 | 0 | 0 | 5,100 | +5,100 |
| **TPC, 22-D-532, KL Security Upgrades** | 2,036 | 0 | 825 | 0 | 280 | +280 |
| | **33,836** | **0** | **825** | **0** | **5,380** | **+5,380** |
| **22-D-531, KL Chemistry and Radiological Health Building** | | | | | | |
| Total Estimated Cost (TEC) | 41,620 | 0 | 0 | 0 | 41,620 | +41,620 |
| Other Project Cost (OPC) | 4,250 | 668 | 185 | 170 | 940 | +770 |
| **TPC, 22-D-531, KL Chemistry and Radiological Health Building** | **45,870** | **668** | **185** | **170** | **42,560** | **+42,390** |
| **21-D-530, KL Steam and Condensate Upgrades** | | | | | | |
| Total Estimated Cost (TEC) | 54,600 | 0 | 0 | 4,000 | 0 | -4,000 |
| Other Project Cost (OPC) | 3,500 | 543 | 0 | 275 | 635 | +360 |
| **TPC, 21-D-530, KL Steam and Condensate Upgrades** | **58,100** | **543** | **0** | **4,275** | **635** | **-3,640** |
| **20-D-931, KL Fuel Development Laboratory** | | | | | | |
| Total Estimated Cost (TEC) | 23,700 | 0 | 23,700 | 0 | 0 | 0 |
| Other Project Cost (OPC) | 8,349 | 2,466 | 823 | 1,959 | 1,021 | -938 |
| **TPC, 20-D-931, KL Fuel Development Laboratory** | **32,049** | **2,466** | **24,523** | **1,959** | **1,021** | **-938** |
| **19-D-930, KS Overhead Piping** | | | | | | |
| Total Estimated Cost (TEC) | 31,894 | 10,994 | 20,900 | 0 | 0 | 0 |
| Other Project Cost (OPC) | 6,952 | 1,493 | 4,205 | 375 | 275 | -100 |
| **TPC, 19-D-930, KS Overhead Piping** | **38,846** | **12,487** | **25,105** | **375** | **275** | **-100** |
| **14-D-901, Spent Fuel Handling Recapitalization Project** | | | | | | |
| Total Estimated Cost (TEC) | 1,886,000 | 688,300 | 238,000 | 330,000 | 348,705 | +18,705 |
| Other Project Cost (OPC) | 174,000 | 174,000 | 0 | 0 | 0 | 0 |
| **TPC, 14-D-901, Spent Fuel Handling Recapitalization Project**[a] | **2,060,000** | **862,300** | **238,000** | **330,000** | **348,705** | **+18,705** |
| **Total All Construction Projects** | | | | | | |
| Total Estimated Cost (TEC) | 2,069,614 | 699,294 | 282,600 | 334,000 | 395,425 | +61,425 |
| Other Project Cost (OPC) | 199,087 | 179,170 | 6,038 | 2,779 | 3,151 | +372 |
| **Total Project Cost (TPC) All Construction Projects** | **2,268,701** | **878,464** | **288,638** | **336,779** | **398,576** | **+61,797** |

[a] 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.

## Research and Development

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.

(Dollars in Thousands)

| | FY 2020 Enacted | FY 2021 Enacted | FY 2022 Request | FY 2022 Request vs FY 2021 Enacted ($) | FY 2022 Request vs FY 2021 Enacted (%) |
|---|---|---|---|---|---|
| **Research and Development (R&D)** | | | | | |
| Basic | 0 | 0 | 0 | 0 | 0% |
| Applied | 0 | 0 | 0 | 0 | 0% |
| Development | 1,112,000 | 1,140,270 | 1,246,109 | +105,839 | +9.3% |
| Subtotal, R&D | **1,112,000** | **1,140,270** | **1,246,109** | **+105,839** | **+9.3%** |
| Equipment | 15,000 | 1,000 | 6,900 | +5,900 | +590.0% |
| Construction | 238,000 | 330,000 | 390,325 | +60,325 | +18.3% |
| **Total, R&D** | **1,365,000** | **1,471,270** | **1,643,334** | **+172,064** | **+11.7%** |

