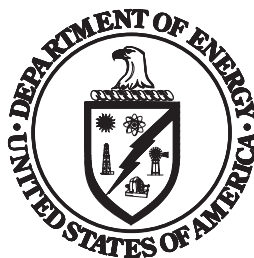


Department of Energy FY 2019 Congressional Budget Request



Budget in Brief

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Budget in Brief

March 2018

Office of Chief Financial Officer



FY 2019 BUDGET IN BRIEF

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OVERVIEW

The President's Budget for FY 2019 requests \$30.6B for the Department of Energy (DOE) to advance U.S. national security and economic growth through transformative science and technology innovation that promotes affordable and reliable energy through market solutions and meets our nuclear security and environmental cleanup challenges.

The FY 2019 Budget Request provides:

- \$15.1B to modernize and restore the nuclear security enterprise aligned with the Nuclear Posture Review (NPR) and National Security Strategy
- \$5.4B to conduct cutting-edge, early-stage scientific research and development (R&D) and build state-of-the-art scientific tools and facilities to keep U.S. researchers at the forefront of scientific innovation, including achieving exascale computing in 2021
- \$2.5B to promote America's energy dominance through technologies that will make our energy supply more affordable, reliable, and efficient
- \$6.6B to continue our commitment for the cleanup of sites resulting from five decades of nuclear weapons development and production and Government-sponsored nuclear energy research

DEPARTMENT OF ENERGY	
DOE Programs	FY19 (\$M)
• National Nuclear Security Administration	15,091
• Science	5,391
• Energy	2,515
• Environmental Management	6,601
• Other Defense Activities	853
• Administration and Oversight	293
• <i>Savings and Receipts</i>	-137
DOE Total	30,609

ACCELERATING PROGRESS ON NATIONAL PRIORITIES

The FY 2019 Budget Request advances key mission areas through significant investments to, achieve exascale computing, protect the national electric grid from cyberattack, promote energy dominance, conduct early stage scientific research, modernize the nuclear security enterprise, and advance the nation's nuclear waste management program.

The FY 2019 Budget Request funds \$636M to achieve exascale computing in 2021, including \$473M in the Office of Science and \$163M in NNSA, \$376M above the FY 2017 Enacted level, to support development of an exascale computing software ecosystem by preparing mission critical applications to address exascale challenges. The Budget Request funds research, development, and design at the Argonne National Laboratory and Oak Ridge National Laboratory with expected deployment of an exascale-capable computing system in 2021 with a second system with a different architecture in 2022. This Science/NNSA partnership will bolster America's national security by supporting the nuclear stockpile while supporting the next generation of science breakthroughs not possible with today's fastest computing systems.

The Request also invests \$105M in quantum computing to address the emerging urgency of building U.S. competency and competitiveness in the developing area of quantum information science, including quantum computing and quantum sensor technology. This early stage, fundamental research will concentrate on accelerating progress towards application of quantum computing techniques and quantum sensing to grand challenge science questions. It also builds on experience gained from multidisciplinary partnerships in areas such as quantum pattern recognition for real-time tracking; quantum algorithms for exponentially increased information storage, quantum chemistry, and nuclear physics; and predictive capability for biological systems such as protein folding.

National and economic security also depends on the reliable function of the Nation's overall energy infrastructure in face of the threat posed by malicious cyber actors. Cybersecurity is one of the Administration's top priorities, and the FY 2019 Budget Request provides funding in multiple programs to prevent and address cyberattacks on the energy sector and to secure the DOE enterprise.

The Request supports the Administration's commitment to protecting energy infrastructure security by proposing a separate account for Cybersecurity, Energy Security, and Emergency Response (CESER). This new account will consolidate funding that supports the expanded national security responsibilities assigned to DOE through the Fixing America's Surface Transportation (FAST) Act, Bipartisan Budget Act of 2015, Presidential Policy Directive 21, and Presidential Executive Order 13800 on Cybersecurity. As part of CESER, the FY 2019 Budget Request provides \$70M for grid cybersecurity. Pursuant to the Federal Power Act, as amended by the FAST Act, DOE remains the sector-specific agency for cybersecurity in the energy sector. As such, DOE is working with the private sector to prepare, mitigate vulnerabilities and help reduce impacts from cyber threats. The FY 2019 Budget Request will help improve preparedness, planning and response capabilities for cyber incidents and help align them across state, local, tribal, territorial and Federal jurisdictions. In addition, the Budget Request will help leverage the cutting-edge R&D of DOE's national labs to drive cybersecurity innovation across the energy sector.

Also, the Request includes \$394.5M for DOE Enterprise cybersecurity, an increase of \$98M from the FY 2017 Enacted amount, to reduce DOE exposure to threats and to manage enterprise cybersecurity risks. This includes \$92M for the Department's Office of Chief Information Officer, \$23M above FY 2017 Enacted level, to reduce the Department's exposure to threats and to manage enterprise cybersecurity risks. The Budget Request also includes over \$300M in other program office budgets to support improved DOE cybersecurity, including \$185M for the cybersecurity of the National Nuclear Security Administration.

The FY 2019 Budget Request continues to focus the Department's energy (\$2.5B) and science (\$5.4B) programs on early-stage R&D at the national laboratories to advance American primacy in scientific and energy research in an efficient and cost effective manner. The Budget Request focuses on cutting-edge innovation. For example, the Request funds \$432M for specific, cutting-edge, early-stage R&D efforts in energy storage solutions beyond batteries, advanced fossil-based power systems, and advanced reactor technologies including Small Modular Reactors to promote American energy dominance through an "all of the above" energy strategy. The Request also fosters the transition of those breakthroughs to the private sector for commercialization through expanded funding for a consolidated technology transitions function in the Office of Technology Transitions (\$8.5M). The Budget Request eliminates the Advanced Research Projects Agency—Energy program, the Title XVII Innovative Technology loan guarantee program, and the Advanced Technology Vehicle Manufacturing loan program.

The FY 2019 Budget Request provides \$11B to NNSA to modernize the nuclear security enterprise, \$1.8B above FY 2017, including the ongoing refurbishment of the nuclear weapon stockpile, in alignment with the 2018 NPR.

Finally, demonstrating the Administration's commitment to nuclear waste management the Request of \$120M resumes support for the Yucca Mountain licensing process and develops and implements a robust interim storage program. The Yucca Mountain and Interim Storage programs are critical to enhancing the national and economic security goals of the nation.

NATIONAL NUCLEAR SECURITY ADMINISTRATION

The National Nuclear Security Administration (NNSA) is responsible for maintaining a safe, secure, and effective nuclear weapons stockpile; for preventing, countering, and responding to evolving and emerging nuclear proliferation and terrorism threats; for providing safe, reliable and long-term nuclear propulsion to the Nation's Navy as it protects American and Allied interests around the world; and for supporting the federal workforce that carries out these critical responsibilities.

To support these activities, the FY 2019 Budget Request proposes \$15.1B for the NNSA, \$2.2B over FY 2017 Enacted. The Request makes necessary investments consistent with the NPR to: modernize and rebuild a nuclear force and nuclear security enterprise; prevent, counter and respond to nuclear proliferation and terrorism threats; and provide safe, reliable, and long-term nuclear propulsion to the Nation’s Navy. The Nuclear Weapons Council (NWC) will translate the NPR’s policy initiatives into requirements. This request positions NNSA to support those initiatives while working within the NWC to define the military requirements and strategic direction provided by the NPR. As military requirements are refined, the Administration will work with Congress to ensure that the program of work is properly authorized and funded.

NATIONAL NUCLEAR SECURITY ADMINISTRATION	
NNSA Programs	FY19 (\$M)
• Weapons Activities	11,017
• Defense Nuclear Nonproliferation	1,863
• Naval Reactors	1,789
• Federal Salaries and Expenses	423
NNSA Total	15,091

The Budget Request includes:

- \$11B for Weapons Activities, \$1.8B above FY 2017 Enacted, to maintain the safety, security, and effectiveness of the nuclear stockpile, to continue the nuclear modernization program, and to modernize NNSA’s nuclear security infrastructure portfolio in alignment with the NPR.
 - \$1.9B for Life Extension Programs (LEPs), \$580M above FY 2017 Enacted, to support the nuclear weapons program. The FY 2019 Budget Request supports the LEP and Major Alterations (Alt) including the W80-4 LEP, the W88 Alt 370, completion of the W76-1 LEP, transition from design to production for the B61-12 LEP, and restart of the Feasibility Study & Design Options for Interoperable Warhead-1 (IW-1) to remain aligned with the Department of Defense (DOD) current nuclear modernization plans.
 - \$3.0B for Infrastructure and Operations, \$194M above FY 2017, to continue the long-term effort to reverse the declining state of NNSA infrastructure, improve working conditions of NNSA’s deteriorating facilities and equipment, and address safety and programmatic risks. The Request funds construction of the Uranium Processing Facility (UPF) and associated buildings; continued construction of the Chemistry and Metallurgical Research Replacement (CMRR) project to sustain plutonium science activities; and construction of the Albuquerque Complex Project to replace aging and degrading facilities.
 - \$163M for activities and research leading to deployment of exascale capability for national security applications. Of this \$47M is designated for two construction projects: 1) \$24M for the Exascale Class Computer Cooling Equipment (EC3E) project at the Los Alamos National Laboratory (LANL), and 2) \$23M for the Exascale Computing Facility Modernization (ECFM) project at the Lawrence Livermore National Laboratory (LLNL).

- \$1.9B for Defense Nuclear Nonproliferation, \$17M below FY 2017 Enacted, to address the entire nuclear threat spectrum by preventing the acquisition of nuclear weapons or weapons-usable materials, countering efforts to acquire such weapons or materials, and responding to nuclear or radiological incidents. The Budget Request also includes \$220M to continue the orderly and safe closure of the Mixed Oxide (MOX) Fuel Fabrication Facility and \$59M for the Surplus Plutonium Disposition (SPD) project to support the dilute and dispose strategy. The Budget Request will support the continuation of preliminary design and the initiation of long-lead procurements in FY 2019.

- \$1.8B for Naval Reactors (NR), an increase of \$369M from the FY 2017 level (excluding the transfer of \$75M to the Office of Nuclear Energy to support the Advanced Test Reactor), to support the current and future fleet. The request funds continued research, development and design for the Columbia-class submarine, recapitalizing the capability to handle naval spent nuclear fuel, and continued work to ensure the fleet remains the most advanced, well-maintained, and capable nuclear fleet in the world.

- \$423M for NNSA Federal Salaries and Expenses, \$35M above FY 2017, to support 1,715 federal full-time equivalent (FTE) employees who provide federal oversight of the nuclear security enterprise. This workforce is responsible for managing and executing NNSA’s weapons activities and nonproliferation missions.

SCIENCE

The FY 2019 Budget Request includes \$5.4B for the Office of Science, the same as FY 2017 Enacted, to focus on its core mission of conducting cutting edge, early-stage research. Highlights of the Request include:

- \$2.2B for discovery at the frontiers of science, maintaining 40% of its budget for research, including \$578M to achieve exascale and quantum computing
- \$2.1B to operate national labs and world-class scientific instruments for over 30,000 researchers
- \$760M to construct the next generation of scientific facilities and tools, including the new Advanced Light Source Upgrade (ALS-U) at Lawrence Berkeley National Laboratory and the Linac Coherent Light Source-II High Energy project at SLAC; continuation of construction of the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) at Fermi, the Facility for Rare Isotope Beams at Michigan State University, two significant upgrades to the Large Hadron Collider, and \$75M for the ITER project.

SCIENCE	
Science Programs	FY19 (\$M)
• Advanced Scientific Computing Research	899
• Basic Energy Sciences	1,850
• Biological and Environmental Research	500
• Fusion Energy Sciences	340
• High Energy Physics	770
• Nuclear Physics	600
• Science Laboratory Infrastructure	127
• Security and Administration	286
• Workforce Development for Teachers and Scientists	19
Science Total	5,391

Specific program requests include:

- \$899M for Advanced Scientific Computing Research (ASCR), an increase of \$252M from FY 2017 Enacted. The funding includes \$472.7M to develop exascale computing systems and continue site preparations and investments to deploy an exascale system in 2021 and another in 2022. The Request also supports core research in applied mathematics and computer science, partnerships under the Scientific Discovery through Advanced Computing program, and new strategic partnerships to understand the challenges that quantum information and neuromorphic technologies pose to DOE mission applications.
- \$1.85B for Basic Energy Sciences (BES), \$21.5M below FY 2017 Enacted. The Request supports early-stage, fundamental R&D and operating and maintaining scientific user facilities. Priority areas include the Energy Frontier Research Centers, ultrafast science, and quantum information science research. Funding supports the two Energy Innovation Hubs, four x-ray facilities, both BES-supported neutron sources, five nanoscience centers, and ongoing and new construction projects.
- \$500M for Biological and Environmental Research, \$112M below FY 2017 Enacted, supporting core research in genomics and modeling while operating scientific user facilities in environmental sciences. The Request funds research in foundational genomic sciences, including the four Bioenergy Research Centers.
- \$340M for Fusion Energy Sciences, a decrease of \$40M from FY 2017 Enacted, to support R&D that will contribute to U.S. leadership in fusion technological advances. The Request funds the DIII-D program research and facility operations; the Materials-Plasma Exposure eXperiment (MPEX) project; high-energy-density laboratory plasma science enabled by the Matter in Extreme Conditions instrument of the Linac

Coherent Light Source (LCLS); and National Spherical Torus Experiment Upgrade (NSTX-U) at Princeton Plasma Physics Laboratory. ITER funding focuses on the highest-priority First Plasma hardware components, including the central solenoid superconducting magnet modules.

- \$770M for High Energy Physics, a decrease of \$55M from FY 2017 Enacted, to support LBNF/DUNE, the High-Luminosity Large Hadron Collider (HL-LC) Accelerator and Detector Upgrade projects at CERN, the Muon to Electron Conversion Experiment project, and Major Items of Equipment. The request also funds Quantum Information Science (QIS) research.
- \$600M for Nuclear Physics, a decrease of \$22M from FY 2017 Enacted, to support research to develop new applications for medicine, commerce, and national security. The Request funds Relativistic Heavy Ion Collider (RHIC) operation, the Continuous Electron Beam Accelerator Facility (CEBAF), and isotope production facilities. The Request also funds Facility for Rare Isotope Beams (FRIB) construction and several Major Items of Equipment.
- \$19M for Workforce Development for Teachers and Scientists (WDTS), a decrease of \$0.5M from FY 2017 Enacted, to fund programs that place highly qualified applicants in authentic STEM learning and training opportunities at DOE laboratories, as well as supporting the National Science Bowl® competition.
- \$126.9M for Science Laboratories Infrastructure (SLI), a decrease of \$3.1M from FY 2017 Enacted, funds two new construction projects: the Electrical Capacity and Distribution Capability project at Argonne National Laboratory (ANL) and the Science User Support Center project at Brookhaven National Laboratory (BNL); and continues funding of ongoing construction projects.

ENERGY

The FY 2019 Budget Request advances energy dominance by investing in America’s leadership in energy innovation. The FY 2019 Request provides \$2.5B for energy and related programs, \$1.9B below FY 2017 Enacted, and continues the Administration’s prioritization of the early-stage R&D that takes place at the National Laboratories. Highlights include:

- \$696M for Energy Efficiency and Renewable Energy, \$1.3B below FY 2017 Enacted, focusing on early stage R&D on energy technologies including approaches across multiple EERE programs to develop innovative energy storage technologies including hydrogen fuel cells and electric vehicles and adaptable energy storage alternatives leading to greater grid resilience.

EERE invests in early-stage research to spur private-sector research, development and commercialization of critical energy technologies: sustainable transportation

technologies to increase fuel diversity and improve efficiency across the transportation sector (\$163.5M); renewable power generation technologies to compete with other electricity sources without subsidies (\$175M); and energy efficiency to improve affordability, energy productivity and resiliency of homes, buildings and manufacturing sectors (\$142M). The request eliminates the Weatherization and State Energy subprograms more appropriately funded at the state level.