**22-D-532, KL Security Upgrade**
**Knolls Atomic Power Laboratory, Niskayuna, NY**
**Project is for Design and Construction**

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

**Summary**

The FY 2022 request for 22-D-532, KL Security Upgrade is $5,100K. The total project cost (TPC) is $33,836K, approved at Critical Decision (CD) CD-0 on October 21, 2018 with a CD-4 of 4Q FY 2027.

**Significant Changes**

This Construction Project Data Sheet (CPDS) is new and includes a new start for the budget year.

**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 2022 | 10/21/2018 | 01/14/2021 | 3Q FY2021 | 2Q FY2023 | 2Q FY2024 | 3Q FY 2024 | N/A | 4Q FY 2027 |

**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 2022 | 5,100 | 26,700 | 31,800 | 2,036 | 0 | 2,036 | 33,836 |

**2. Project Scope and Justification**

**Scope**

This project upgrades and modernizes the security perimeter of the Knolls site, including the fenceline and security lighting, the site's Security Area Entry Point (SAEP), and the Central Alarm Station (CAS).

**Justification**

The primary SAEP, CAS, security perimeter fencing, and perimeter lighting are reaching the end of their useful life. The current SAEP was constructed in 1960 and is beyond its expected service life. In addition, security requirements for the SAEP have evolved over the years (i.e., automated personnel ingress and egress requirements) and the current facility does not have enough available space to address vulnerabilities for Security Police Officers staffing the SAEP. The security

[a] Schedules are only estimates and consistent with the high end of the schedule ranges.
[b] Amounts are only estimates and consistent with the high end of the cost ranges.

perimeter and SAEP are the first line of defense for the facility and must be maintained in an effective configuration which meets current security standards to ensure robust protection against intrusion and infiltration.

A modern, reliable CAS is critical to effective security at the site; the current facility and its equipment can no longer provide the requisite reliability or the ability to effectively utilize the installed systems required for effective security monitoring of the site.

**3. Project Cost and Schedule**

**Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2022 | 5,100 | 5,100 | 2,449 |
| Outyears | 0 | 0 | 2,651 |
| Total Design | 5,100 | 5,100 | 5,100 |
| Construction | | | |
| Outyears | 26,700 | 26,700 | 26,700 |
| Total Construction | 26,700 | 26,700 | 26,700 |
| **Total, TEC** | 31,800 | 31,800 | 31,800 |
| Other Project Cost (OPC) | | | |
| FY 2020 | 825 | 825 | 618 |
| FY 2021 | 0 | 0 | 206 |
| FY 2022 | 280 | 280 | 280 |
| Outyears | 931 | 931 | 932 |
| Total OPC | 2,036 | 2,036 | 2,036 |
| | | | |
| **Total Project Cost (TPC)** | | | |
| FY 2020 | 825 | 825 | 618 |
| FY 2021 | 0 | 0 | 206 |
| FY 2022 | 5,380 | 5,380 | 2,729 |
| Outyears | 27,631 | 27,631 | 30,283 |
| **Grand Total** | 33,836 | 33,836 | 33,836 |

**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 | 4,310 | N/A | N/A |
| Contingency | 790 | N/A | N/A |
| Total, PED | 5,100 | N/A | N/A |

| | | | |
|---|---|---|---|
| Construction | | | |
| Construction | 22,800 | N/A | N/A |
| Site Preparation | 0 | N/A | N/A |
| Equipment | 0 | N/A | N/A |
| Contingency | 3,900 | N/A | N/A |
| Total, Construction | 26,700 | N/A | N/A |
| Other TEC | | | |
| Contingency | N/A | N/A | N/A |
| Total, Other TEC | | | |
| **Total Estimated Cost** | 31,800 | N/A | N/A |
| *Contingency, TEC* | 0 | N/A | N/A |
| Other Project Cost (OPC) | | | |
| OPC Except D&D | | | |
| OPC | 2,036 | N/A | N/A |
| Contingency | 0 | N/A | N/A |
| D&D | 0 | N/A | N/A |
| **Total, OPC** | 2,036 | N/A | N/A |
| *Contingency, OPC* | 0 | N/A | N/A |
| **Total Project Cost** | 33,836 | N/A | N/A |
| ***Total, Contingency (TEC+OPC)*** | 4,680 | N/A | N/A |

**Schedule of Appropriation Requests**

| Request Year | Type | Prior Years | FY 2021 | FY 2022 | Outyears | Total |
|---|---|---|---|---|---|---|
| FY 2022 | TEC | 0 | 0 | 5,100 | 26,700 | 31,800 |
| | OPC | 0 | 825 | 280 | 931 | 2,036 |
| | TPC | 0 | 825 | 5,380 | 27,631 | 33,836 |

**4. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy | 4Q FY 2027 |
| 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 | N/A | $1.3 | N/A | $51.6 |

**5. D&D Information**

The new project replaces the existing SAEP facility.

| | Square Feet |
|---|---|
| New area being constructed by this project at Knolls | 5,181 |
| Area of D&D in this project at Knolls | 1,990 |
| Area at Knolls to be transferred, sold, and/or D&D outside the project including area previously "banked" | TBD |
| Area of D&D in this project at other sites | TBD |
| Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked" | TBD |
| Total area eliminated | 3,265 |

**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.

**22-D-531, KL Chemistry Laboratory and Radiological Health**
**Knolls Atomic Power Laboratory, Niskayuna, NY**
**Project is for Construction**

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

**Summary**

The FY 2022 request for 22-D-531, KL Chemistry and Radiological Health is $41,620K. The total project cost (TPC) is $45,870K, approved at Critical Decision (CD) CD-1/2 on April 27, 2020 with a CD-4 of 1Q FY 2025.

**Significant Changes**

This Construction Project Data Sheet (CPDS) is new and includes a new start for the budget year.

**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 2022 | 2/13/2017 | 01/31/2020 | 4/27/2020 | 4/27/2020 | 1Q FY 2023 | 3Q FY 2021 | N/A | 1Q 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/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 2022 | 0 | 41,620 | 41,620 | 4,250 | 0 | 4,250 | 45,870 |

**2. Project Scope and Justification**

**Scope**

This project will design and construct a state-of-the-art multi-story, approximately 45,000 square foot building to house Physical Chemistry, Analytical Chemistry, and Radiochemistry operations as well as Radiation Health consisting of Internal and External Dosimetry and RADIAC calibration. The building will also provide professional office space for approximately 60 personnel who will work in the facility. The facility will provide laboratory type areas to support chemistry operations, adequate storage space, standard building services, accommodations for a 77,000 pound Low Energy Lung Monitor (LELM) whole body counting equipment, radioactive source storage including shielding, and space for the RADIAC calibration source range. The facility will meet the requirements for vibration sensitive equipment, include independent ventilation systems for laboratory environmental control and radiological operations, and provide radiological facility design features that conform to all applicable government radiological controls requirements.

[a] Schedules are only estimates and consistent with the high end of the schedule ranges.
[b] Amounts are only estimates and consistent with the high end of the cost ranges.

**Justification**

Current facilities that serve the Chemistry Laboratories and Radiation Health organizations are deteriorating and require replacement to maintain an environment that supports laboratory operations and satisfactory working conditions for personnel. The existing facilities contain legacy contamination, which makes maintenance and repair efforts lengthy and complex. Deteriorating infrastructure poses a risk to high value equipment, as inability to effectively control ventilation and temperature affects routine work processes. In addition, general office conditions are inadequate for personnel and fire protection systems are incomplete and do not meet current standards.