ENERGY	
Energy Programs	FY19 (\$M)
• Energy Efficiency and Renewable Energy	696
• Electricity Delivery	61
• Cyber Security, Energy Security, & Emergency Response	96
• Fossil Energy Research and Development	502
• Petroleum Reserves	195
• Nuclear Energy	757
• Yucca Mountain and Interim Storage	120
• Indian Energy	10
• Office of Policy	3
• Advanced Research Projects Agency—Energy	–
• Loan Programs	-1
• Power Marketing Administrations	77
Energy Total	2,515

- The Budget proposes to split the Electricity Delivery and Energy Reliability (OE) account, which totals \$157M, into two accounts to increase focus on grid reliability (Electricity Delivery) and cybersecurity (CESER).
 - \$61M for Electricity Delivery (OE), \$89M below the comparable FY 2017 level, to improve the resilience and reliability of the nation’s electricity system; invest in our transmission system to support resource adequacy and generation diversity; move forward with new architecture approaches for the transmission and distribution system to enhance security and resilience; and advance energy storage.
 - \$96M to protect energy infrastructure security by establishing the new Cybersecurity, Energy Security, and Emergency Response (CESER) account, \$17M above the comparable FY 2017 level. This account funds increases in Cybersecurity for Energy Delivery Systems to improve grid and energy sector cybersecurity and in Infrastructure Security and Energy Restoration to support a more robust response capability to effectively address the needs of affected areas after storms or other incidents.
- \$502M for Fossil Energy R&D, \$81M above FY 2017 Enacted, to focus on cutting-edge, early stage R&D to improve the reliability and efficiency of advanced fossil-based power systems through multiple R&D efforts including significant improvements to coal plant energy generation. Carbon capture technologies will continue to focus on mitigating domestic CO2 emissions at fossil fuel-fired power plants and concentrating CO2 for high-valued products and Enhanced Oil Recovery.
- \$757M for Nuclear Energy, \$259M below FY 2017 Enacted, to revive and expand the U.S. nuclear energy sector through early-stage R&D, prioritizing support for advanced manufacturing methods, instrumentation, and reactor technologies, including \$54M for advanced Small Modular Reactor R&D. The Request supports R&D for enhanced accident tolerance on light water reactor fuel concepts; strategic infrastructure investments in nuclear energy technologies, including modeling and simulation; and investments into the reliability and availability of the Advanced Test Reactor. The Integrated Waste Management System subprogram is discontinued and interim storage activities and corresponding Program Direction funding is moved to the Yucca Mountain and Interim Storage program.
- \$120M for the Yucca Mountain and Interim Storage Program, demonstrating the Administration’s commitment to nuclear waste management by restarting Nuclear Regulatory Commission licensing activities for the Yucca Mountain nuclear waste repository (\$110M of which \$19.6M is Program Direction), establishing a robust interim storage program to develop a capability for earlier acceptance of spent nuclear fuel (\$10M of which \$3.4M is Program Direction).
- \$10M, \$6M below FY 2017 Enacted, to provide financial and technical assistance critical to advancing electrification and energy development and deployment and reducing energy costs on Indian lands.
- Terminates the Loan Programs and the Advanced Research Projects Agency—Energy, while maintaining monitoring of the existing loan portfolio and overseeing existing awards to completion.
- \$195M for the Petroleum Reserves, including the Strategic Petroleum Reserve (SPR), Naval Petroleum and Oil Shale Reserves, and Northeast Home Heating Oil Reserve. The President’s Budget continues the sale of SPR oil for the Energy Security and Infrastructure Modernization Fund authorized by the Bipartisan Budget Act of 2015 to support an effective modernization program for the SPR.
- \$77M for the Power Marketing Administrations (PMA), \$6M below FY 2017 Enacted. As part of the President’s mandatory budget proposals, the Request proposes to sell the PMA transmission assets, repeal the \$3.25B Western Area Power Administration borrowing authority authorized by the Recovery Act of 2009, and permit consideration of comparable utilities’ rates when setting prices.

- \$2.5M and uses carryover balances for an Office of Policy (OP), to develop energy policies; produce congressionally mandated reports; and provide research, market and industry analysis of the energy sector.
- \$115M for the Energy Information Administration, \$7M below FY 2017 Enacted, to continue supporting the collection, analysis, and dissemination of independent and impartial energy information and analysis to promote sound policymaking, efficient markets, and public understanding.

ENVIRONMENTAL MANAGEMENT

The Budget Request includes \$6.6B for Environmental Management, \$182M above FY 2017 Enacted, to continue managing the cleanup resulting from five decades of nuclear weapons development and production and Government-sponsored nuclear energy research. This request will clean up millions of gallons of liquid radioactive waste, thousands of tons of spent (used) nuclear fuel and nuclear materials, disposition of large volumes of transuranic and mixed/low-level waste, huge quantities of contaminated soil and water, and deactivation and decommissioning of excess facilities. EM is responsible for clean up at 16 remaining sites in 11 states. Highlights of the FY 2019 Budget Request include:

- \$1.7B, \$287M above FY 2017 Enacted, to provide support at the Savannah River Site for the Liquid Tank Waste Management Program, including a significant increase in the production at the Defense Waste Processing Facility, startup of the Salt Waste Processing Facility, continued construction of the Saltstone Disposal Unit #7, and completion of design and beginning construction of Saltstone Disposal Units #8 and #9.
- \$1.4B, \$61M below FY 2017 Enacted, for the Office of River Protection, to safely manage and treat approximately 56M gallons of radioactive liquid and chemical waste currently stored in 177 underground storage tanks at Hanford, 17 of which have completed waste retrieval and are transitioning to closure, including ongoing construction, startup and commissioning activities at the Waste Treatment Plant supporting the direct feed of low-activity waste for immobilization by December 2023.
- \$747M, \$169M below FY 2017 Enacted, for Richland cleanup at Hanford to support cleanup required by the Tri-Party Agreement, including soil and groundwater remediation, facility decontamination and decommissioning, and stabilization and disposition of nuclear materials and spent nuclear fuel.
- \$415M, \$33M above FY 2017 Enacted, for the decontamination and decommissioning project and other cleanup at the Portsmouth Site.
- \$409M, \$90M less than FY 2017 Enacted, for cleanup activities at the Oak Ridge site, including continued deactivation and demolition at the East Tennessee Technology Park, preparation of Building 2026 to support

ENVIRONMENTAL MANAGEMENT	
DOE Cleanup Sites and Program	FY19 (\$M)
• Savannah River	1,656
• River Protection	1,438
• Richland/Hanford	747
• Portsmouth	415
• Oak Ridge	409
• Carlsbad/Waste Isolation Pilot Plant (WIPP)	403
• Idaho	359
• Program Direction	300
• Paducah	270
• Los Alamos	192
• Excess Facilities	150
• West Valley Demonstration Project	64
• Nevada	60
• Moab	35
• Uranium Thorium Reimbursements	30
• Technology Development	25
• Separation Process Research Unit (SPRU)	15
• Headquarters Operations	13
• Energy Technology Engineering Center	8
• Other Sites	5
• Sandia National Laboratory	3
• Brookhaven	2
• Lawrence Livermore National Laboratory	2
Environmental Management Total	6,601

processing of the remaining U-233 material at the Oak Ridge National Laboratory, planning and initiation of design for a new On-Site Waste Disposal Facility, and planning and completion of early site preparation activities for the Outfall 200 Mercury Treatment Facility.

- \$403M, \$79M above FY 2017 Enacted, to safely continue waste emplacement at the Waste Isolation Pilot Plant (WIPP), the Nation's only mined geologic repository for permanent disposal of defense-generated transuranic waste, including \$85M for ventilation system and utility shaft projects to increase underground airflow for simultaneous mining and waste emplacement operations.
- \$359M, \$31M less than FY 2017 Enacted, to continue cleanup at the Idaho site, including the commissioning and startup of the Integrated Waste Treatment Unit and operating the Advanced Mixed Waste Treatment Project, continue progress toward buried waste exhumation under the Accelerated Retrieval Project, support spent (used) nuclear fuel activities to meet the Idaho Settlement Agreement milestone of all spent (used) nuclear fuel out of wet storage by 2023, and maintain soil and ground remedies for the protection of the Snake River Plain aquifer.
- \$270M, \$2M less than FY 2017 Enacted, for the Paducah site to continue ongoing cleanup activities.
- \$150M to deactivate and decommission specific high-risk excess contaminated facilities at Y-12 National Security Complex and Lawrence Livermore National Laboratory not currently in the program's inventory.

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FUNDING BY APPROPRIATION

Department of Energy Budget by Appropriation	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Energy and Water Development, and Related Agencies					
Energy Programs					
Energy Efficiency and Renewable Energy	2,034,582	2,040,249	695,610	-1,338,972	-65.8%
Electricity Delivery and Energy Reliability	229,585	228,026	0	-229,585	-100.0%
Electricity Delivery	0	0	61,309	+61,309	N/A
Cybersecurity, Energy Security, and Emergency Response	0	0	95,800	+95,800	N/A
Nuclear Energy	1,015,821	1,008,922	757,090	-258,731	-25.5%
Fossil Energy Programs					
Fossil Energy Research and Development	421,154	425,093	502,070	+80,916	+19.2%
Naval Petroleum and Oil Shale Reserves	12,005	14,848	10,000	-2,005	-16.7%
Strategic Petroleum Reserve	222,605	221,485	175,105	-47,500	-21.3%
Northeast Home Heating Oil Reserve	6,497	6,456	10,000	+3,503	+53.9%
Total, Fossil Energy Programs	662,261	667,882	697,175	+34,914	+5.3%
Uranium Enrichment Decontamination and Decommissioning (D&D) Fund	767,929	763,106	752,749	-15,180	-2.0%
Energy Information Administration	122,000	121,171	115,035	-6,965	-5.7%
Non-Defense Environmental Cleanup	246,762	245,324	218,400	-28,362	-11.5%
Science	5,390,972	5,354,362	5,390,972	0	N/A
Advanced Research Projects Agency - Energy	305,245	303,172	0	-305,245	-100.0%
Nuclear Waste Disposal (30M in DNWF 050)	0	0	90,000	+90,000	N/A
Departmental Administration	120,692	120,009	139,534	+18,842	+15.6%
Inspector General	44,424	44,122	51,330	+6,906	+15.5%
Title 17 - Innovative Technology Loan Guarantee Program	139	16,749	7,000	+6,861	+4,936.0%
Advanced Technology Vehicles Manufacturing Loan Program	3,883	4,966	1,000	-2,883	-74.2%
Tribal Energy Loan Guarantee Program	9,000	8,939	-8,500	-17,500	-194.4%
Total, Energy Programs	10,953,295	10,926,999	9,064,504	-1,888,791	-17.2%
Atomic Energy Defense Activities					
National Nuclear Security Administration					
Federal Salaries and Expenses	387,366	384,736	422,529	+35,163	+9.1%
Weapons Activities	9,240,739	9,241,675	11,017,078	+1,776,339	+19.2%
Defense Nuclear Nonproliferation	1,879,738	1,885,970	1,862,825	-16,913	-0.9%
Naval Reactors	1,419,792	1,410,455	1,788,618	+368,826	+26.0%
Total, National Nuclear Security Administration	12,927,635	12,922,836	15,091,050	+2,163,415	+16.7%
Environmental and Other Defense Activities					
Defense Environmental Cleanup	5,404,217	5,368,298	5,630,217	+226,000	+4.2%
Other Defense Activities	781,703	778,676	853,300	+71,597	+9.2%
Defense Nuclear Waste Disposal (90M in 270 Energy)	0	0	30,000	+30,000	N/A
Total, Environmental and Other Defense Activities	6,185,920	6,146,974	6,513,517	+327,597	+5.3%
Total, Atomic Energy Defense Activities	19,113,555	19,069,810	21,604,567	+2,491,012	+13.0%
Power Marketing Administrations					
Southeastern Power Administration	0	0	0	0	N/A
Southwestern Power Administration	11,057	10,982	10,400	-657	-5.9%
Western Area Power Administration	94,742	94,099	89,372	-5,370	-5.7%
Falcon and Amistad Operating and Maintenance Fund	232	230	228	-4	-1.7%
Colorado River Basins Power Marketing Fund	-23,000	-22,844	-23,000	0	N/A
Total, Power Marketing Administrations	83,031	82,467	77,000	-6,031	-7.3%
Federal Energy Regulatory Commission (FERC)	0	0	0	0	N/A
Subtotal, Energy and Water Development, and Related Agencies	30,149,881	30,079,276	30,746,071	+596,190	+2.0%
Uranium Enrichment D&D Fund Discretionary Payments	-563,000	-559,177	0	+563,000	+100.0%
Defense EM Funded Uranium Enrichment D&D Fund Contribution	563,000	559,177	0	-563,000	-100.0%
Excess Fees and Recoveries, FERC	-16,645	-9,000	-16,000	+645	+3.9%
Title XVII Loan Guarantee Program Section 1703 Negative Credit Subsidy Receipt	-37,000	-37,000	-44,000	-7,000	-18.9%
Sale of Northeast Gas Reserve	0	0	-77,000	-77,000	N/A
Defense Programs Rescission of Balances (Undistributed)	-43	-43	0	+43	+100.0%
Title 17 Loan Guarantee Program Rescission	-9,000	-8,939	0	+9,000	+100.0%
Total, Funding by Appropriation	30,087,193	30,024,294	30,609,071	+521,878	+1.7%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

FUNDING BY ORGANIZATION

Department of Energy Budget by Organization	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
Federal Salaries and Expenses	387,366	384,736	422,529	+35,163	+9.1%
Weapons Activities	9,240,739	9,241,675	11,017,078	+1,776,339	+19.2%
Defense Nuclear Nonproliferation	1,879,738	1,885,970	1,862,825	-16,913	-0.9%
Naval Reactors	1,419,792	1,410,455	1,788,618	+368,826	+26.0%
Total, National Nuclear Security Administration	12,927,635	12,922,836	15,091,050	+2,163,415	+16.7%
Energy Programs					
Energy Efficiency and Renewable Energy	2,034,582	2,040,249	695,610	-1,338,972	-65.8%
Electricity Delivery & Energy Reliability	229,585	228,026	0	-229,585	-100.0%
Office of Electricity Delivery	0	0	61,309	+61,309	N/A
Power Marketing Administrations	83,031	82,467	77,000	-6,031	-7.3%
Office of Cybersecurity, Energy Security, and Emergency Response	0	0	95,800	+95,800	N/A
Petroleum Reserves	241,107	242,789	195,105	-46,002	-19.1%
Fossil Energy Research and Development	421,154	425,093	502,070	+80,916	+19.2%
Nuclear Energy	1,015,821	1,008,922	757,090	-258,731	-25.5%
Yucca Mountain and Interim Storage	0	0	120,000	+120,000	N/A
Energy Policy and Systems Analysis	30,999	30,789	0	-30,999	-100.0%
Office of Indian Energy	16,000	15,891	10,005	-5,995	-37.5%
Office of Policy	0	0	2,510	+2,510	N/A
Project Management Oversight Assessment	12,373	12,289	15,005	+2,632	+21.3%
Environment, Health, Safety and Security Mission Support	189,826	189,675	205,847	+16,021	+8.4%
Credit Programs					
Title 17 - Innovative Technology Loan Guarantee Program	139	16,749	7,000	+6,861	+4,936.0%
Advanced Technology Vehicles Manufacturing Loan Program	3,883	4,966	1,000	-2,883	-74.2%
Tribal Energy Loan Guarantee Program	9,000	8,939	-8,500	-17,500	-194.4%
Total, Credit Programs	13,022	30,654	-500	-13,522	-103.8%
Total, Energy Programs	4,287,500	4,306,844	2,736,851	-1,550,649	-36.2%
Science, Environmental and Legacy Management, and Office of Technology Transitions (OTT)					
Science	5,390,972	5,354,362	5,390,972	0	N/A
Environmental Management	6,418,908	6,376,728	6,601,366	+182,458	+2.8%
Office of Legacy Management	153,254	153,272	158,877	+5,623	+3.7%
Office of Technology Transitions	6,906	6,859	8,505	+1,599	+23.2%
Total, Science, Environmental and Legacy Management, and OTT	11,970,040	11,891,221	12,159,720	+189,680	+1.6%
Other Department Offices					
Departmental Administration (Direct Reports)					
Chief Information Officer	74,492	73,986	96,793	+22,301	+29.9%
Management	52,924	52,565	54,872	+1,948	+3.7%
Chief Human Capital Officer	24,486	24,334	25,625	+1,139	+4.7%
Economic Impact and Diversity	10,169	10,100	10,005	-164	-1.6%
Office of the Secretary	5,089	5,054	5,395	+306	+6.0%
Chief Financial Officer	49,242	48,908	48,912	-330	-0.7%
Congressional and Intergovernmental Affairs	6,200	6,158	4,212	-1,988	-32.1%
Public Affairs	3,405	3,408	6,594	+3,189	+93.7%
General Counsel	33,000	32,776	33,075	+75	+0.2%
International Affairs	17,998	17,878	24,545	+6,547	+36.4%
Office of Small and Disadvantaged Business Utilization	3,000	2,980	3,170	+170	+5.7%
Strategic Partnership Projects and Revenues	-105,875	-105,063	-56,000	+49,875	+47.1%
Total, Departmental Administration	174,130	173,084	257,198	+83,068	+47.7%
Other Defense Activities (Direct Reports)					
Office of Enterprise Assessments	75,579	75,067	76,770	+1,191	+1.6%
Specialized Security Activities	237,908	236,296	254,378	+16,470	+6.9%
Hearings and Appeals	5,420	5,463	3,739	-1,681	-31.0%
Total, Other Defense Activities	318,907	316,826	334,887	+15,980	+5.0%
Other Department Offices					
Advanced Research Projects Agency - Energy	305,245	303,172	0	-305,245	-100.0%
Energy Information Administration	122,000	121,171	115,035	-6,965	-5.7%
Inspector General	44,424	44,122	51,330	+6,906	+15.5%
Total, Other Department Offices	964,706	958,375	758,450	-206,256	-21.4%
Federal Energy Regulatory Commission	-16,645	-9,000	-16,000	+645	+3.9%
Title XVII Loan Guarantee Program Section 1703 Negative Credit Subsidy Receipt	-37,000	-37,000	-44,000	-7,000	-18.9%
Sale of Northeast Gas Reserve	0	0	-77,000	-77,000	N/A
Defense Programs Rescission of Balances (Undistributed)	-43	-43	0	+43	+100.0%
Title 17 Loan Guarantee Program Rescission	-9,000	-8,939	0	+9,000	+100.0%
Total, Funding by Organization	30,087,193	30,024,294	30,609,071	+521,878	+1.7%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

NATIONAL NUCLEAR SECURITY ADMINISTRATION

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
Federal Salaries and Expenses	387,366	384,736	422,529	+35,163	+9.1%
Weapons Activities	9,240,739	9,241,675	11,017,078	+1,776,339	+19.2%
Defense Nuclear Nonproliferation	1,879,738	1,885,970	1,862,825	-16,913	-0.9%
Naval Reactors ^a	1,419,792	1,410,455	1,788,618	+368,826	+26.0%
Total, National Nuclear Security Administration	12,927,635	12,922,836	15,091,050	+2,163,415	+16.7%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **National Nuclear Security Administration (NNSA)** FY 2019 Budget Request is \$15.1 billion, an increase of \$2.2 billion (17 percent) above the FY 2017 Enacted level to fund NNSA’s mission to support the security and safety of our nation. NNSA pursues four major national security endeavors: (1) use science to maintain a safe, secure, and effective nuclear weapons stockpile; (2) reduce the threat posed by nuclear proliferation and terrorism both domestically and internationally, including unsecured or excess nuclear and radiological materials; (3) prepare to respond to, and mitigate, nuclear and radiological incidents worldwide; and (4) design and maintain safe and effective nuclear propulsion for the U.S. Navy. The FY 2019 Budget Request will modernize America’s nuclear stockpile and infrastructure, support U.S. Navy nuclear propulsion requirements, and support the nonproliferation goals. The Request also supports efforts to formulate a comprehensive Government-wide Reform Plan to create a lean, accountable, more efficient government; effectively and efficiently deliver NNSA programs; and align the NNSA federal workforce to meet the needs of today and the future.