**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 finalized with CD-2 approval.

| Performance Measure | Threshold | Objective |
|---|---|---|
| Building Size - Usable Square Feet (USF) | Provide 23,000 USF of laboratory space and general occupancy space. | Provide 25,000 USF of laboratory space and general occupancy space. |
| Occupancy | Provide office space for 60 personnel | Provide office space for 60 personnel |
| Stability - temperature, humidity, vibration isolation, and acoustic attenuation | Meet the minimum requirements outlined in the Project Program and by the manufacturers of the laboratory equipment | Meet the minimum requirements outlined in the Project Program and by the manufacturers of the laboratory equipment |
| Compliance with radiological controls requirements | Meet all applicable government radiological controls requirements | Meet all applicable government radiological controls requirements |
| Sustainability | Achieve 30% or greater efficiency over ASHRAE 90.1-2016 | Achieve 30% or greater efficiency over ASHRAE 90.1-2016 |

**3. Project Cost and Schedule**

**Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations) | Obligations | Costs |
|---|---|---|---|
| **Total Estimated Cost (TEC)** | | | |
| Design | | | |
| FY 2022 | 0 | 0 | 0 |
| Outyears | 0 | 0 | 0 |
| Total Design | 0 | 0 | 0 |
| Construction | | | |
| FY 2022 | 41,620 | 41,620 | 11,561 |
| Outyears | 0 | 0 | 30,059 |
| Total Construction | 41,620 | 41,620 | 41,620 |
| **Total, TEC** | 41,620 | 41,620 | 41,620 |
| Other Project Cost (OPC) | | | |
| FY 2019 and earlier | 668 | 668 | 512 |
| FY 2020 | 185 | 185 | 315 |
| FY 2021 | 170 | 170 | 196 |
| FY 2022 | 940 | 940 | 460 |
| Outyears | 2,287 | 2,287 | 2,767 |

| | | | |
|---|---|---|---|
| Total OPC | 4,250 | 4,250 | 4,250 |

| | | | |
|---|---|---|---|
| **Total Project Cost (TPC)** | | | |
| FY 2019 and earlier | 668 | 668 | 512 |
| FY 2020 | 185 | 185 | 315 |
| FY 2021 | 170 | 170 | 196 |
| FY 2022 | 42,560 | 42,560 | 12,021 |
| Outyears | 2,287 | 2,287 | 32,826 |
| **Grand Total** | 45,870 | 45,870 | 45,870 |

**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 | 0 | N/A | 0 |
| Contingency | 0 | N/A | 0 |
| Total, PED | 0 | N/A | 0 |
| Construction | | | |
| Construction | 38,425 | N/A | 38,425 |
| Site Preparation | 0 | N/A | N/A |
| Equipment | 0 | N/A | N/A |
| Contingency | 3,195 | N/A | 3,195 |
| Total, Construction | 41,620 | N/A | 41,620 |
| **Total Estimated Cost** | 41,620 | N/A | 41,620 |
| *Contingency, TEC* | 3,195 | N/A | 3,195 |
| Other Project Cost (OPC) | | | |
| OPC Except D&D | | | |
| OPC | 4,250 | N/A | 4,250 |
| Contingency | 0 | N/A | 0 |
| D&D | 0 | N/A | 0 |
| **Total, OPC** | 4,250 | N/A | 4,250 |
| *Contingency, OPC* | 0 | N/A | 0 |
| **Total Project Cost** | 45,870 | N/A | 45,870 |
| ***Total, Contingency (TEC+OPC)*** | 3,195 | N/A | 3,195 |

**Schedule of Appropriation Requests**

| Request Year | Type | Prior Years | FY 2021 | FY 2022 | Outyears | Total |
|---|---|---|---|---|---|---|
| FY 2022 | TEC | 0 | 0 | 41,620 | 0 | 41,620 |
| | OPC | 853 | 170 | 940 | 2,287 | 4,250 |
| | TPC | 853 | 170 | 42,560 | 2,287 | 45,870 |