Program Highlights

The **NNSA Federal Salaries and Expenses (FSE)** FY 2019 Budget Request is \$422.5 million, a \$35.2 million (9 percent) increase above the FY 2017 Enacted.

The **Weapons Activities (WA)** FY 2019 Budget Request is \$11 billion, a \$1.8 billion (19 percent) increase above the FY 2017 Enacted.

The **Defense Nuclear Nonproliferation (DNN)** FY 2019 Budget Request is \$1.9 billion, a \$16.9 million (1 percent) decrease from the FY 2017 Enacted.

The **Naval Reactors (NR)** FY 2019 Budget Request is \$1.8 billion, a \$368.8 million (26 percent) increase above the FY 2017 Enacted.

Major Outyear Priorities and Assumptions

NNSA’s FYNSP topline for FY 2020 – FY 2023 is \$66.4 billion maintaining stable and consistent funding which is key to the current and future nuclear strategy and enterprise. This budget supports the modernization efforts and the scientific tools necessary to execute the 2018 Nuclear Posture Review (NPR). The budget continues to modernize America’s nuclear stockpile and infrastructure, and the underlying science that supports strategic decisions and certification of the stockpile. The Request supports the U.S Navy’s nuclear fleet through a safe and effective integrated nuclear propulsion systems. The Request also supports the nonproliferation goals outlined in NNSA’s *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (NPCR)*.

^a Funding does not reflect the transfer to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor.

FEDERAL SALARIES AND EXPENSES – NNSA

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
NNSA Federal Salaries and Expenses					
Federal Salaries and Expenses	390,000	387,352	422,529	+32,529	+8.3%
Subtotal, NNSA Federal Salaries and Expenses	390,000	387,352	422,529	+32,529	+8.3%
Rescission of Prior Year Balances	-2,634	-2,616	0	+2,634	+100.0%
Total, NNSA Federal Salaries and Expenses	387,366	384,736	422,529	+35,163	+9.1%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

NNSA's **Federal Salaries and Expenses (FSE)** pays for costs associated with recruiting, training, and retaining a federal staff to perform program and project management and appropriate oversight of approximately \$13 billion in Weapons Activities and Defense Nuclear Nonproliferation funding across the nuclear security enterprise. FSE provides for the salaries and benefits of 1,737 FTEs (1,715 paid from FSE, 22 paid from WCF), space and occupancy needs, travel costs, support service contractors, training, and other related expenses. 74 percent of FSE funds are for employee salaries and benefits.

The NNSA workforce consists of a diverse cadre of engineers, project managers, scientists, foreign affairs specialists, and highly technical support staff. The workforce is also comprised of mission support staff in information technology and cybersecurity, technical program management, corporate project management, procurement and contract management, safety and health, cost estimating and program evaluation, financial management, human capital management, and legal services. The Department of Energy and NNSA collaboratively work to identify ways to reduce overlap in mission support functions to minimize funding required to achieve our mission.

NNSA is physically disbursed throughout the United States, reflecting NNSA's work with the nuclear security enterprise. FSE funds federal staff 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 Savannah River Field Office (South Carolina).

NNSA also manages the Department's overseas presence, including placing DOE staff in foreign countries. NNSA supervises both federal employees and locally employed staff, and reimburses the Department of State for International Cooperative Administrative Support Services (ICASS) and Capital Security Cost Sharing (CSCS) charges. DOE funds its overseas presence through the Working Capital Fund (WCF) for consistent administrative and operational support to Departmental personnel.

Program Highlights

The FY 2019 Budget Request pays for costs associated with recruiting, training, and retaining a federal staff to perform program and project management and appropriate oversight of approximately \$13 billion in Weapons Activities and Defense Nuclear Nonproliferation funding across the nuclear security enterprise. The \$422.5 million request reflects a \$35.2 million (9.1 percent) increase above FY 2017 Enacted level, which included a one-time rescission of \$2.6 million. The request provides salaries, benefits, and other expenses for 1,737 federal FTEs (1,715 paid from FSE, 22 paid from WCF), includes a 5.5 percent increase for benefit escalation, provides additional funding to the Department's Working Capital Fund, includes headquarters security investigations costs per Congressional direction, and includes funding for headquarters facility upgrades. These increases are partially offset by reductions in projected field security investigation requirements and Corporate Project Management, consistent with the plan to transition from contractor support to federal support.

NNSA projects a total FSE workforce of 1,690 FTEs by the end of FY 2018 and 1,737 FTEs by the end of FY 2019 (1,715 paid from FSE, 22FTEs paid from Department's WCF).

NNSA is continuing disciplined efforts to support a lean, accountable, efficient government; effectively and efficiently deliver NNSA programs; and align the NNSA federal workforce to meet the needs of today and the future. As NNSA continues the nuclear modernization efforts, a highly skilled federal workforce is required for appropriate oversight principally in LEPs, program management, and major project management. The FY 2019 FSE FTE level is 10 percent lower than FY 2010 levels, while funding has increased 50 percent from FY 2010 Enacted levels to the FY 2019 request for Weapons Activities and Defense Nuclear Nonproliferation, primarily for the nuclear modernization program and supporting infrastructure projects.

Working with U.S. Office of Personnel Management (OPM) experts, NNSA is developing a Human Capital Management Plan (HCMP) that institutionalizes a consistent staffing analysis and career development methodology to support NNSA management responsibilities and prepare for an anticipated wave of retirements. Phase II was initiated in FY 2017. Results are expected summer 2018. Succession planning is critical since 45 percent of the current federal FTEs are eligible to retire by 2023. The HCMP will focus on the level and mix of skills needed of the federal workforce at all levels at present and for the future workforce. Specifically, strategic consideration of each business line and methods to gain efficiencies, eliminate redundancies and unnecessary bureaucracy, and align resources to mission requirements is paramount to an achievable HCMP. This includes a comprehensive recruiting and hiring plan that aligns the NNSA workforce with current and future mission needs.

FY 2018 Planned and FY 2019 Projected Accomplishments

FSE's planned FY 2018 and projected FY 2019 accomplishments include maintaining NNSA Federal Salaries and Expenses Federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at less than 5.9 percent; increase the quantity, quality, and effectiveness of the workforce to accomplish the growing NNSA mission; and identify efficiencies in federal travel, support service contractors, and other administrative expenses.

WEAPONS ACTIVITIES – NNSA

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
Weapons Activities					
Directed Stockpile Work	3,308,027	3,285,561	4,666,205	+1,358,178	+41.1%
Science	436,500	433,537	564,860	+128,360	+29.4%
Engineering	132,482	131,582	211,367	+78,885	+59.5%
Inertial Confinement Fusion Ignition and High Yield	522,959	519,408	418,927	-104,032	-19.9%
Advanced Simulation and Computing	663,184	658,680	703,401	+40,217	+6.1%
Advanced Manufacturing Development	87,105	86,514	96,838	+9,733	+11.2%
Infrastructure and Operations	2,808,363	2,789,290	3,002,736	+194,373	+6.9%
Secure Transportation Asset	248,889	247,199	278,639	+29,750	+12.0%
Defense Nuclear Security	685,500	680,845	690,638	+5,138	+0.7%
Information Technology and Cybersecurity	176,592	175,393	221,175	+44,583	+25.2%
Legacy Contractor Pensions	248,492	246,804	162,292	-86,200	-34.7%
Subtotal, Weapons Activities	9,318,093	9,254,813	11,017,078	+1,698,985	+18.2%
Rescission of Prior Year Balances	-77,354	-13,138	0	+77,354	+100.0%
Total, Weapons Activities	9,240,739	9,241,675	11,017,078	+1,776,339	+19.2%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

Programs funded in the **Weapons Activities (WA)** appropriation support the Nation's safe, secure, and effective nuclear deterrent including the supporting infrastructure of science, technology, and engineering capabilities. Weapons Activities provides for the maintenance and refurbishment of nuclear weapons to continue sustained confidence in their safety, reliability, and performance; investment in scientific, engineering, and manufacturing capabilities to enable certification of the enduring nuclear weapons stockpile; and manufacture of nuclear weapon components. Weapons Activities also provides for maintenance and investment in the NNSA nuclear complex to be more responsive and cost effective. This work is done in partnership with the Department of Defense (DOD).

NNSA's Management and Operating (M&O) contractors employ approximately 39,000 people, primarily at eight geographical sites, to execute these programs managed by a Federal workforce composed of civilian and military staff. Additional details about these programs will be included in the FY 2019 Stockpile Stewardship and Management Plan (SSMP), planned for release in March 2018.

The FY 2019 Request provides a 19.2% increase from the FY 2017 Enacted level, and supports the current stockpile, life extension programs, modernization efforts, and the scientific tools necessary for these efforts. This scope is consistent with the 2018 Nuclear Posture Review (NPR). The Nuclear Weapons Council (NWC) will translate the NPR's policy initiatives into requirements. This request positions NNSA to support those initiatives while working within the NWC to define the military requirements and strategic direction provided by the NPR. As military requirements are refined, the Administration will work with Congress to ensure that the program of work is properly authorized and funded. FY 2019 funding increases are requested in a number of areas as noted below.

Program Highlights

- **Directed Stockpile Work (DSW)**

DSW encompasses activities that support the nuclear weapons stockpile. These activities include maintenance and surveillance; planned refurbishment; reliability assessment; weapon dismantlement and disposition; and research,

development, and certification of technology efforts to meet stockpile requirements and strategic materials. Requested increases in Life Extension Programs (LEP) and Major Alterations (Alt) support planned workscope for the restart of and feasibility and design options study for the Interoperable Warhead 1 (IW1). This additional funding is required to maintain alignment with DOD schedules. Increases are included for Plutonium Sustainment to fabricate four to five development (DEV) W87 pits, continue investments to replace end-of-life pit production equipment, and install equipment to increase production capacity. The Tritium Sustainment increase supports increased Tritium production associated with Tennessee Valley Authority (TVA) reactor fuel and operational costs. The Uranium Sustainment increases to extend the operational lifetime of existing enriched uranium facilities. The Lithium Sustainment increases to produce and maintain the lithium material supply to meet mission deliverables, including maintenance of a configuration controlled lithium supply and demand model. The increase in Domestic Uranium Enrichment supports the start of an effort to downblend available stocks of highly enriched uranium for use in tritium production, which delays the need for a domestic uranium enrichment capability.

- **Research, Development, Test and Evaluation (RDT&E)**

RDT&E develops and maintains critical capabilities, tools, and processes needed to support science-based stockpile stewardship, refurbishment, and continued certification of the stockpile without the use of underground nuclear explosive testing. The FY 2019 Request funds the development of tools supporting annual assessments and increases funding in several areas to support future LEP options and system certification, including Hydrodynamic and subcritical experiments and Enhanced Capabilities for Subcritical Experiments (ECSE). Advanced Simulation and Computing (ASC) funding supports NNSA's exascale activities to include infrastructure upgrade projects to prepare for siting of future high performance computing platforms. The Inertial Confinement Fusion Ignition and High Yield program supports continued research and operations at NNSA's preeminent High Energy Density (HED) facilities - National Ignition Facility (NIF) at Lawrence Livermore National Laboratories (LLNL) and Z Pulsed Power facility at Sandia National Laboratories (SNL). The FY 2019 Request proposes to rebalance the ICF program to focus on support for shorter-term SSP deliverables as well as respond to higher NNSA priorities. The FY 2019 Request initiates a three-year ramp-down in NNSA support for the University of Rochester's Laboratory for Laser Energetics, including the Omega Laser Facility. Finally, NNSA is proposing increases in Engineering to implement a Stockpile Responsiveness program as well as to conduct research, experiments, and studies that will lay the foundation in order to be ready to meet future requirements.

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

I&O maintains, operates, and modernizes the NNSA infrastructure in a safe, secure, and cost-effective manner to enable program results. Infrastructure and Operations activities provide a comprehensive approach to start reversing the declining state of NNSA infrastructure while maximizing return on investment, and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools through Capability Based Investments and Line Item Construction projects. For FY 2019, funding will continue the stabilization of deferred maintenance, execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease overall operating costs; and reduce safety, security, environmental, and program risk. The request supports increases in funding for UPF and CMRR per the respective project execution plans and efforts to phase out mission dependency in the existing aged facilities. Increased funding also provides for general-purpose construction projects including the construction of the Albuquerque Complex Project to replace the aging and degrading Federal facilities and the 138kV Power Transmission System Replacement project to replace and upgrade the current power transmission system for the Mission Corridor at NNSA.

- **Secure Transportation Asset (STA)**

STA supports the safe, secure movement of nuclear weapons, special nuclear material, and weapon components. The Program Direction in this account provides for the secure transportation workforce, including Federal agents. The pillars of the STA security concept are specialized vehicles to include highly secure trailers, well trained agents, and robust communication systems. In FY 2019, Mobile Guardian Transporter (MGT) development includes the completion of both the Prototype 2 (P-2) Rolling Chassis Manufacturing Readiness Review and the Cargo Manufacturing Readiness Review as well as the assembly, integration, and crash test of Prototype 1 (P-1). The FY 2019 funding also supports the Safeguards Transporter (SGT) risk reduction initiatives to extend the life of the SGT, replacement of vehicles and

tractors, and efforts to restore federal agent strength levels required to meet the STA mission capacity. The increase in Program Direction funding supports inflation as well as the anticipated increase in federal agents and services to support the workforce in accomplishing the mission.

- **Defense Nuclear Security (DNS)**

DNS provides protection for NNSA nuclear weapons and special nuclear materials, facilities, and personnel against a full spectrum of threats, ranging from local security incidents to terrorism. This program employs over 1,500 protective force officers and 1,100 additional security professionals and support staff responsible for meeting all security requirements at NNSA sites. In FY 2019, the Request includes funding for positions in key security program areas at the sites, such as protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning. It also includes planning and conceptual design funds for future projects to sustain and recapitalize the Perimeter Intrusion Detection and Assessment Systems (PIDAS) at the Pantex and Y-12 sites, as estimated in the 10-year Refresh Plan.

- **Information Technology (IT) and Cybersecurity**

The IT and Cybersecurity program provides a range of IT and Cybersecurity support functions and activities, and manages cybersecurity operations and program areas within NNSA's M&O contractors. In FY 2019, the program will support the continued recapitalization of the Enterprise Secure Network, modernize the federal and site Cybersecurity infrastructure, implement the Identity Control and Access Management project at NNSA Headquarters and site elements, execute and coordinate Public Key Infrastructure and other Committee on National Security Systems requirements, and leverage IT Modernization efforts across the NNSA nuclear security enterprise to increase the efficiency and cost-effectiveness of NNSA IT services, consistent with the DOE Strategies.

Planned and Proposed Accomplishments

In FY 2017, the Department:

- Exceeded scheduled deliveries for the W76-1 LEP to the Department of the Navy.
- Continued the Production Engineering phase and joint qualification/testing with the Air Force for the B61-12 LEP.
- Completed Feasibility Study and Option Down-Select activities for W80-4 warhead for Air Force's LRSO System and commenced Phase 6.2A, Cost Study, in September 2017.
- Commenced the Production Engineering phase and continued joint qualification/testing with the Navy for the W88 ALT 370.
- Completed the annual stockpile assessment process and for the 21th consecutive year certified the stockpile as safe, secure, and effective without underground nuclear testing.
- Completed a multi-year NIF campaign of 63 experiments to validate an important hydrodynamic mix model.
- LANL's next high performance computing system (Trinity) fully transitioned to classified network to support annual assessment of stockpile.
- LLNL's next high performance computing system (El Capitan) to be delivered in FY 2023 passed Critical Decision 0 (Mission Need) for exascale computer system.

In FY 2018, expected accomplishments:

- Maintain a safe, secure, and effective nuclear weapons stockpile without nuclear explosive testing for over 20 years.
- Continue to execute the Defense Nuclear Security Safeguards and Security program by protecting Special Nuclear Material, classified information and NNSA personnel and property.
- Conduct Z data experiment comparison of a 5-year-old plutonium sample to an aged, 53-year-old plutonium sample.
- Achieve highest neutron yield to date on NIF, 1.7×10^{16} DT neutrons, a 70% increase from the previous FY 2015 record.
- Continue funding Cybersecurity operations to provide defense in depth security at each of the national security laboratories, plants, and sites to defend appropriately against the steadily increasing threats.
- Complete 90% design of UPF and achieved technical readiness for microwave casting and calciner technologies.

In FY 2019, the Budget Request proposes to:

- Complete production of W76-1 LEP warhead.
- Continue B61-12 LEP activities supporting First Production Unit (FPU) in FY 2020.
- Continue W88 Alt 370 activities supporting FPU in FY 2020.
- Continue W80-4 LEP activities supporting FPU in FY 2025.
- Initiate IW1, Feasibility Study and Design Option, and technology maturation investment activities and support Nuclear Posture Review direction.
- Continue the phased approach for constructing UPF for the uranium strategy.
- Collaborate with DOE Office of Science in developing exascale class high performance computing to meet needs for future assessments, LEPs, and stockpile stewardship.
- Continue work on the CMRR project to support the plutonium strategy and pit production requirements.
- Continue work on Enhanced Capabilities for Subcritical Experiments/U1a Complex Enhancement Project.
- Increase Federal Agents supporting the Secure Transportation Asset, and Continue with baseline design for Mobile Guardian Transporter.
- Continue the stabilization of deferred maintenance, execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease overall operating costs; and reduce safety, security, environmental, and program risk.
- Increase funding for general-purpose construction projects including the construction of the Albuquerque Complex Project to replace the aging and degrading Federal facilities and the 138kV Power Transmission System Replacement project to replace and upgrade the current power transmission system for the Mission Corridor at NNS.
- Continue recapitalization of the Enterprise Secure Network, modernize the federal and site Cybersecurity infrastructure, and implement the Identity Control and Access Management project at NNSA Headquarters and site elements.

DEFENSE NUCLEAR NONPROLIFERATION – NNSA

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
Defense Nuclear Nonproliferation					
Defense Nuclear Nonproliferation Programs					
Material Management and Minimization	288,350	286,391	332,094	+43,744	+15.2%
Global Material Security	367,108	364,615	337,108	-30,000	-8.2%
Nonproliferation and Arms Control	124,703	123,856	129,703	+5,000	+4.0%
Defense Nuclear Nonproliferation R&D	469,750	466,560	456,095	-13,655	-2.9%
Nonproliferation Construction	335,000	332,725	279,000	-56,000	-16.7%
Subtotal, Defense Nuclear Nonproliferation Programs	1,584,911	1,574,147	1,534,000	-50,911	-3.2%
Nuclear Counterterrorism and Incident Response Program	271,881	270,035	319,185	+47,304	+17.4%
Legacy Contractor Pensions	83,208	82,643	28,640	-54,568	-65.6%
Subtotal, Defense Nuclear Nonproliferation	1,940,000	1,926,825	1,881,825	-58,175	-3.0%
Use of Prior Year Balances	-38,000	-37,742	-19,000	+19,000	+50.0%
Rescission of Prior Year Balances	-22,262	-3,113	0	+22,262	+100.0%
Total, Defense Nuclear Nonproliferation	1,879,738	1,885,970	1,862,825	-16,913	-0.9%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

NNSA helps keep America safe by: preventing adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise; countering efforts to acquire such weapons or materials; and responding to nuclear or radiological accidents and incidents domestically and abroad. NNSA’s nonproliferation and counterterrorism activities extend the nation’s defenses far beyond America’s borders. NNSA’s programs share the United States’ long experience in managing special nuclear materials with partners around the world to achieve international nonproliferation and counterterrorism goals. NNSA leverages the knowledge that underpins the stockpile stewardship program for a range of nonproliferation missions, from assessing foreign weapons programs and potential terrorist devices to managing the proliferation risks posed by civil nuclear applications. 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 an important role in enhancing global stability and constrains the range of potential threats facing the nation, our allies and partners.

This appropriation funds the core **Defense Nuclear Nonproliferation (DNN)** program and the Nuclear Counterterrorism and Incident Response (NCTIR) program. DNN and NCTIR have a primary role in the United States’ approach for reducing security risks. These two programs, as part of a whole-of-government approach, provide policy and technical leadership to prevent or limit the spread of materials, technology, and expertise related to weapons of mass destruction (WMD); develop technologies to detect nuclear proliferation; secure or eliminate inventories of nuclear weapons-related materials and infrastructure; and ensure technically-trained teams and state-of-the-art equipment are prepared to respond to any nuclear or radiological emergency domestically or abroad. DNN’s efforts reduce the danger that hostile nations or terrorist groups may acquire nuclear devices, radiological dispersal devices, weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise. The President’s 2017 National Security Strategy (NSS) and Nuclear Posture Review (NPR) reinforce the important work of NNSA’s nonproliferation programs, including committing to, “augment measures to secure, eliminate, and prevent the spread of WMD and related materials.”

These activities are carried out within a dynamic global security environment, as described in NNSA’s annual report *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats* (<https://nnsa.energy.gov/aboutus/ourprograms/dnn/npcr>). This environment is characterized by the persistent threat of state or non-state actors seeking to obtain nuclear and radiological materials; state actors potentially undermining arms control agreements and nonproliferation regimes; an increase in risk of the availability of nuclear and radiological materials as a result of the global expansion of nuclear power

and possible spread of fuel cycle technology; increased opportunities for illicit nuclear material trafficking and sophisticated procurement networks; and technology advances (including cyber-related tools) that may shorten nuclear weapon development timelines and complicate nuclear safeguards and security missions.

Program Highlights

- **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 2019 Budget Request supports this objective by funding the conversion or shut-down of research reactors and isotope production facilities that use highly enriched uranium (HEU), the acceleration of the establishment of new, non-HEU-based Mo-99 production facilities in the United States, the removal and disposal of weapons-usable nuclear material, the independent validation of the lifecycle cost estimate and schedule for the dilute and dispose alternative for plutonium disposition, and the completion of the Repurposed Enriched Uranium (REU) contractual down-blending activities. In addition, political and technical challenges have delayed implementation of several removal efforts, so prior year uncosted balances will continue to be used to support the removal, consolidation, and disposal of excess nuclear material from civilian sites worldwide.

- **Global Material Security (GMS)**

The FY 2019 GMS program prevents terrorists and other actors from obtaining nuclear and radiological material to use in an improvised nuclear device (IND) or a radiological dispersal device (RDD) by working with partner countries to improve the security of vulnerable materials and facilities and to improve partners' capacity to deter, detect, and investigate illicit trafficking of these materials. GMS works extensively with and through multilateral partners such as the International Atomic Energy Agency (IAEA) and 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 the program is a key component of DOE/NNSA's integrated nonproliferation, counterterrorism, and emergency response strategy. The decrease in funding relative to FY 2017 reflects a commitment to reduce prior year carryover balances, permitting a lower FY 2019 Budget Request.

- **Nonproliferation and Arms Control (NPAC)**

NPAC supports activities to prevent the proliferation of weapons of mass destruction by state and non-state actors. NPAC develops and implements programs and strategies to: strengthen international nuclear safeguards; control the spread of nuclear and dual-use material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and address enduring and emerging nonproliferation and arms control challenges and opportunities. The increase of \$5.0 million relative to FY 2017 includes \$3.5 million to enhance training and deployment readiness of the U.S. Uranium and Plutonium Verification Teams required to verify disablement, dismantlement, or other negotiated nonproliferation activities in foreign nuclear facilities and \$1.5 million to enhance export control dual-use license and interdiction reviews.

- **Defense Nuclear Nonproliferation Research and Development (DNN R&D)**

DNN R&D drives the innovation of unilateral and multi-lateral technical capabilities to detect nuclear detonations; foreign nuclear weapons programs' activities; and the presence, movement, or diversion of special nuclear materials. To meet national and departmental nuclear security requirements, DNN R&D leverages the unique facilities and scientific skills of the Department of Energy, academia, and industry to perform research, conduct technology demonstrations, develop prototypes, and produce and deliver sensors for integration into operational systems. The FY 2019 Budget decrease of \$13.7 million relative to FY 2017 includes: a \$52.7 million decrease due to the transfer of the funding for the US High Performance Research Reactor (USHPRR) program to the M³ Program; offset by a \$21.6 million increase to Proliferation Detection to support development and demonstration of advanced testbeds for early detection of proliferation activities and in material security; and a \$17.4 million increase to Nuclear Detonation Detection for front-loading procurements to mitigate potential impacts of supply-chain interruptions and for sensor integration costs in meeting schedule of deliveries of space-based sensors to the U.S. Air Force.

- **Nonproliferation Construction**

Nonproliferation Construction consolidates construction costs for DNN projects. Construction covers Total Project Costs (TPC), which include Other Project Costs (OPC) and Total Estimated Costs (TEC). The FY 2019 budget request is

\$279 million, a decrease of \$56 million, 16.7% below the FY 2017 enacted level. The request proposes termination of the Mixed Oxide Fuel Fabrication (MFFF) project and continue the transition to the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of surplus U.S. weapon-grade plutonium. The request includes \$220 million to bring an orderly and safe closure of the MFFF project. In addition, \$59 million is for the Surplus Plutonium Disposition (SPD) project to support the dilute and dispose strategy. The request will support the continuation of preliminary design and the initiation of long lead procurements in FY 2019.

- **Nuclear Counterterrorism and Incident Response (NCTIR)**

NCTIR executes the DOE/NNSA's Comprehensive Emergency Management System program that administers implementation and support of emergency management for all DOE/NNSA offices and sites, and manages the DOE/NNSA Consolidated Emergency Operations Center, Emergency Communications Network, Emergency Management Policy, Training, National Exercises Program, and Continuity Program activities. NCTIR also applies the unique technical expertise from the NNSA's nuclear security enterprise to prepare for, prevent, mitigate, and respond to a nuclear or radiological incident domestically or abroad, providing technical advice to the Department of Defense; the Federal Bureau of Investigation; other interagency and international partners; and state and local organizations in support of nuclear counterproliferation, nuclear counterterrorism, nuclear incident response, and nuclear forensics.

Planned and Proposed Accomplishments

In FY 2019, NNSA plans to:

- Continue to address the entire nuclear threat spectrum by preventing the acquisition of nuclear weapons or weapons-usable materials, countering efforts to acquire such weapons or materials, and responding to nuclear or radiological incidents.
- Identify and eliminate excess HEU and plutonium, including removing and/or disposing of 95 kilograms of material
- Convert and/or verify the shutdown of three research reactors and isotope production facilities
- Continue to pursue the dilute and dispose strategy to dispose of 34 metric tons of plutonium
- Support nuclear security best practices exchanges and/or training courses with more than 20 countries in Europe, the Middle East, Africa, Asia, and Latin America
- Complete security upgrades at an additional 100 buildings with high-priority radioactive sources (55 domestic sites and 45 international sites)
- Deploy mobile detection systems and equip priority border crossing points (mostly in Eastern Europe, Central Asia, and Africa) with radiation detection systems, and provide associated training and maintenance support, to help counter the threat of illicit trafficking of special nuclear material
- Transfer financial responsibility for training and maintenance of radiation detection systems at 57 overseas locations
- Provide critical mission support to the IAEA, including strengthening the international nuclear safeguards system and supporting their expanding nuclear security activities
- Facilitate legitimate U.S. trade by annually providing roughly 6,000 technical reviews of U.S. export license applications and technical support and training to U.S. law enforcement to help prevent the exploitation of the U.S. industrial base
- Work with roughly 35 countries each year to build global export control capacity through training, technical exchanges, and train-the-trainer approaches
- Demonstrate new U.S. capabilities for detecting foreign material and weapons production processes
- Demonstrate new capabilities for weapons and material security applications, including detecting special nuclear material movement and diversion and nuclear safeguards
- Sustain and improve U.S. capabilities in nuclear explosion monitoring, including delivering the nation's space-based nuclear detonation detection payloads and related activities that support treaty monitoring and military missions
- Respond to and mitigate any emergent radiological and nuclear emergency domestically or abroad
- Procure three fixed-wing aircraft to replace the existing Aerial Measuring System aircraft
- Sustain a highly secure field deployable incident response communications network for critical real-time information sharing between scientific experts, operational assets, and executive decision makers throughout the government in support of new Presidential policy requirements
- Recapitalize priority nuclear counterterrorism emergency response equipment including neutron multiplicity detectors, specialized search equipment, and contamination monitoring systems
- Complete a technical assessment of global stockpiles of nuclear materials of concern, in support of the International Nuclear Security Strategy pillar, contained within the 2017 National Security Strategy

- Maintain and strengthen the Department’s capabilities to plan for and manage incidents and emergencies at its operating locations and contribute technical assistance capability to enhance Emergency Management and upgrade the Emergency Communications Network (ECN) Suite to state of art capabilities

NAVAL REACTORS – NNSA

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
National Nuclear Security Administration					
Naval Reactors					
Naval Reactors Operations and Infrastructure	449,682	446,628	525,764	+76,082	+16.9%
Naval Reactors Development	440,338	437,348	514,951	+74,613	+16.9%
S8G Prototype Refueling	124,000	123,158	250,000	+126,000	+101.6%
<i>Columbia</i> -Class Reactor Systems Development (formerly <i>Ohio</i> Replacement Reactor Systems Development)	213,700	212,249	138,000	-75,700	-35.4%
Program Direction	44,100	43,801	48,709	+4,609	+10.5%
Construction	148,300	147,292	311,194	+162,894	+109.8%
Subtotal, Naval Reactors	1,420,120	1,410,476	1,788,618	+368,498	+25.9%
Rescission of Prior Year Balances	-328	-21	0	+328	+100.0%
Total, Naval Reactors¹	1,419,792	1,410,455	1,788,618	+368,826	+26.0%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

¹Funding does not reflect the transfer to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor.

Appropriation Overview

Naval Reactors’ (NR) activities directly contribute to meeting the DOE strategic goal for Nuclear Security and NR plays a critical leadership role in meeting the goal to design and maintain safe and effective integrated nuclear propulsion systems for the U.S. Navy. The Naval Reactors program has responsibility for all naval nuclear propulsion work, from reactor plant technology development and design, continuing through reactor plant operation and maintenance, and ending with reactor plant disposal.

Program Highlights

Funding for the program supports continued safe and reliable operation of the Navy's nuclear-powered fleet (70 submarines, 11 aircraft carriers, and 4 research, development, and training platforms), constituting over 45 percent of the Navy's major vessels. 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, Naval Reactors 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.

Naval Reactors supports the President's national security strategy with the continued development of the reactor plant system for the *Columbia*-Class submarine and stewardship of naval nuclear infrastructure. Ensuring the continuity of a sea-based strategic deterrent, the Budget Request provides for the research, design, and development of the reactor plant system for the *Columbia*-Class submarine, to include the development of a life-of-ship reactor core. The budget further provides funding for the refueling and overhaul of the Land-based S8G Prototype reactor, a critical research and development asset for the long-term. Lastly, the Spent Fuel Handling Recapitalization Project will ensure the continued capability to refuel and defuel aircraft carriers and submarines, which is critical to maintaining the nuclear fleet's operational availability for national security missions.

- **Naval Reactors Operations and Infrastructure**

The FY 2019 Request will support facility and systems maintenance and regulatory requirements across the Program’s four DOE sites, environmental remediation, and necessary general plant projects and capital equipment to recapitalize aging infrastructure and equipment.

- **Naval Reactors Development**
The FY 2019 Request will support the Advanced Test Reactor at the Idaho National Laboratory, reactor core material development, radioactive test and evaluation efforts, and the procurement of a high performance computer to support reactor plant performance modeling efforts.
- **S8G Prototype Refueling**
The increase over FY 2017 Enacted levels is consistent with the planned project profile and supports refueling overhaul execution.
- **Columbia-Class Reactor Systems Development**
The decrease from FY 2017 Enacted levels is consistent with the planned project profile and supports FY 2019 long lead time component procurement.
- **Construction**
The increase over FY 2017 Enacted levels is in accordance with NR's program of record, as detailed in the Ten-Year Facilities Plan and supports construction ramp-up for the Spent Fuel Handling Recapitalization Project.
- **Program Direction**
The FY 2019 Request places Naval Reactors in a position to execute its mission and provide federal oversight of the program's DOE laboratories.

ENERGY EFFICIENCY AND RENEWABLE ENERGY

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Energy Efficiency and Renewable Energy					
Sustainable Transportation					
Vehicle Technologies	306,959	304,874	68,500	-238,459	-77.7%
Bioenergy Technologies	205,000	203,608	37,000	-168,000	-82.0%
Hydrogen and Fuel Cell Technologies	101,000	100,315	58,000	-43,000	-42.6%
Total, Sustainable Transportation	612,959	608,797	163,500	-449,459	-73.3%
Renewable Power					
Solar Energy Technologies	207,600	206,190	67,000	-140,600	-67.7%
Wind Energy Technologies	90,000	89,388	33,000	-57,000	-63.3%
Water Power Technologies	84,000	83,429	45,000	-39,000	-46.4%
Geothermal Technologies	69,500	69,028	30,000	-39,500	-56.8%
Total, Renewable Power	451,100	448,035	175,000	-276,100	-61.2%
Energy Efficiency					
Advanced Manufacturing	257,500	255,751	75,000	-182,500	-70.9%
Federal Energy Management Program	27,000	26,817	10,000	-17,000	-63.0%
Building Technologies	199,141	197,789	57,000	-142,141	-71.4%
Weatherization and Intergovernmental Programs					
Weatherization Assistance Program	225,000	223,472	0	-225,000	-100.0%
Training and Technical Assistance	3,000	2,980	0	-3,000	-100.0%
State Energy Program	50,000	49,660	0	-50,000	-100.0%
Total, Weatherization and Intergovernmental Programs	278,000	276,112	0	-278,000	-100.0%
Total, Energy Efficiency	761,641	756,469	142,000	-619,641	-81.4%
Corporate Support Programs					
Facilities and Infrastructure (NREL)	92,000	91,375	90,000	-2,000	-2.2%
Program Direction	153,500	152,458	125,110	-28,390	-18.5%
Strategic Programs	19,000	18,871	0	-19,000	-100.0%
Total, Corporate Support	264,500	262,704	215,110	-49,390	-18.7%
Subtotal, Energy Efficiency and Renewable Energy	2,090,200	2,076,005	695,610	-1,394,590	-66.7%
Rescission of Prior Year Balances	-55,618	-35,756	0	+55,618	+100.0%
Total, Energy Efficiency and Renewable Energy	2,034,582	2,040,249	695,610	-1,338,972	-65.8%

*Note. - A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The Office of Energy Efficiency and Renewable Energy (EERE) invests in research and development (R&D) as part of the Department of Energy’s (DOE’s) broad portfolio approach to address our Nation’s energy and environmental challenges. The Budget focuses DOE resources toward early-stage R&D, where the Federal role is strongest, and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. It emphasizes energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. Some areas of focus include innovative approaches to electric vehicles, including a robust battery material and chemistry program, along with hydrogen fuel cell infrastructure expansion. One area of focus for EERE is energy storage. The Request includes \$36 million for battery R&D as well as \$90 million for R&D that would research storage technologies in a new initiative “Beyond Batteries”. As part of Grid Modernization, “Beyond Batteries” considers energy storage holistically, and focuses on advances in controllable loads, hybrid systems, and new approaches to energy storage, which are essential to increasing the reliability and resilience of our energy systems. Advances in this wide range of energy storage technologies will allow for loads to be combined with generation from all sources to optimize use of existing assets to provide grid services, and increase grid reliability.