**4. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation or Beneficial Occupancy | 1Q FY 2025 |
| Expected Useful Life | 40 years |
| Expected Future Start of D&D of this capital asset | 1Q FY 2065 |

**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 | $0.751 | N/A | $20.101 |

**5. D&D Information**

The new area being constructed in this project is not replacing existing facilities.

| | Square Feet |
|---|---|
| New area being constructed by this project at Knolls | 45,000 |
| Area of D&D in this project at Knolls | 0 |
| Area at Knolls 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 |

**6. Acquisition Approach**

The procurement strategy for this project is Design-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 2022 Request for 14-D-901, Spent Fuel Handling Recapitalization Project is $348,705K. 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 2021 CPDS and does not include a new start for the budget year.

Consistent with the October 2019 Performance Baseline Revision, the CPDS has been updated to reflect the required funding through Project Closeout.

A 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 | 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 | 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] |
| FY 2022 | 03/29/2008 | 03/19/2015 | 03/19/2015 | 09/24/2018 | 03/04/2021 | 09/24/2018 | N/A | 3Q FY 2026 |

**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

[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.

**Final Design Complete** – Actual date the facility design was 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] |
| FY 2022 | 12/7/2016 | 6/14/2017 | 3Q FY 2025 |

**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] | 302,489 | 1,169,911 | 1,472,400 | 174,100 | N/A | 174,100 | 1,686,500[f] |
| FY 2021[g] | 278,860 | 1,607,140 | 1,886,000 | 174,000 | N/A | 174,000 | 2,060,000 |
| FY 2022 | 276,896 | 1,609,104 | 1,886,000 | 174,000 | N/A | 174,000 | 2,060,000 |

**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

[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 was first reflected in the FY 2021 CPDS.
[g] The FY 2021 CPDS revised the TEC, OPC, and TPC to reflect the Performance Baseline Revision and included the $40M funding requirement from the initial Performance Baseline that was not reflected in the FY 2020 CPDS.

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 has completed the final design, site preparation has completed, 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., 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. |
| 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. Financial Schedule**

(Dollars in Thousands)

| | Budget Authority (Appropriations)[a] | Obligations[a] | 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 | 25,352 |
| FY 2020 | N/A | N/A | 25,448 |
| FY 2021 | N/A | N/A | 5,040 |
| Total, Design | N/A | N/A | 276,896 |
| Construction | | | |
| FY 2017 | N/A | N/A | 1,867 |
| FY 2018 | N/A | N/A | 11,530 |
| FY 2019 | N/A | N/A | 103,653 |
| FY 2020 | N/A | N/A | 266,070 |
| FY 2021 | N/A | N/A | 453,274 |
| FY 2022 | N/A | N/A | 325,282 |
| Outyears | N/A | N/A | 447,428 |
| Total Construction | N/A | N/A | 1,609,104 |
| 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 | 129,005 |
| FY 2020 | N/A | N/A | 291,518 |
| FY 2021 | N/A | N/A | 458,314 |
| FY 2022 | N/A | N/A | 325,282 |
| Outyears | N/A | N/A | 447,428 |
| **Total, TEC** | N/A | N/A | 1,886,000 |

[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.

(Dollars in Thousands)

| | Budget Authority (Appropriations)[a] | Obligations[a] | Costs |
|---|---|---|---|
| **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 | 5,269 |
| FY 2021 | N/A | N/A | 2,977 |
| FY 2022 | N/A | N/A | 6,332 |
| Outyears | N/A | N/A | 19,096 |
| **Total, OPC** | N/A | N/A | 174,000 |
| **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 | 296,787 |
| FY 2021 | 330,000 | 330,000 | 461,291 |
| FY 2022 | 348,705 | 348,705 | 331,614 |
| Outyears | 280,995 | 280,995 | 466,524 |
| **Grand Total** | 2,060,000 | 2,060,000 | 2,060,000 |

[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.