The FY 2019 Budget provides \$695.6 million to maintain America's leadership in transformative science and emerging energy technologies in sustainable transportation, renewable power, and energy efficiency. All EERE programs will focus on research that industry either does not have the technical capability to undertake or is too far from market realization to merit sufficient industry focus and critical mass. Knowledge generated by EERE early-stage R&D enables U.S. industries, businesses, and entrepreneurs to develop and deploy innovative energy technologies and gives them the competitive edge needed to excel in the rapidly changing global energy economy. Industry deployment of these technologies creates jobs, reduces U.S. reliance on foreign resources, increases energy affordability, improves energy security, ensures environmental responsibility and offers Americans a broader range of energy choices. The shift away from later-stage development and deployment activities and the increased focus on early-stage R&D provides an opportunity to reorganize and move toward a more efficient organizational structure. In keeping with the direction to generate efficiencies and reduce the cost of government, and to align with reductions in technology program budgets, DOE will reduce EERE Full-Time Equivalents by approximately 30 percent from the FY 2017 level. The specific reduction will be adjusted as needed, dependent on the timing of appropriations, in order to fully account for associated severance payments. Remaining staff will ensure continuity of the essential oversight activities for EERE's project portfolio and maintain proper stewardship of taxpayer dollars. In a further effort to eliminate redundancies and increase efficiencies across the Department, during FY 2018, staff and associated functions from the EERE Office of Strategic Programs will be centralized within DOE corporate offices, including International Affairs and Public Affairs within Departmental Administration and the Office of Technology Transitions.

Program Highlights

Sustainable Transportation

- **Vehicle Technologies**

FY 2019 funding supports early-stage R&D to generate knowledge upon which industry can develop and deploy innovative energy technologies for more affordable, secure and reliable transportation of people and goods across America. Vehicle Technologies will focus on research that industry either does not have the technical capability to undertake or is too far from market realization to merit sufficient industry focus and critical mass. Within Battery and Electrification Technologies, Advanced Battery R&D will explore new battery materials, high-power fast-charging methods, innovative chemistries beyond lithium ion technology and advanced cell technologies. These topics have the potential to reduce the cost of electric vehicle batteries by more than half, to less than \$100/kWh (ultimate goal is \$80/kWh), increase range to 300 miles, and decrease charge time to 15 minutes or less. Building upon recent work, Energy Efficient Mobility Systems (EEMS) will continue to create new ideas and knowledge focused on pathways to significantly improve transportation system efficiency leading to greater energy productivity in moving people and goods. EEMS research will include the application of new computational models and simulation capabilities to create and test new theories that use vehicle connectivity and automation to improve energy efficiency including; vehicle autonomy, big data tools, machine/deep-learning and artificial intelligence, as well as new scientific approaches that improve mobility decision making and increase transportation choices at both the individual and system level. In Advanced Engine and Fuel Technologies, research will continue to advance and improve our understanding of, and ability to, increase combustion efficiency, generating knowledge and insight necessary for industry to develop the next generation of engines and fuels capable of improving passenger vehicle fuel economy 35 percent by 2030 from a 2015 baseline. In Materials Technology, research will focus on novel approaches to build lightweight, multi-material structures, and on creating new materials that can meet the extreme temperatures and pressures (e.g., high compression engines) that the next generation of vehicle engines will require.

- **Bioenergy Technologies**

FY 2019 funding supports early-stage R&D that bolsters the body of scientific and engineering knowledge enabling industry to develop and deploy high-performing drop-in biofuels at \$3 per gallon gasoline equivalent, which includes high-value co-production of renewable chemicals and materials. Domestically-produced renewable biomass, and its subsequent conversion to bioenergy and bioproducts, offers a tremendous opportunity to create American jobs across the supply chain, boost economic growth, and encourage investment across the Nation. The program's early-stage, laboratory-based R&D emphasizes advanced technologies to produce renewable gasoline, diesel, and jet fuels from non-food sources. Consortium-supported research focus areas include: (1) detailed understanding and optimization of the physics and chemistry of each feedstock and preprocessing steps necessary for high conversion rates; (2) identification and molecular characterization of high performing algal strains; and (3) development of engineered organisms and novel catalysts. In collaboration with the Advanced Engine and Fuel Technologies sub-program, Bioenergy will explore the co-optimization of fuels and engines enabling the development of bio-based fuels/additives

that have the potential for a 35 percent fuel economy gain (25 percent from advanced engine research and 10 percent from co-optimization with biofuels) by 2030 compared to 2015 gasoline vehicles.

- **Hydrogen and Fuel Cell Technologies**

FY 2019 funding supports early-stage R&D to investigate novel hydrogen and fuel cell technologies that could enable American energy independence, resilience, and domestic job growth through industry development and deployment. To be cost competitive with vehicles powered by gasoline and an internal combustion engine on a cents-per-mile driven basis, the cost of hydrogen delivered from domestic resources needs to be less than \$4/gge (untaxed), and the cost of a durable fuel cell system needs to be less than \$40/kW. In FY 2019, research will emphasize the acceleration of materials breakthroughs by National Laboratory consortia that bring together world-class capabilities from multiple laboratories, while leveraging the results of ongoing projects with university and industry partners using prior year funding. Key areas of research include: platinum-free catalysts; high performance durable membranes and electrodes; materials for hydrogen production, storage, and transmission; and understanding the infrastructure necessary to accomplish H2@Scale — a vision of cost-competitive, domestically sourced and produced hydrogen used across multiple sectors.

Renewable Power

- **Solar Energy**

FY 2019 funding supports the DOE's goal of making solar power one of the least expensive forms of electricity by enabling cost reductions toward the 2030 target of \$0.03/kWh for utility-scale solar power without subsidies. Funding will support early-stage R&D at the National Laboratories, in partnership with academia and industry, with a focus on increasing the reliability and decreasing the cost of next-generation photovoltaics and concentrating solar power technologies. In addition, the program will advance the state of knowledge necessary for industry to develop more reliable, on-demand solar technologies that can be more effectively integrated into the electric grid. Key areas of research include: grid reliability, PV efficiency, energy yield and storage, material durability, power electronics, microgrid integration, and next generation concentrating solar power. Funding will also support analytics and modeling of power system integrity and potential cybersecurity issues related to integrating increasing amounts of solar power on the electric grid. National Laboratory research also supports the development of experimental test and evaluation standards. The program will also perform some research at universities in coordination with the Office of Science and the National Science Foundation.

- **Wind Energy**

FY 2019 funding emphasizes fundamental, early-stage R&D, and related testing that builds the knowledge base upon which industry can develop and deploy novel technologies. FY 2019 activities will focus on applying high-performance computing to analyze wind technology challenges and investigate fundamental systems-level interactions influenced by atmospheric conditions, variable terrain, and machine-to-machine wake interactions. Continuing R&D will focus on the scientific challenges associated with the design and manufacturing of low-specific power rotors for tall wind applications, aimed at enabling industry improvement of wind plant capacity factors by as much as 10 percent, and mitigating challenges associated with aerodynamic and gravitational loading. Funding will continue to advance collaboration with Department of Defense, Federal Aviation Administration, Department of Homeland Security, and other agencies to complete a suite of wind turbine radar interference mitigation algorithms for long-range and terminal radar systems. R&D will explore long-term challenges related to reliably integrating increasing amounts of wind power on the electric grid, including secure and reliable hybrid system concepts, new energy storage technologies, and control strategies, as well as technologies to reduce environmental and community impacts, all to achieve necessary cost reductions, improved grid reliability, and reduction of regulatory burdens.

- **Water Power**

FY 2019 funding supports early-stage R&D exploring novel concepts and approaches to capturing hydropower and marine hydrokinetic energy resources. The program invests in hydropower technology R&D for innovative standardized and modular approaches to hydropower development that can lower overall project costs versus traditional projects at greenfield sites and non-powered dams. The program will continue its focus on hydropower and PSH's roles in grid reliability and resiliency by continuing to support innovative PSH technologies and conducting new research to evaluate the specific grid resiliency services provided by hydropower and/or PSH. It will also support the development of innovative environmental mitigation technologies and new research to inform licensing studies and requirements in order to reduce the time, cost and uncertainty of hydropower licensing. In marine and hydrokinetics (MHK), the

program will support R&D to enable improvements in controls, structures, materials and power take-offs for early-stage wave, tidal and ocean current technologies, ultimately leading to reduced costs and increased competitiveness of marine energy devices. Through its partnerships with the Navy and with university-National Laboratory collaborations, the program will validate reliability of marine energy technologies and the value of integrating energy from prototype devices into the electric grid. Monitoring of open water tests and continued analysis and dissemination of the results of new research is also supported to reduce perceived environmental risk and the time associated with device permitting.

- **Geothermal Technologies**

FY 2019 funding supports Geothermal Technologies' early-stage R&D. Within Enhanced Geothermal Systems (EGS), the program will continue implementation of the Frontier Observatory for Research in Geothermal Energy (FORGE) to advance Phase 3 field operations at the FORGE site. The EGS Collab effort, which brings together a team comprised of National Laboratories, academia, and industry to conduct early-stage R&D that explores the fundamental relationships between seismicity, stress state, and permeability to validate and verify models, will continue into FY 2019. These models will serve as the basis for the design of the FORGE stimulations. The Hydrothermal subprogram will address subsurface stress, focusing on subsurface stress measurement and simulation to enable the collection of stress data at reservoir scale to understand fracture propagation, permeability distribution, reservoir management, fluid production, and wellbore integrity. The Budget Request also supports improving grid reliability and resilience through research focusing on subsurface thermal energy storage, thermal management of reservoirs, and evaluation of geothermal's potential to respond to electrical demand fluctuations. Combined efforts will strengthen the body of knowledge necessary to enable industry to achieve a cost target of \$0.06/kWh by 2030 from newly developed geothermal systems, and support enhanced grid reliability and resiliency through analyses focused on improving the ability for geothermal power to be operated flexibly and provide essential grid reliability services.

Energy Efficiency

- **Advanced Manufacturing**

FY 2019 funding supports early-stage applied R&D focused on advancing and creating new understanding of underlying technologies, materials, and processes relevant to the productive use of energy in manufacturing, as well as the competitive manufacturing of energy related products, with additional emphasis on alternative approaches to energy storage and the intersection between manufacturing and the energy grid. The Budget for Advanced Manufacturing reasserts the proper role of the Federal Government by reflecting an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focusing funding toward early-stage R&D. By fostering collaboration between National Laboratories, universities and companies (for-profit and not-for-profit), this Budget Request will enhance the foundational knowledge base in materials and manufacturing processes, focusing on research challenges that present a significant degree of scientific or technical uncertainty and are beyond the horizon in terms of commercialization, making it unlikely that industry will pursue independently.

- **Federal Energy Management Program**

FY 2019 funding supports Federal Energy Management Program's core activities of catalyzing and assisting Federal agencies to both meet energy-related goals and provide Federal energy leadership to the country, increasing Federal energy security, reliability, and resilience. FY 2019 funds will support continued assistance on energy projects and energy savings through the provision of technical assistance, energy-related contracting tools and skills training.

- **Building Technologies**

FY 2019 funding supports early-stage R&D of innovative building energy technologies such as lighting, space conditioning and refrigeration, windows and envelope and their effective integration into smart, efficient, resilient, grid-connected, and secure building systems. Particular focus will be placed building system interaction with the grid in terms of load management and alternative energy storage technologies. The goal of the program is to overcome the high degree of fragmentation across the heterogeneous buildings industry, spanning construction to appliance and equipment manufacturing. Building Technologies' research also focuses on developing the physics-based algorithms for improved energy modeling and system controls required to better predict and manage energy efficient appliance/equipment, system, and whole-building energy usage. Additionally, Building Technologies' early stage R&D on cyber secure advanced sensors and controls will help strengthen the body of knowledge to enable industry to develop and deploy truly "smart" buildings capable of connecting with the power grid securely, in new and increasingly adaptive manners, to help with overall electric system efficiency, resilience and bringing down energy prices across the

grid. Finally, it supports DOE working with industry and stakeholders to meet requirements for statutorily-mandated efficiency standards and building energy codes determinations.

- **Weatherization and Intergovernmental Programs**

No funding is requested in FY 2019 for both the Weatherization Assistance Program and the State Energy Program due to a departmental shift in focus away from deployment activities and towards early-stage R&D. Activities in FY 2019 will focus on completing work activities associated with existing financial and technical assistance awards and initiatives with states and local governments and stakeholder organizations, closing out awards and agreements as they come to the end of their periods of performance, and providing resources and institutional knowledge to state and local entities as practicable.

ELECTRICITY DELIVERY

	(\$K)				
	FY 2017 Enacted ^a	FY 2018 Annualized CR ^{ab}	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Electricity Delivery					
Transmission Reliability and Resilience (formerly Clean Energy Transmission and Reliability) ^c	36,000	35,756	13,000	-23,000	-63.9%
Resilient Distribution Systems (formerly Smart Grid Research and Development)	50,000	49,660	10,000	-40,000	-80.0%
Energy Storage	31,000	30,790	8,000	-23,000	-74.2%
Transformer Resilience and Advanced Components	6,000	5,959	5,000	-1,000	-16.7%
Transmission Permitting and Technical Assistance (formerly National Electricity Delivery)	7,500	7,449	6,000	-1,500	-20.0%
Program Direction	20,300	20,162	19,309	-991	-4.9%
Subtotal, Electricity Delivery	150,800	149,776	61,309	-89,491	-59.3%
Rescission of Prior Year Balances	-415	-412	0	+415	+100.0%
Total, Electricity Delivery	150,385	149,364	61,309	-89,076	-59.2%

^a The FY 2019 Budget Request to Congress proposes to split the Electricity Delivery and Energy Reliability appropriation into two appropriations: Electricity Delivery (OE) and Cybersecurity, Energy Security, and Emergency Response (CESER). To allow an apples-to-apples comparison with the FY 2019 request, the amounts for FY 2017 and FY 2018 exclude amounts for the Cybersecurity for Energy Delivery Systems and Infrastructure Security and Energy Restoration programs, and a portion of Program Direction funding, equivalent to what would have been in CESER, had the proposed structure been in place in FY 2017 and FY 2018.

^b Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

^c Transmission Reliability and Resilience was titled Transmission Reliability in the FY 2018 Request to Congress.

Appropriation Overview

Electricity Delivery (OE) leads the Department’s efforts to strengthen, transform, and improve energy infrastructure so that consumers have access to reliable, secure, and clean sources of energy. OE provides solutions to market, institutional and operational failures that go beyond any one utility’s ability to solve. To accomplish this critical mission, OE works with private industry and Federal, State, local, and tribal governments on a variety of initiatives to modernize the electric grid.

Grid modernization is critical to achieving public policy objectives, sustaining economic growth, supporting environmental stewardship, and mitigating risks to secure the Nation. The goal for the future grid is to deliver reliable, affordable, and clean electricity to consumers where, when, and how they want it.

OE programs work in an integrated manner in partnership with industry and other stakeholders as well as other DOE offices, to enhance key characteristics of the U.S. electric transmission and distribution systems:

- Reliability—consistent and dependable delivery of high quality power
- Flexibility—the ability to accommodate changing supply and demand patterns and new technologies
- Efficiency—low losses in electricity delivery and more optimal use of system assets
- Resilience—the ability to withstand and quickly recover from disruptions and maintain critical function
- Affordability—more optimal deployment of assets to meet system needs and minimize costs
- Security—the ability to protect system assets and critical functions from unauthorized and undesirable actors

Within the appropriation, OE funds:

- Research and Development (R&D)—pursuing early-stage research for technologies to improve grid reliability, efficiency, flexibility, and functionality
- Modeling and Analytics—developing core analytic, assessment, and engineering capabilities that can evolve as the technology and policy needs mature to support decision making within the Department and for stakeholders; analyses explore complex interdependencies among infrastructure systems, such as between electricity and natural gas systems
- Institutional Support and Technical Assistance—building capacity in the industry and convening stakeholders to coordinate efforts to transform the electric grid; providing technical assistance to states and regions to improve policies, utility incentives, state laws, and programs that facilitate the modernization of the electric infrastructure
- Coordination of Federal Transmission Permits—streamlining permits, special use authorizations, and other approvals required under Federal law to site electric transmission facilities

Program Highlights

The FY 2019 Budget Request to Congress proposes to split the Electricity Delivery and Energy Reliability appropriation into two appropriations: OE and Cybersecurity, Energy Security, and Emergency Response (CESER). The CESER highlights are provided separately.

- OE includes the Transmission Reliability and Resilience, Resilient Distribution Systems, Energy Storage, Transformer Resilience and Advanced Components, and Transmission Permitting and Technical Assistance programs.
- Program direction funding is allocated between the two appropriations, with administrative, senior management, budget, procurement, contractual management and human capital support activities funded within OE under a service center approach that will support both appropriations.

The request continues OE's R&D focus on cutting-edge early-stage R&D.

- **Transmission Reliability and Resilience** is focused on ensuring the reliability and resiliency of the U.S. electric grid through early-stage and foundational R&D on measurement and control of the electricity system and risk assessment to address challenges across integrated energy systems. The request supports development of new modeling-based capability for monitoring the long-term resiliency of our grid and identifying opportunities to improve resiliency and mitigate risks associated with the energy systems interdependencies.
- **Resilient Distribution Systems** focuses on the development of innovative technologies, tools, and techniques to modernize the distribution portion of the electric delivery system. Results from the research in Advanced Distribution Management Systems (ADMS), microgrids, and Dynamic Controls and Communications (DC&C) will enable industry to strengthen the resilience of electrical infrastructure against adverse effects of future extreme weather phenomena and other unforeseen natural and man-made occurrences.
- **Energy Storage** focuses on accelerating the development of new materials and device technologies that can lead to significant improvements in the cost and performance of utility-scale energy storage systems and accelerate the adoption of energy storage systems into the grid infrastructure. The request supports materials research on the next generation of battery chemistries, development of new materials and new device technologies for efficient power conversion, development of optimal design and control architectures for energy storage integration into the grid infrastructure, and development of open source models and software tools for system level energy storage planning and evaluation.
- **Transformer Resilience and Advanced Components** supports modernization, hardening, and resilience of the grid by addressing the unique challenges facing transformers and other critical grid components that are responsible for carrying and controlling electricity from where it is generated to where it is needed. TRAC will continue research to support innovative concepts and designs for solid-state power substations, including advanced materials and system architectures. Research to improve asset monitoring capabilities and equipment performance under stress will enhance the portfolio of solutions available to industry to increase grid security, reliability, and resilience.

- **Transmission Permitting and Technical Assistance** fosters and enables the development of reliable, affordable, and resilient electricity infrastructure. TPTA provides electricity policy technical expertise to state, regional, and tribal entities on all facets of the electric system, including generation, transmission, storage, distribution, or demand-side electricity resources. TPTA also implements a number of legal authorities, such as coordination of transmission permitting by Federal agencies, periodic transmission congestion studies, permitting of cross-border transmission lines, authorization of electricity exports, and supporting actions by the Secretary of Energy during electricity emergencies. TPTA will pursue topics flagged as meriting further research in the Staff Report to the Secretary on Electricity Markets and Reliability, such as valuation of essential reliability services, gauging the economic health and efficiency of the bulk power system, and obstacles to timely and needed infrastructure development for resilience and protecting defense critical electric infrastructure.

POWER MARKETING ADMINISTRATIONS

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Power Marketing Administrations					
Southeastern Power Administration					
Southeastern Power Administration	84,929	84,352	79,684	-5,245	-6.2%
Less Alternative Financing/Offsetting Collections	-84,929	-84,352	-79,684	+5,245	+6.2%
Total, Southeastern Power Administration	0	0	0	0	N/A
Southwestern Power Administration					
Southwestern Power Administration	140,898	83,984	159,876	+18,978	+13.5%
Less Alternative Financing/Offsetting Collections	-129,841	-73,002	-149,476	-19,635	-15.1%
Total, Southwestern Power Administration	11,057	10,982	10,400	-657	-5.9%
Western Area Power Administration					
Western Area Power Administration (CROM)					
Western Area Power Administration (CROM)	947,270	755,326	915,533	-31,737	-3.4%
Less Alternative Financing/Offsetting Collections (CROM)	-852,528	-661,227	-826,161	+26,367	+3.1%
Total, Western Area Power Administration (CROM)	94,742	94,099	89,372	-5,370	-5.7%
Falcon and Amistad O&M Fund					
Operation and Maintenance	4,393	4,363	5,329	+936	+21.3%
Less Alternative Financing/Offsetting Collections	-4,161	-4,133	-5,101	-940	-22.6%
Total, Falcon and Amistad O&M Fund	232	230	228	-4	-1.7%
Colorado River Basins Power Marketing Fund					
Spending Authority from Offsetting Collections	213,530	212,080	220,337	+6,807	+3.2%
Offsetting Collections	-236,530	-234,924	-243,337	-6,807	-2.9%
Total, Colorado River Basins Power Marketing Fund	-23,000	-22,844	-23,000	0	N/A
Total, Western Area Power Administration	71,974	71,485	66,600	-5,374	-7.5%
Total, Power Marketing Administrations	83,031	82,467	77,000	-6,031	-7.3%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriations Overview

The four **Power Marketing Administrations (PMAs)** sell electricity primarily generated by federally owned hydropower projects. Preference in the sale of power is given to public entities and electric cooperatives. Revenues from the sale of Federal power and transmission services are used to repay all related power costs.

The President’s budget request includes a proposal to authorize the Federal government to sell the transmission assets of Southwestern Power Administration, Western Area Power Administration, and Bonneville Power Administration. The budget also includes a legislative proposal for all four of the PMAs to change their statutory rate structure requirements from cost recovery to a market based structure that takes into consideration rates charged by comparable utilities and which could allow for faster recoupment of the tax payer investment.

Program Highlights

- **Southeastern Power Administration**
Southeastern markets and delivers all available Federal hydroelectric power from 22 U.S. Army Corps of Engineers (Corps) multipurpose projects to preference customers in an eleven-state area in the southeastern United States. Southeastern does not own or operate any transmission facilities, and contracts with regional utilities that own electric

transmission systems to deliver the Federal hydropower to Southeastern's customers. Southeastern's use of receipts and alternative financing offsets its appropriations resulting in a net-zero balance for the program.

- **Southwestern Power Administration**

Southwestern markets and delivers Federal hydroelectric power from 24 Corps multipurpose projects to preference customers in a six-state area and participates with other water resource users in an effort to balance diverse interests with power needs. To deliver power to its customers, Southwestern maintains 1,380 miles of high-voltage transmission lines, 26 substations/switchyards, and 51 microwave and VHF radio sites.

- **Western Area Power Administration**

Western Area Power Administration (WAPA) markets and transmits Federal power to a 1.3-million-square-mile service area in 15 central and western states from 56 Federally-owned hydroelectric power plants operated by the Bureau of Reclamation (the Bureau), the Army Corps of Engineers (the Corps), and the International Boundary and Water Commission. It also markets a portion of the power from the Navajo Generating Station coal-fired plant near Page, Arizona. WAPA's construction program, conducted in close coordination with preference customers, continues to emphasize replacement, upgrade, and modernization of the electric system infrastructure to bring continued reliability, improved connectivity, and increase flexibility and capability to the power grid. Through extensive partnering efforts, WAPA has obtained significant stakeholder and customer participation in financing much of the construction program. Through transparency WAPA demonstrates the value of its efficient operations that preference customers enjoy. WAPA will continue to make significant efforts to be open, transparent and inclusive of customers and stakeholders in its operational choices and capital planning efforts. WAPA is strengthening its Asset and Risk Management to further ensure capital investments are sufficient and wisely deployed for our Nation and for our customers.

The President's budget request includes a proposal to repeal the borrowing authority managed by WAPA's Transmission Infrastructure Program (TIP). Separate from the CROM construction program, TIP offers development assistance and debt financing options to deliver or facilitate the delivery of renewable energy resources.

- **Bonneville Power Administration**

Bonneville operates under a business-type budget under the Government Corporation Control Act, 31 U.S.C 9101-10 and on the basis of the self-financing authority provided by the Federal Columbia River Transmission System Act of 1974 (Transmission Act) (Public Law 93-454).

Bonneville is responsible for meeting the net firm power requirements of its requesting customers through a variety of means, including energy conservation programs, acquisition of renewable and other resources, and power exchanges with utilities both in and outside the region.

Bonneville provides electric power, transmission, and energy services to a 300,000-square-mile service area in eight states in the Pacific Northwest. Bonneville wholesales the power produced at 31 Federal projects operated by the Corps and the Bureau and from certain non-Federal generating facilities. From these revenues, Bonneville funds the expense portion of its budget and the power operations and maintenance costs of the Bureau and the Corps in the Federal Columbia River Power System (FCRPS). The capital portion of the budget is funded mostly through borrowing from the U.S. Treasury at market rates for similar projects and with some non-Federal financing.

Bonneville is self-financed and receives no direct annual appropriations from Congress. In FY 2019, estimated total requirements of all Bonneville programs of \$4,417 million include estimated budget obligations of \$4,009 and estimated capital transfers of \$409 million. Estimated obligations include operating expenses of \$3,141 million, capital investments of \$827 million, and \$41 million in projects funded in advance. These investments provide electric utility and general plant requirements associated with the FCRPS's transmission services, capital equipment, hydroelectric projects, conservation, and capital investments to mitigate impacts on the environment, fish, and wildlife.

CYBERSECURITY, ENERGY SECURITY, AND EMERGENCY RESPONSE (CESER)

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Cybersecurity, Energy Security, and Emergency Response (CESER)					
Infrastructure Security and Energy Restoration	9,000	8,939	18,000	+9,000	+100.0%
Cybersecurity for Energy Delivery Systems (CEDs)	62,000	61,579	70,000	+8,000	+12.9%
Program Direction - Office of CESER	8,200	8,144	7,800	-400	-4.9%
Total, Cybersecurity, Energy Security, and Emergency Response	79,200	78,662	95,800	+16,600	+21.0%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

Cybersecurity, Energy Security, and Emergency Response (CESER) leads the Department’s efforts to secure U.S. energy infrastructure against all hazards, reduce the risks of and impacts from cyber events and other disruptive events, and assist with restoration activities. CESER is a proposed new office in FY 2019, established by transferring the Cybersecurity for Energy Delivery Systems (CEDs) and Infrastructure Security and Energy Restoration (ISER) programs, along with a portion of program direction funding, from the Electricity Delivery and Energy Reliability appropriation. Remaining programs from Electricity Delivery and Energy Reliability, which is renamed to the Office of Electricity Delivery (OE), remain there.

Due to the critical role the electric grid plays across Federal, state, and local jurisdictions, CESER programs work in an integrated manner in partnership with industry and other stakeholders as well as other DOE offices, to enable industry to enhance the resilience (the ability to withstand and quickly recover from disruptions and maintain critical function) and security (the ability to protect system assets and critical functions from unauthorized and undesirable actors) of the U.S. energy infrastructure. A reliable and resilient power grid is critical to U.S. economic competitiveness and leadership.

Within the appropriation, CESER funds:

- Research and Development (R&D) to deliver game-changing tools and technologies that help utilities secure today’s energy infrastructure from advanced cyber threats and design next-generation future systems that are built from the start to automatically detect, reject, and withstand cyber incidents, regardless of the threat.
- Cybersecurity Tools and Development to strengthen the energy sector’s cybersecurity posture through public and private sector partnerships that leverage DOE-supported tools, guidelines, outreach, training, and technical assistance.
- Emergency Preparedness and Response to pursue enhancements to the reliability, survivability, and resiliency of energy infrastructure, and facilitating faster recovery from disruptions to energy supply.

Program Highlights

The FY 2019 Budget Request to Congress proposes to split the Electricity Delivery and Energy Reliability appropriation into two appropriations: CESER and OE. The OE highlights are provided separately.

- CESER includes the CEDs and ISER programs.
- Program direction funding is allocated between the two appropriations, with administrative, senior management, budget, procurement, contractual management and human capital support activities funded within OE under a service center approach that will support both appropriations.
- **Cybersecurity for Energy Delivery Systems** seeks to reduce the risk of energy disruptions due to cyber events. The request reflects the critical need to accelerate and expand efforts to strengthen the energy infrastructure against cyber threats and mitigate vulnerabilities, focusing on enhancing the speed and effectiveness of cyber threat and vulnerability sharing, establishing a national cyber supply chain assessment capability in partnership with industry, and accelerating game-changing R&D.

- **Infrastructure Security and Energy Restoration** coordinates a national effort to secure U.S. energy infrastructure against all hazards, reduce impacts from disruptive events, and assist with restoration activities. The request supports on-going efforts and maintains capability to respond to energy sector emergencies through a regionalized volunteer delivery model and improves the Federal national energy infrastructure situational awareness and visualization capability provided by EAGLE-I. ISER will expand its efforts with state, local, tribal, and territorial (SLTT) partners to ensure their energy assurance plans integrate cyber information sharing mechanisms and are aligned with energy sector industry efforts. ISER will also establish an energy-sector-specific cyber incident response and hunt capability specializing in the intersection of cyber threats and energy sector industrial control systems.

PETROLEUM ACCOUNTS

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Fossil Energy Petroleum Accounts					
Naval Petroleum and Oil Shale Reserves					
Production Operations**	9,685	0	8,000	-1,685	-17.4%
Management	2,320	0	2,000	-320	-13.8%
Total, Naval Petroleum and Oil Shale Reserves	12,005	14,848	10,000	-2,005	-16.7%
Strategic Petroleum Reserve					
Facilities Development and Operations	195,345	0	149,131	-46,214	-23.7%
Management for SPR Operations	27,260	0	25,974	-1,286	-4.7%
Total, Strategic Petroleum Reserve	222,605	221,485	175,105	-47,500	-21.3%
Northeast Home Heating Oil Reserve					
Northeast Home Heating Oil Reserve**	6,497	0	10,000	+3,503	+53.9%
Total, Northeast Home Heating Oil Reserve	6,497	6,456	10,000	+3,503	+53.9%
SPR Petroleum Account					
SPR Petroleum Account**	0	0	0	0	N/A
Total, SPR Petroleum Accounts	0	0	0	0	N/A
Total, Fossil Energy Petroleum Accounts	241,107	242,789	195,105	-46,002	-19.1%
Energy Security and Infrastructure Modernization Fund	0	350,000	300,000	+300,000	N/A

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

**New FY 2019 budget authority will be supplemented with the use of prior year balances.

Appropriation Overview

Fossil Energy Petroleum Accounts consists of three energy security programs, one SPR modernization program, and post-sale remediation activities at Naval Petroleum Reserve No. 1 and 3. The Strategic Petroleum Reserve storage sites are located at four government-owned Gulf Coast locations with oversight from the Project Management office in Harahan, Louisiana, along with Headquarters personnel in Washington, D.C. Both the Northeast Home Heating Oil Reserve (NEHHOR) and the Northeast Gasoline Supply Reserve (NGSR) consist of Government-owned refined petroleum products stored in leased commercial storage in terminals in the Northeast. Legacy environmental clean-up/remediation continues at the previously-sold Naval Petroleum Reserve No. 1 (Elk Hills, California), and landfill remediation and closure continues as part of post-sale activities at Naval Petroleum Reserve No. 3 (Casper, Wyoming).

Program Highlights

- **Strategic Petroleum Reserve**

The Strategic Petroleum Reserve (SPR) provides strategic and economic security against foreign and domestic disruptions in oil supplies via an emergency stockpile of crude oil. The program fulfills United States' obligations under the International Energy Program, which avails the United States of International Energy Agency assistance through its coordinated energy emergency response plans, and provides a deterrent against energy supply disruptions. The FY 2019 Budget will support the SPR's operational readiness and drawdown capabilities of 4.13MB/d. The program will complete the degasification of crude oil inventory at the West Hackberry site and conduct cavern wellbore activities to ensure the availability of the SPR's crude oil inventory.

- **SPR Petroleum Account**

The SPR Petroleum Account funds SPR petroleum acquisition, transportation, and drawdown activities, as well as the Northeast Gasoline Supply Reserve (NGSR). Consistent with the FY 2018 Budget request, the Administration is proposing to disestablish the NGSR in this FY 2019 budget request. The NGSR has not been utilized since its establishment, and is not considered to be cost efficient or operationally effective.

In addition, the Program requests that language authorizing the sale of one million barrels of SPR crude oil be included in the General Provisions. Proceeds from the requested sale will fund the costs of drawdown operations, including drawdown costs associated with mandatory oil sales. The current drawdown cost estimate for FY 2019 is approximately \$10 million. Balances from the sale of up to 1 million barrels in excess of FY 2019 drawdown costs will be apportioned and allotted to future fiscal years.

- **Naval Petroleum and Oil Shale Reserves**

Following the 1998 sale of the government's interests in NPR-1 (Elk Hills, CA), environmental cleanup/remediation activities under the Corrective Action Consent Agreement with the State of California Department of Toxic Substances Control (DTSC) began. Of the 131 Areas of Concern (AOCs) for which DOE is responsible for environmental cleanup, as of September 30, 2017, 68 AOCs have received certification of No Further Action (NFA) from California's DTSC, 23 AOCs are under DTSC review for NFA certification, and 40 AOCs have undergone an initial field work investigation that require remediation activities and/or the need for additional field work to be performed.

- **Northeast Home Heating Oil Reserve**

The Northeast Home Heating Oil Reserve (NEHHOR) FY 2019 Budget continues to maintain a 1 million barrel inventory of government-owned ultra-low sulfur distillate (ULSD), which is stored in three Northeast commercial storage terminals, as a short-term supplement to the Northeast systems' commercial supply of heating oil for deployment in the event of an emergency supply disruption. Commercial storage contracts went into effect on April 1, 2016, with the final option year extending through March 31, 2020. The Program will continue to focus its oversight and management on product quality analysis of the Reserve, as well as information technology support for the sales system.

- **Energy Security and Infrastructure Modernization Fund (ESIM)**

The Energy Security and Infrastructure Modernization Fund was established in Section 404 of the Bipartisan Budget Act of 2015 to finance modernization of the Strategic Petroleum Reserve (SPR). One billion dollars in crude oil sales will support Life Extension investments needed to ensure the SPR can maintain its operational readiness capability, meet its mission requirements, and operate in an environmentally responsible manner. The Marine Terminal Distribution Capability Enhancements project is currently being re-evaluated pending development of finalized policy guidance within the Administration. The FY 2019 Budget increment continues the four-year (FY 2017 – FY 2020) financing structure of multi-year oil sales that support an effective modernization program for the SPR.