**4. Details of Project Cost Estimate**

**Overall Project**

(Budget Authority in Thousands of Dollars)

| | Current Total Estimate | Previous Total Estimate[a] | Original Validated Baseline |
|---|---|---|---|
| Total Estimated Cost (TEC) | | | |
| Design | | | |
| Design | 275,896 | 277,860 | 300,789 |
| Contingency | 1,000 | 1,000 | 1,700 |
| Total, Design | 276,896 | 278,860 | 302,489 |
| Construction | | | |
| Long Lead Material and Site Preparation | 57,010 | 41,148 | 41,148 |
| Spent Fuel Handling Equipment | 224,354 | 228,936 | 215,454 |
| Facility Construction | 1,268,221 | 1,261,679 | 845,841 |
| Contingency | 59,519 | 75,377 | 107,468 |
| Total, Construction | 1,609,104 | 1,607,140 | 1,209,911 |
| **Total Estimated Cost** | 1,886,000 | 1,886,000 | 1,512,400 |
| *Contingency, TEC* | 60,519 | 76,377 | 109,168 |
| Other Project Cost (OPC) | | | |
| Conceptual Planning | 37,540 | 37,540 | 37,540 |
| Conceptual Design | 99,427 | 99,427 | 99,427 |
| Start-up | 20,852 | 26,273 | 26,273 |
| Other (e.g., EIS, Project Reviews) | 12,029 | 7,301 | 7,301 |
| Contingency | 4,152 | 3,459 | 3,559 |
| **Total, OPC** | 174,000 | 174,000 | 174,100 |
| Contingency, OPC | 4,152 | 3,459 | 3,559 |
| **Total Project Cost** | 2,060,000 | 2,060,000 | 1,686,500 |
| ***Total, Contingency (TEC+OPC)*** | 64,671 | 79,836 | 112,727 |

[a] Previous Total Estimate is from the FY 2021 CPDS.

**5. Schedule of Appropriation Requests**

| Request Year | Type | Prior Years | FY 2021 | FY 2022 | Outyears | Total |
|---|---|---|---|---|---|---|
| FY 2014 | TEC | 1,171,500 | 64,300 | 50,700 | 0 | 1,286,500 |
| | OPC | 145,000 | 10,700 | 9,300 | 0 | 165,000 |
| | TPC | 1,316,500 | 75,000 | 60,000 | 0 | 1,451,500 |
| FY 2015 | TEC | 1,171,500 | 64,300 | 50,700 | 0 | 1,286,500 |
| | OPC | 145,000 | 10,700 | 9,300 | 0 | 165,000 |
| | TPC | 1,316,500 | 75,000 | 60,000 | 0 | 1,451,500 |
| FY 2015 Rev | TEC | 1,090,200 | 197,900 | 66,900 | 52,900 | 1,407,900 |
| | OPC | 143,900 | 6,500 | 6,700 | 21,100 | 178,200 |
| | TPC | 1,234,100 | 204,400 | 73,600 | 74,000 | 1,586,100 |
| FY 2016 | TEC | 931,500 | 234,300 | 186,100 | 99,000 | 1,450,900 |
| | OPC | 154,000 | 4,700 | 6,900 | 30,000 | 195,600 |
| | TPC | 1,085,500 | 239,000 | 193,000 | 129,000 | 1,646,500 |
| FY 2017 | TEC | 940,800 | 234,700 | 186,700 | 110,200 | 1,472,400 |
| | OPC | 145,500 | 4,300 | 6,300 | 18,000 | 174,100 |
| | TPC | 1,086,300 | 239,000 | 193,000 | 128,200 | 1,646,500 |
| FY 2018 | TEC | 954,800 | 234,700 | 186,700 | 96,200 | 1,472,400 |
| | OPC | 145,500 | 4,300 | 6,300 | 18,000 | 174,100 |
| | TPC | 1,100,300 | 239,000 | 193,000 | 114,200 | 1,646,500 |
| FY 2019[a] | TEC | N/A | N/A | N/A | N/A | 1,472,400 |
| | OPC | N/A | N/A | N/A | N/A | 174,100 |
| | TPC | 1,100,300 | 239,000 | 193,000 | 114,200 | 1,646,500 |
| FY 2020 | TEC | N/A | N/A | N/A | N/A | 1,472,000 |
| | OPC | N/A | N/A | N/A | N/A | 174,100 |
| | TPC | 1,100,300 | 239,000 | 193,000 | 114,200 | 1,686,500[b] |
| FY 2021 | TEC | N/A | N/A | N/A | N/A | 1,886,000 |
| | OPC | N/A | N/A | N/A | N/A | 174,000 |
| | TPC | 1,100,300 | 330,000 | 193,000 | 114,200 | 2,060,000[c] |
| FY 2022[d] | TEC | N/A | N/A | N/A | N/A | 1,886,000 |
| | OPC | N/A | N/A | N/A | N/A | 174,000 |
| | TPC | 1,100,300 | 330,000 | 348,705 | 280,995 | 2,060,000 |