FOSSIL ENERGY RESEARCH AND DEVELOPMENT (FER&D)

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Fossil Energy Research and Development					
Advanced Coal Energy Systems & CCUS					
Advanced Energy Systems	116,650	0	175,000	+58,350	+50.0%
Cross-cutting Research	48,850	0	53,300	+4,450	+9.1%
Carbon Capture, Utilization and Storage	196,300	0	40,000	-156,300	-79.6%
STEP (Supercritical CO2)	24,000	0	25,000	+1,000	+4.2%
Transformational Coal Pilots	50,000	0	0	-50,000	-100.0%
NETL Coal Research and Development	38,000	0	50,000	+12,000	+31.6%
Subtotal, Advanced Coal Energy Systems & CCUS	473,800	470,581	343,300	-130,500	-27.5%
Natural Gas Technologies	43,000	42,708	5,500	-37,500	-87.2%
Unconventional Fossil Energy Technologies from					
Petroleum - Oil Technologies	21,000	20,857	14,000	-7,000	-33.3%
Program Direction	60,000	59,593	61,070	+1,070	+1.8%
Special Recruitment Programs	700	695	200	-500	-71.4%
NETL Infrastructure	40,500	40,226	38,000	-2,500	-6.2%
NETL Research and Operations	43,000	42,708	40,000	-3,000	-7.0%
Subtotal Fossil Energy Research and Development	682,000	677,368	502,070	-179,930	-26.4%
Use of Prior Year Balances	-14,000	-13,905	0	+14,000	+100.0%
Rescission of Prior Year Balances	-246,846	-238,370	0	+246,846	+100.0%
Total, Fossil Energy Research and Development	421,154	425,093	502,070	+80,916	+19.2%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **Fossil Energy Research and Development (FER&D)** program conducts research that supports the clean, affordable and efficient use of domestic fossil energy resources. The program funds early-stage R&D with academia, National Laboratories, and the private sector to generate knowledge that industry can use to develop new products and processes. Funding is also provided to support competitive awards with industry, National Laboratories and academia focused on innovative early-stage R&D to improve the reliability, availability, efficiency, and environmental performance of advanced fossil-based power systems. Program activities, including National Energy Technology Laboratory (NETL) R&D, support early-stage R&D focused on: 1) novel fossil-fueled power systems and components that improve the reliability and efficiency of new and existing units; 2) advanced materials and computational systems; 3) utilization of coal and CO₂ for the production of critical materials and products; 4) transformational CO₂ capture technologies applicable to both new and existing fossil-fueled facilities; and 5) CO₂ storage, with emphasis on storage in depleted oil and gas fields; offshore geologic reservoirs; and addressing injection challenges across all reservoir types. The program will also conduct early-stage research to generate new understanding of shale geology and fracture dynamics to enable industry to further develop unconventional oil and natural gas resources. In addition, FER&D will conduct work focused on characterizing gas hydrates and will explore new concepts for novel technologies that could improve the reliability and operational efficiency of natural gas transmission, distribution, and storage facilities.

The FY 2019 Budget proposes a restructure of the Advanced Energy Systems (AES), Crosscutting Research, and Carbon Capture and Storage programs within the FER&D Program. This restructure improves the alignment of the budget structure to the research focus areas, repositioning the Department to more effectively enable industry to commercialize and deploy advanced technologies necessary to support a secure and reliable power grid. FER&D will support early-stage research in materials, sensors, and processes to expand the knowledge base upon which industry can improve the efficiency, flexibility, and resilience of the existing fleet of coal fired power plants. The restructure also focuses funding on early-stage research that enables the next generation of high efficiency

and low emission coal fired power plants that can directly compete with other sources of electricity in the market and provide low cost reliable power 24/7.

Program Highlights

Advanced Coal Energy Systems & CCUS

- **Advanced Energy Systems**

The mission of the Advanced Energy Systems (AES) subprogram is to increase the availability, efficiency, and reliability of fossil energy power systems and to fund early-stage research to advance technologies that represent a new way to convert energy to enable a step change in performance, efficiency, and the cost of electricity for next generation power plants while maintaining environmental standards through early-stage R&D. Specific efforts will focus on six activities: 1) Advanced Combustion/Gasification Systems, 2) Advanced Turbines, 3) Solid Oxide Fuel Cells, 4) Advanced Sensors and Controls, 5) Power Generation Efficiency, and 6) Advanced Energy Materials. While the primary focus is on coal-based power systems, improvements to these technologies will result in spillover benefits that can reduce the cost of converting other carbon-based fuels, such as natural gas, biomass, or petroleum coke into power and other useful products in an environmentally-acceptable manner. Funding is also provided to support competitive awards with industry, National Laboratories, and academia. By the end of FY 2022, develop three technologies that, verified through modeling, improve the average heat rate (i.e., efficiency) of a typical plant in the existing fleet by 5 percent from the 2017 baseline of 30 percent. By the end of FY 2022, complete at least two designs of advanced high efficiency (greater than or equal to 42% on a higher heating value basis), low emission (HELE) coal fired, small-scale and/or modular units that have flexible operating capacity to meet baseload and load following requirements needed for the evolving grid.

- **Crosscutting Research**

The Crosscutting Research subprogram supports innovative early-stage R&D for improving reliability, availability, efficiency, and environmental performance of advanced fossil-based power systems. The program bridges basic and applied research by targeting concepts with the greatest potential for transformational breakthroughs. As such, the program focuses on advancing early-stage research in areas such materials, rare earth recovery from coal and coal byproducts, fluid dynamics, and fuel preparation characteristics (i.e., coal particle sizing and drying). The program also aims to obtain new knowledge regarding plant phenomena and operation that can be incorporated into a new generation of plant control technologies. Crosscutting Research is focused on four activities and associated sub-activities: 1) Critical Minerals; 2) Water Management R&D; 3) Modeling, Simulation and Analysis; and 4) University Training and Research (e.g., funding for: University Coal Research, and Historically Black Colleges and Universities and other Minority-Serving Institutions, and the University Turbine Systems Research.

- **Carbon Capture, Utilization & Storage**

The Carbon Capture subprogram is focused on early-stage research and development on post-combustion and pre-combustion CO₂ capture, novel compression technologies for new and existing fossil fuel-fired power plants and CO₂ utilization technologies to convert CO₂ to valuable products and commodities. Significant improvements are required to reduce parasitic energy load, and lower capital costs that can support the market potential for large quantities of CO₂ for economic utilization in Enhanced Oil Recovery (EOR) operations and conversion to high-value products. Low cost CO₂ can strengthen U.S. energy security by enabling the production of up to 60 billion barrels of stranded oil that is uneconomic with current recovery practices and current market prices for CO₂. The Carbon Utilization subprogram focuses on using captured/concentrated CO₂ and/or carbon-containing substances, or directly using CO₂ from flue gas or mixed gas streams, and converting it into valuable products. Critical challenges identified in the utilization focus area include the cost-effective use of CO₂ and other carbon-containing substances as a feedstock for chemical synthesis, or its integration into pre-existing products. The Carbon Storage subprogram is focused on development of technologies for the safe and permanent geologic storage of captured CO₂. The subprogram is focused on early-stage R&D in five primary storage types—saline formations, oil and natural gas reservoirs, unmineable coal seams, basalts, and organic shales—and in geologic reservoirs across eleven different geologic storage depositional classes. Coupled simulation tools, characterization methods, and monitoring technologies developed and validated through the Carbon Storage subprogram will improve storage efficiency, reduce overall cost, decrease subsurface uncertainties, and identify ways to ensure that operations are safe, economically viable, and environmentally benign.

- **STEP (Supercritical CO₂)**
 STEP is a pilot test facility that is intended to be available for industry- led projects. Through competitively awarded funding opportunity announcements, the program will support advances in the next generation of lower cost, higher performance recuperators as well as the next generation turbine components such as seals, bearings, and rotors needed to improve efficiency, reduce cost, and increase durability of power systems that use supercritical CO₂ as a working fluid.
- **Natural Gas Technologies**
 The Natural Gas Technologies program addresses critical and emergent issues pertaining to the safe and environmentally sustainable supply of domestic natural gas. Specifically, the program’s mission is to promote our Nation’s energy independence through early-stage research and development that enables the prudent development, distribution, and storage of natural gas resources. The program is comprised of two subprograms: 1) Natural Gas Infrastructure Research and 2) Gas Hydrates. Given the importance of natural gas in our energy system, it is critical to ensure the safety and reliability of related infrastructure to protect energy reliability, public health, and the environment. To that end, the Natural Gas Infrastructure Research subprogram conducts early-stage R&D on technologies that industry could advance to improve the reliability and operational efficiency of natural gas transmission, distribution, and storage facilities. In addition, while shale gas has been discovered in sufficient quantities to now support and warrant U.S. liquefied natural gas (LNG) exports, the most plentiful supplies of natural gas throughout the world may in fact be the methane molecules trapped in ice-like structures called hydrates. The Gas Hydrates subprogram supports unique early-stage research to evaluate the occurrence, nature, and behavior of the potentially enormous naturally-occurring gas hydrate resources within the U.S. and territorial waters, with particular focus on the Arctic and Gulf of Mexico regions.
- **Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies**
 The mission of the Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies program is to advance open information and technologies that will better assure sustainable and responsible development of domestic unconventional fossil energy resources, including tight and shale oil and natural gas. The prudent development of these natural resources is essential to ensuring the Nation’s continued energy resilience and security. The Unconventional Fossil Energy Technologies Program is aligned with Administration priorities of enhancing domestic energy production and U.S. energy security.
- **NETL Coal Research and Development**
 The NETL Coal R&D program funds all NETL in-house research efforts. In addition to supporting research capabilities in the areas of computational engineering, material engineering and manufacturing, and geological systems, this program funds collaboration activities with universities, other National Laboratories, state and local governments, and industry. NETL will leverage funding and will explore collaborative models for partnerships with other laboratories, industry, and academia in accordance with laws, regulations, and policies. This program also encompasses strategic energy analysis and research data management activities.
- **NETL Infrastructure and Operations**
 The NETL Infrastructure program supports the fixed costs of NETL’s facility and major equipment footprint in three geographic locations -- Morgantown, WV; Pittsburgh, PA; and Albany, OR. The Department continues to evaluate ways to improve operational efficiency. The NETL Infrastructure and Operations program is comprised of the following subprograms: (1) High performance Computer; (2) Plant & Capital Equipment; (3) Safeguards and Security; and (4) Environmental Restoration.
- **Program Direction**
 Program Direction provides the funding for all headquarters personnel and operational expenses for FER&D. Also included is the Import/Export Authorization program, which will continue regulatory reviews and oversight of the transmission of natural gas across the U.S. borders. Program Direction at NETL continues to include functions that are necessary for the performance of NETL activities, such as legal, finance, and procurement. Each of these elements also fund the DOE-wide Human Resources Shared Services Center and the FE program office contributes to the DOE Working Capital Fund.

NUCLEAR ENERGY

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Nuclear Energy					
Integrated University Program	5,000	4,966	0	-5,000	-100.0%
STEP R&D	5,000	4,966	0	-5,000	-100.0%
SMR Licensing Technical Support	95,000	94,355	0	-95,000	-100.0%
Reactor Concepts RD&D	132,000	131,103	163,000	+31,000	+23.5%
Fuel Cycle R&D	207,500	206,091	60,000	-147,500	-71.1%
Nuclear Energy Enabling Technologies	115,100	114,319	116,000	+900	+0.8%
Radiological Facilities Management	17,000	16,884	9,000	-8,000	-47.1%
Idaho Facilities Management ¹	237,713	236,098	204,000	-33,713	-14.2%
Idaho Sitewide Safeguards and Security	129,303	128,425	136,090	+6,787	+5.2%
International Nuclear Energy Cooperation	3,000	2,980	2,500	-500	-16.7%
Program Direction	80,000	79,457	66,500	-13,500	-16.9%
Subtotal, Nuclear Energy	1,026,616	1,019,644	757,090	-269,526	-26.3%
Use of Prior Year Balances	-10,000	-9,932	0	+10,000	+100.0%
Rescission of Prior Year Balances	-795	-790	0	+795	+100.0%
Total, Nuclear Energy	1,015,821	1,008,922	757,090	-258,731	-25.5%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

¹Funding does not reflect the transfer of approximately \$75M from Naval Reactors for maintenance and operation of the Advanced Test Reactor

Appropriation Overview

Nuclear Energy (NE) supports the diverse civilian nuclear energy programs of the U.S. Government, leading Federal efforts to research and develop nuclear energy technologies, including generation, safety, and security technologies, to help unleash an era of energy dominance through strategic support for innovation.

Program Highlights

- **Reactor Concepts Research, Development and Demonstration**

FY 2019 activities will include cost-shared efforts to extend the life of the existing commercial nuclear reactor fleet through early-stage research in the areas of materials aging and degradation, safety margin characterization, safety technologies, and instrumentation and controls; and early-stage research into advanced reactor technologies, such as fast reactor technologies and high temperature reactor technologies for the production of electricity and high temperature process heat to improve the economic competitiveness and safety of nuclear energy as a resource capable of meeting the Nation's energy, environmental and energy security goals. In FY 2019 Versatile Advanced Test Reactor subprogram will transition from R&D planning to development of a pre-conceptual design. A new FY 2019 subprogram, Advanced Small Modular Reactor R&D, supports early-stage research and development (R&D) and technical assistance, the results of which are intended to be widely applicable and employed by nuclear technology development vendors for the purpose of accelerating the development of their technologies.

- **Fuel Cycle Research and Development**

The FY 2019 Budget Request supports progress towards developing one or more light water reactor fuel concepts with significantly enhanced accident tolerance.

- **Nuclear Energy Enabling Technologies**

The FY 2019 Budget Request supports early-stage R&D and strategic investments in research capabilities to develop innovative and crosscutting nuclear energy technologies. This program funds high-priority early-stage R&D on advanced

manufacturing methods, fabrication, and instrumentation technologies to includes a strong investment in modeling and simulation tools, and provides access to unique nuclear energy research capabilities through its Nuclear Science User Facilities (NSUF). Collectively, NEET-sponsored activities support the goals, objectives, and activities of the Gateway for Accelerated Innovation in Nuclear (GAIN) initiative to make these technology advancements accessible to U.S. industry through private-public partnerships.

- **Radiological Facilities Management**

The FY 2019 Budget Request supports the provision of fresh reactor fuel to, and removal of used fuel from 25 operating university research reactors to support their continued operation. This provides continued test reactor capability to universities, coupled with research, development, and educational opportunities in support of U.S. nuclear energy initiatives.

- **Idaho Facilities Management and Idaho Site-wide Safeguards and Security**

Idaho Facilities Management program will continue investments at the Advanced Test Reactor (ATR) and Advanced Test Reactor Critical Facility (ATRC) to improve reliability and availability of the ATR, and continue operations at the Transient Reactor Test Facility (TREAT) following completion of readiness activities in FY 2018. The Idaho Site-wide Safeguards and Security program will increase the workforce and focus on continued implementation of infrastructure investments, capital improvements, emerging technology investments, and enhanced cybersecurity program capabilities to adequately secure site assets.

YUCCA MOUNTAIN AND INTERIM STORAGE

	FY 2017 Enacted	FY 2018 Annualized CR*	(\$K)		
			FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Yucca Mountain and Interim Storage					
Yucca Mountain	0	0	90,400	+90,400	N/A
Interim Storage	0	0	6,600	+6,600	N/A
Program Direction	0	0	23,000	+23,000	N/A
Total, Yucca Mountain and Interim Storage	0	0	120,000	+120,000	N/A

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The mission of the Yucca Mountain and Interim Storage program is to accelerate progress on fulfilling the Federal Government’s obligations to address nuclear waste, enhance national security, and reduce future taxpayer burden. The FY 2019 Budget Request proposes funding from two separate appropriation accounts, Nuclear Waste Disposal (\$90 million) and Defense Nuclear Waste Disposal (\$30 million).

Program Highlights

- **Yucca Mountain (\$110M) and Interim Storage (\$10M) Programs**

The FY 2019 Yucca Mountain and Interim Storage FY 2019 Budget Request supports the resumption of the Nuclear Regulatory Commission (NRC) licensing process for Yucca Mountain and initiation of a robust interim storage program. Prior year activities that supported the participation in the NRC licensing process were suspended in FY 2010, but are being continued under the FY 2019 Budget Request.

This request provides for a program office to provide policy direction and perform functions necessary to support the licensing process. This request provides for legal support to represent the Department in the licensing process, as well as to respond to litigation and other legal matters. It provides for technical and scientific support necessary to support an affirmative case for the license and to respond to any challenges to the license application. It also provides for the document management activities associated with the licensing process.

The FY 2019 Budget Request includes funding to develop and implement a robust interim storage enabling near-term consolidation of nuclear waste and safely storing it while a repository is completed.

- **Program Direction**

The Program Direction budget has been structured to support both licensing (\$19.6 million) and interim storage (\$3.4 million). Program Direction is needed for a variety of activities, including the salaries of Federal Employees working in furtherance of the NWPA.

ENVIRONMENT, HEALTH, SAFETY AND SECURITY MISSION SUPPORT

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Environment, Health, Safety and Security Mission Support					
Environment, Health, Safety and Security Mission Support	126,972	126,110	135,194	+8,222	+6.5%
Program Direction	64,000	63,565	70,653	+6,653	+10.4%
Subtotal, Environment, Health, Safety and Security Mission Support	190,972	189,675	205,847	+14,875	+7.8%
Rescission of Prior Year Balances	-1,146	0	0	+1,146	+100.0%
Total, Environment, Health, Safety and Security Mission Support	189,826	189,675	205,847	+16,021	+8.4%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

Environment, Health, Safety and Security (EHSS) supports DOE’s commitment to maintain a safe and secure work environment for all Federal and contractor employees; ensure operations do not adversely affect the environment, health and safety of surrounding communities; and protect national security and other entrusted assets. In particular they support achieving DOE’s mission in a safe, secure, environmentally responsible manner by providing consistent policy, technical assistance, and corporate leadership for environment, health, safety and security program areas.

Program Highlights

- **Environment, Health and Safety**

EHSS funds are used to provide technical and analytical expertise to protect and enhance the safety of all DOE workers, the public, and the environment in support of Departmental missions and goals. EHSS maintains policies and guidance that promote safe, environmentally sustaining work practices in the areas of occupational, facility, nuclear, and radiation safety; environmental protection; and quality assurance. EHSS provides technical assistance to DOE program and site offices and laboratories through activities such as nuclear facility safety bases reviews and corporate-wide services such as accrediting commercial laboratories used by DOE sites for regulatory compliance and employee radiological monitoring programs. EHSS also manages the Employee Concerns program, which manages and provides a DOE enterprise approach to ensure that employee concerns related to environment, health, safety and security and the management of DOE and NNSA programs and facilities are addressed. EHSS supports Departmental and national preparedness and response efforts associated with radiation emergencies and accidents and domestic and international research on exposures of workers and the public to nuclear, radiological, and other hazardous materials. EHSS provides health and environmental services to the people of the Marshall Islands; and medical screenings for former DOE and DOE-related vendor employees, and supports the Department of Labor in implementation of the Energy Employee Occupational Illness Compensation Program Act.