[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 was first 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 included requirement updates through FY 2021 only, including the $40M funding requirement with an additional $51M requirement to implement the Performance Baseline revision. The FY 2021 appropriation schedule also included 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.

[d] Consistent with the October 2019 Performance Baseline Revision, the FY 2022 CPDS has been updated to reflect the required funding profile through Project Closeout (FY 2027).

**6. Related Operations and Maintenance Funding Requirements**

| | |
|---|---|
| Start of Operation of Beneficial Occupancy | 4Q FY 2025 |
| 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 | 6,656 | 6,656 |

**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.

**DEPARTMENT OF ENERGY**
**Funding by Site**
Naval Reactors BY 2022
(Dollars in Thousands)

| | FY 2020 Request Detail | FY 2021 Request Detail | FY 2022 Request Detail |
|---|---|---|---|
| **Bettis Atomic Power Laboratory** | | | |
| Naval Reactors Development | 231,140 | 250,006 | 280,776 |
| Columbia-Class Reactor Systems Development | 23,881 | 15,028 | 11,689 |
| S8G Prototype Refueling | 3,245 | 2,888 | 0 |
| Naval Reactors Operations and Infrastructure | 117,287 | 82,713 | 113,367 |
| 14-D-901 Spent Fuel Handling Recapitalization Project, NRF | 17,694 | 14,362 | 12,240 |
| Construction - Naval Reactors | 17,694 | 14,362 | 12,240 |
| **Total Bettis Atomic Power Laboratory** | **393,247** | **364,997** | **418,072** |
| **Idaho National Laboratory** | | | |
| Naval Reactors Development | 102,114 | 105,534 | 108,535 |
| S8G Prototype Refueling | 786 | 738 | 0 |
| Naval Reactors Operations and Infrastructure | 144,103 | 183,809 | 178,433 |
| 14-D-901 Spent Fuel Handling Recapitalization Project, NRF | 213,044 | 310,587 | 332,366 |
| Construction - Naval Reactors | 213,044 | 310,587 | 332,366 |
| **Total Idaho National Laboratory** | **460,047** | **600,668** | **619,334** |
| **Knolls Atomic Power Laboratory** | | | |
| Naval Reactors Development | 181,043 | 210,505 | 249,393 |
| Columbia-Class Reactor Systems Development | 51,619 | 49,672 | 43,311 |
| S8G Prototype Refueling | 165,969 | 131,374 | 126,000 |
| Naval Reactors Operations and Infrastructure | 282,538 | 254,125 | 288,717 |
| 22-D-532 Security Upgrades KL | 0 | 0 | 5,100 |
| 22-D-531 KL Chemistry and Radiological Health Building | 0 | 0 | 41,620 |
| 21-D-530 KL Steam and Condensate Upgrades | 0 | 4,000 | 0 |
| 20-D-931, KL Fuel Development Laboratory | 23,700 | 0 | 0 |
| 19-D-930 KS Overhead Piping | 20,900 | 0 | 0 |
| 14-D-901 Spent Fuel Handling Recapitalization Project, NRF | 7,262 | 5,051 | 4,099 |
| Construction - Naval Reactors | 51,862 | 9,051 | 50,819 |
| **Total Knolls Atomic Power Laboratory** | **733,031** | **654,727** | **758,240** |
| **Naval Reactors Laboratory Field Office** | | | |
| Program Direction - Naval Reactors | 20,240 | 20,680 | 22,232 |
| **Total Naval Reactors Laboratory Field Office** | **20,240** | **20,680** | **22,232** |
| **Washington Headquarters** | | | |
| Naval Reactors Development | 1,908 | 1,955 | 1,980 |
| Naval Reactors Operations and Infrastructure | 9,663 | 9,953 | 13,500 |
| Program Direction - Naval Reactors | 30,260 | 31,020 | 33,347 |
| **Total Washington Headquarters** | **41,831** | **42,928** | **48,827** |
| **Undesignated LPI** | | | |
| Rescission of Prior Year Balances | 0 | 0 | -6,000 |
| **Total Undesignated LPI** | **0** | **0** | **-6,000** |
| **Total Funding by Site for Naval Reactors** | **1,648,396** | **1,684,000** | **1,860,705** |

## GENERAL PROVISIONS-DEPARTMENT OF ENERGY
### [(INCLUDING TRANSFER 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 ar-rangements (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 Agree-ment 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), 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 ex-planatory 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 substan-tial 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 practic-able, but not later than 3 days after the date of the activity to which a require-ment or restriction would otherwise have applied. Such notice shall include an explanation of the substantial risk under paragraph (1) that permitted such waiver.

(h) 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 [2021] 2022 until the enactment of the Intelligence Authorization Act for fiscal year [2021] 2022.

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 require-ments.

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. 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. 306. (a) Of the offsetting collections, including unobligated balances of such collections, in the "Department of Energy-Power Marketing Administra-tion-Colorado River Basins Power Marketing Fund, Western Area Power Admin-istration", $21,400,000 shall be transferred to the "Department of the Interior-Bur-eau of Reclamation-Upper Colorado River Basin Fund" for the Bureau of Reclam-ation to carry out environmental stewardship and endangered species recovery efforts.

(b) No funds shall be transferred directly from "Department of Energy-Power Marketing Administration-Colorado River Basins Power Marketing Fund, Western Area Power Administration" to the general fund of the Treasury in the current fiscal year.]

## 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 appro-priation 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 depart-ment, 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 require-ments for each authority.]

SEC. [503]*502*. 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]*503*. (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.

[SEC. 505. (a) Requirements relating to non-Federal cost-share grants and co-operative agreements for the Delta Regional Authority under section 382D of the Agricultural Act of 1961 and Consolidated Farm and Rural Development Act (7 U.S.C. 2009aa-3) are waived for grants awarded in fiscal year 2020 and in sub-sequent years in response to economic distress directly related to the impacts of the Coronavirus Disease (COVID-19).

(b) Requirements relating to non-Federal cost-share grants and cooperative agreements for the Northern Border Regional Commission under section 15501(d) of title 40, United States Code, are waived for grants awarded in fiscal year 2020 and in subsequent years in response to economic distress directly related to the impacts of the Coronavirus Disease (COVID-19).

(c) Requirements relating to non-Federal cost-share grants and cooperative agreements for the Denali Commission are waived for grants awarded in fiscal year 2020 and in subsequent years in response to economic distress directly re-lated to the impacts of the Coronavirus Disease (COVID-19).]

SEC. [506]*504*. Of the unavailable collections currently in the United States Enrichment Corporation Fund, [$291,000,000] $415,670,000 shall be transferred to and merged with the Uranium Enrichment Decontamination and Decommis-sioning Fund and shall be available only to the extent provided in advance in ap-propriations Acts.