- **Security**

EHSS provides technical security and analytical expertise to develop and assist in the implementation of safeguards and security programs that protect national security assets entrusted to DOE; and to implement the U.S. Government nuclear weapons-related technology classification and declassification program. EHSS maintains policies and guidance related to physical protection, personnel and information security and nuclear materials accountability, in order to be responsive to national security needs and evolving threats. EHSS provides technical assistance to DOE programs, site offices and laboratories to implement cost effective security measures tailored to the mission. EHSS maintains corporate security-related information management systems to determine the potential for an undue risk to individual sites, DOE, and national security. EHSS provides for the protection of DOE Headquarters facilities and access authorizations for its DOE Headquarters personnel.

- **Program Direction**

Provides Federal staffing, travel, support services and other resources required for execution of EHSS program activities and provides technical support for liaison activities with the Defense Nuclear Facilities Safety Board.

Planned and Proposed Accomplishments

In FY 2018, the EHSS funding will be used to:

- Maintain DOE's EHSS policies to be efficient, effective, and compliant with National policies, including:
 - Initiation of a rulemaking to revise DOE's Nuclear Safety Management rule to reduce regulatory burden;
 - Complete an update to DOE's Beryllium Rule to provide better protection to workers;
 - Complete an update to DOE's Worker Protection Rule to make it easier to implement;
 - Update information for classification policy and guidance to better protect national security interests.
- Support implementation of DOE policies including:
 - Cost effective implementation of the Department's Design Basis Threat Order;
 - Cost effective implementation of the Department's Occurrence Reporting System Order.
- Improve DOE's safety culture to improve safe accomplishment of work by establishing a safety culture community of interest to share best practices, performing safety culture assessments, and implementing methods to monitor safety culture performance.
- Manage DOE's classification program to protect national security interests.
- Manage programs that support EHSS excellence and efficiency across the complex such as the Voluntary Protection Program and Insider Threat Program.
- Manage programs that promote improvements in EHSS knowledge and capabilities such as the Nuclear Safety Research and Development Program and international health studies.

In FY 2019, the Budget Request proposes to:

- Keep DOE's EHSS policies efficient, effective and in compliance with national policies.
- Support cost effective implementation of EHSS requirements including continued support for implementation of DOE's Design Basis Threat Order.
- Identify and assess effective, safe and reliable physical security technologies to replace aging and failing systems currently in operation at nuclear facilities and laboratories.
- Continue to improve DOE's safety culture by expanding the safety culture community of interest to share best practices, performing safety culture assessments, and monitoring safety culture performance including analyzing and monitoring results to improve safe accomplishment of work.
- Manage DOE's classification program to protect national security interests.
- Manage programs that support EHSS excellence and efficiency across the complex such as the Voluntary Protection Program.
- Manage programs that promote improvements in EHSS knowledge and capabilities such as the Nuclear Safety Research and Development Program and international health studies.

TITLE 17 - INNOVATIVE TECHNOLOGY LOAN GUARANTEE PROGRAM

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR ⁴	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Title 17 - Innovative Technology Loan Guarantee Program					
Administrative Operations	37,000	36,749	10,000	-27,000	-73.0%
Loan Guarantee, Offsetting Collections	-27,000 ⁵	-20,000	-3,000	+24,000	+88.9%
Subtotal, Title 17 - Innovative Technology Loan Guarantee Program	10,000	16,749	7,000	-3,000	-30.0%
Rescission of Prior Year Balances ¹	-9,861	0	0	+9,861	+100.0%
Total, Title 17 - Innovative Technology Loan Guarantee Program	139	16,749	7,000	+6,861	+4,936.0%
FY 2011 Loan Subsidy Rescission ²	-9,000	-8,939	0	+9,000	+100.0%
ARRA Loan Subsidy Cancellation ³	0	0	-383,433	-383,433	N/A

¹Rescission of administrative appropriations from FY 2012 and FY 2013 (Pub. L. 115-31)

²Due to FY 2018 appropriations uncertainty, the Budget does not assume the availability of unobligated balances appropriated by the Department of Defense and Full-Year Continuing Appropriations Act of 2011 (Pub. L. 112-10) for cancellation. However, rescission of these balances would be consistent with the proposal to eliminate the Title 17 program.

³The Budget proposes to cancel \$383 million in unobligated balances appropriated by the American Reinvestment and Recovery Act of 2009 (Pub. L. 111-5).

⁴Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

⁵The FY 2017 Budget estimate for offsetting collection was \$27 million. The FY2017 Congressional estimate for offsetting collections was \$30 million.

Appropriation Overview

Innovative Technology Loan Guarantee Program (LGP), as authorized under Title XVII of the Energy Policy Act of 2005 and executed by the Department of Energy's (DOE) Loan Programs Office (LPO), encourages early commercial use of new or significantly improved technologies in energy projects. Projects supported by DOE loan guarantees must avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; employ new or significantly improved technologies compared to commercial technologies in service in the United States at the time the guarantee is issued; and offer a reasonable prospect of repayment of the principal and interest on the guaranteed obligation.

The FY 2019 Budget eliminates the Title 17 program and proposes to cancel all remaining loan volume authority. In addition to \$10 million in appropriation offset by \$3 million in collections, the Loan Programs Office will utilize unobligated balances carried forward from prior year appropriations to cover loan portfolio monitoring and administrative expenses; including salaries for its full time employees as well as the cost of outside advisors for financial, legal, engineering, credit, and market analysis. The LPO will wind down operations in FY 2019 with the expectation that it will shut down in FY 2020 with remaining loan monitoring and closeout activities transferred to another office. All activities not essential for the continued monitoring of the portfolio will be terminated.

Program Highlights

The FY 2019 Budget eliminates the Title 17 program.

- The loan authority provided in prior year appropriations Acts for commitments to guarantee loans under Title XVII of the Energy Policy Act of 2005 is cancelled, with the exception of potential obligations made before October 1, 2018.
- LPO will continue to manage its existing portfolio of assets.
- The Budget provides \$7 million (net of collection) to augment balances of prior year appropriations for loan portfolio monitoring and related administrative expenses.

ADVANCED TECHNOLOGY VEHICLES MANUFACTURING LOAN PROGRAM

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Advanced Technology Vehicles Manufacturing Loan Program					
Administrative Expenses	5,000	4,966	1,000	-4,000	-80.0%
Subtotal, Advanced Technology Vehicles Manufacturing Loan Program	5,000	4,966	1,000	-4,000	-80.0%
Rescission of Prior Year Balances ¹	-1,117	0	0	+1,117	+100.0%
Total, Advanced Technology Vehicles Manufacturing Loan Program	3,883	4,966	1,000	-2,883	-74.2%
Loan Subsidy Cancellation ²	0	0	-4,333,500	-4,333,500	N/A

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

¹Recission of administrative appropriations from FY 2012 (Pub. L. 115-31)

²The Budget proposes to cancel \$4.3 billion in unobligated balances appropriated by the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act of 2009 (Pub. L. 110-329)

Appropriation Overview

Advanced Technology Vehicles Manufacturing (ATVM) Loan Program supports the manufacturing of advanced technology vehicles and associated components in the United States. ATVM provides loans to automobile and automobile part manufacturers for the cost of re-equipping, expanding, or establishing manufacturing facilities in the United States to produce advanced technology vehicles or qualified components and for associated engineering integration costs.

The FY 2019 Budget eliminates the ATVM Loan Program and proposes to cancel all remaining loan volume authority and appropriated credit subsidy. The Budget provides \$1 million to cover loan portfolio monitoring and administrative expenses: including salaries for its full time employees as well as the cost of outside advisors for financial, legal, engineering, credit, and market analysis. The Loan Programs Office (LPO) will wind down operations in FY 2019 with the expectation that it will shut down in FY 2020 with remaining loan monitoring and closeout activities transferred to another office. All activities not essential for the continued monitoring of the portfolio will be terminated.

Program Highlights

The FY 2019 Budget eliminates the ATVM Loan Program

- The direct loan authority provided under section 129 of the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act, 2009 is permanently cancelled.
- LPO will continue to manage its existing portfolio of assets.
- The Budget provides \$1 million to augment balances of prior year appropriations for loan portfolio monitoring and related administrative expenses.

SCIENCE

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Science					
Advanced Scientific Computing Research	647,000	642,606	899,010	+252,010	+39.0%
Basic Energy Sciences	1,871,500	1,858,791	1,850,000	-21,500	-1.1%
Biological and Environmental Research	612,000	607,844	500,000	-112,000	-18.3%
Fusion Energy Sciences Program	380,000	377,419	340,000	-40,000	-10.5%
High Energy Physics	825,000	819,397	770,000	-55,000	-6.7%
Nuclear Physics	622,000	617,776	600,000	-22,000	-3.5%
Workforce Development for Teachers and Scientists	19,500	19,368	19,000	-500	-2.6%
Science Laboratories Infrastructure	130,000	129,117	126,852	-3,148	-2.4%
Safeguards and Security	103,000	102,301	106,110	+3,110	+3.0%
Program Direction	182,000	180,764	180,000	-2,000	-1.1%
Subtotal, Science	5,392,000	5,355,383	5,390,972	-1,028	0.0%
Rescission of Prior Year Balances	-1,028	-1,021	0	+1,028	+100.0%
Total, Science	5,390,972	5,354,362	5,390,972	0	N/A

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The Office of Science (SC) is the nation’s largest Federal supporter of basic research in the physical sciences and funds programs in physics, chemistry, materials science, biology, environmental science, applied mathematics, and computer and computational science. The SC portfolio has two principal thrusts: direct support of scientific research, and direct support of the design, development, construction, and operation of unique, open-access scientific user facilities. The SC basic research portfolio includes extramural grants and contracts supporting about 23,000 researchers located at over 300 institutions and the 17 DOE national laboratories, spanning all fifty states and the District of Columbia. The portfolio of 27 scientific user facilities serves nearly 31,000 users per year. SC programs invest in foundational science, including basic research for the advancement of clean energy, to transform our understanding of nature and strengthen the connection between advances in fundamental science and technology innovation.

Program Highlights

• **Advanced Scientific Computing Research**

- Advanced Scientific Computing Research (ASCR) supports advanced computational research, applied mathematics, and computer science, as well as development and operation of multiple, large high performance and leadership computing user facilities and high performance networking. ASCR increases by \$252.0 million, or 39.0 percent, above the FY 2017 Enacted level. The Request provides for significantly expanded investments to accelerate the development of exascale-capable computing systems, applications and software infrastructure in order to deploy the first exascale system in 2021 and a second in 2022 to provide next-generation tools for scientific discovery and meet national security needs. The Request funds:
- Research, development, and design to ultimately achieve exascale-capable systems with a fifty fold improvement in true application performance over the current systems at the Leadership Computing Facilities at Argonne National Laboratory and the Oak Ridge National Laboratory.
 - Core research in applied mathematics and computer science.
 - Research on the application of high performance computer simulation and modeling to science challenges, including computational partnerships under the Scientific Discovery through Advanced Computing (SciDAC) program and new strategic partnerships aimed at understanding the challenges that quantum information and neuromorphic technologies pose to DOE mission applications.
 - Research in data-intensive science to address end-to-end data management challenges, including the massive quantities of data generated by SC facilities and collaborations.

- Operations and preparation for upgrades at ASCR's four scientific user facilities, including site preparations at the Leadership Computing Facilities in support of the delivery of the first exascale-capable computing system in 2021.
- The Next Generation Networking for Science activity has been eliminated. Core efforts in networking research are supported within the computer science activity. Collaboratory efforts, are supported within the computational partnerships to strengthen the interconnectivity of these efforts.

- **Basic Energy Sciences**

Basic Energy Sciences (BES) supports fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels in order to provide the foundations for new energy technologies, to mitigate the environmental impacts of energy use, and to support DOE missions in energy, environment, and national security. BES decreases by \$21.5 million or 1.1 percent, below the FY 2017 Enacted level. The Request funds:

- Core research activities in the broad disciplines of condensed matter and materials physics, chemistry, geosciences, and aspects of physical biosciences to discover new materials and design novel chemical processes.
- Energy Frontier Research Centers (EFRCs) to overcome hurdles in basic science that require team efforts with a scope and complexity beyond what is possible in single-investigator or small-group awards.
- Core research and the EFRC program emphasize emerging high priorities in quantum materials and chemistry, ultrafast science, catalysis science, synthesis, instrumentation science, and materials and chemical research related to future nuclear energy systems, next-generation electrical energy storage, and interdependent energy-water issues.
- The Batteries and Energy Storage and the Fuels from Sunlight Energy Innovation Hubs.
- Computational Materials Sciences to develop community codes for the predictive design of functional materials, and Computational Chemical Sciences to develop codes that are well-adapted to anticipated exascale architectures.
- Fundamental research to enable advancement of clean energy technologies, with emphases on targeting novel materials and chemistry for energy efficiency and for use in extreme environments.
- Continuing operation of BES user facilities below optimal levels: five x-ray light sources, two neutron scattering sources, and five research centers for nanoscale science.
- Continued construction of the Linac Coherent Light Source-II at SLAC National Accelerator Laboratory.
- Support for the Advanced Photon Source Upgrade project. Two new line item construction projects: the Advanced Light Source Upgrade project at Lawrence Berkeley National Laboratory (LBNL) and the Linac Coherent Light Source-II High Energy project at SLAC.

- **Biological and Environmental Research**

Biological and Environmental Research (BER) supports fundamental research to understand complex biological, biogeochemical, and physical principles of natural systems at scales extending from the genome of microbes and plants to the environmental and ecological processes at the scale of the planet Earth. BER decreases by \$112.0 million, or 18.3 percent, below the FY 2017 Enacted level. The Request funds:

- Research in foundational genomic sciences, including the DOE Bioenergy Research Centers, using approaches that include genome sequencing, secure biodesign, proteomics, metabolomics, structural biology, high-resolution imaging and characterization, and integration of information into computational models that can be iteratively tested and validated to advance a predictive understanding of biological systems.
- Core research in earth and environmental systems science, with activities focused on scientific analysis and modeling of the sensitivity and uncertainty of Earth system predictions to atmospheric, cryospheric, oceanic, and biogeochemical processes.
- Continuing operation of the three BER scientific user facilities: the Joint Genome Institute, the Atmospheric Radiation Measurement Research Facility, and the Environmental Molecular Sciences Laboratory.

- **Fusion Energy Sciences**

Fusion Energy Sciences (FES) supports research to understand matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. FES decreases by \$40.0 million, or 10.5 percent, below the FY 2017 Enacted level. The Request funds:

- The DIII-D program research and facility operations, with an emphasis on completion of facility improvements that began in FY 2018 and study of high priority topics identified by community research needs workshops.
- National Spherical Torus Experiment Upgrade (NSTX-U) at Princeton Plasma Physics Laboratory to implement repairs and corrective actions required to obtain robust, reliable research operations, and enhanced collaborative research at other facilities to support NSTX-U research program priorities.
- SciDAC in partnership with ASCR, including research to accelerate development of a whole-device modeling capability and address large-scale data analysis challenges.
- The Materials-Plasma Exposure eXperiment project, which will be a world-leading facility for dedicated studies of reactor-relevant heat and particle loads on fusion materials.
- Research opportunities for U.S. scientists on overseas superconducting tokamaks and stellarators and other international facilities with unique capabilities, enabled by U.S. hardware and intellectual contributions.
- Discovery plasma science, emphasizing research on intermediate-scale scientific user facilities.
- High-energy-density laboratory plasma science enabled by the Matter in Extreme Conditions instrument of the Linac Coherent Light Source.
- The U.S. Contribution to the ITER project focusing on the highest-priority First Plasma hardware components, including the continued fabrication of the central solenoid superconducting magnet modules.

- **High Energy Physics**

High Energy Physics (HEP) supports research to understand how the universe works at its most fundamental level by discovering the most elementary constituents of matter and energy, probing the interactions among them, and exploring the basic nature of space and time. HEP decreases by \$55.0 million, or 6.7 percent, below the FY 2017 Enacted level. The Request funds:

- The highest priority activities and projects identified by the high energy physics community and described in the High Energy Physics Advisory Panel May 2014 Particle Physics Project Prioritization Panel (P5) report. This includes increased support for the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) and the Proton Improvement Plan-II project that will provide the world's highest proton beam intensity of greater than 1.2 megawatts for LBNF/DUNE, which are hosted at the Fermi National Accelerator Laboratory; and the High-Luminosity Large Hadron Collider Accelerator and Computational Materials Sciences and A Toroidal LHC Apparatus Detector Upgrade projects with international partners.
- Core research activities, with priority given to areas critical to executing P5 report recommendations.
- Quantum Information Science (QIS) opens prospects for new capabilities in sensing, simulation, and computing. HEP activities will be a part of a larger national effort involving interagency coordination of programs.
- Accelerator Stewardship activities to enable development of real-world accelerator applications, including advanced proton and ion beams for the treatment of cancer (in coordination with the National Institutes of Health), and compact accelerators for environmental remediation.
- Muon to Electron Conversion Experiment (Mu2e) project proceeding to the construction phase; Mu2e will provide a unique window into charged lepton flavor violation.
- Next-generation projects to search for dark matter, LUX-ZEPLIN and SuperCDMS-SNOlab; and the Dark Energy Spectroscopic Instrument to further studies of dark energy.

- **Nuclear Physics**

Nuclear Physics (NP) supports research to discover, explore, and understand all forms of nuclear matter. NP decreases by \$22.0 million or 3.5 percent, below the FY 2017 Enacted level. The Request funds:

- High priority world-class nuclear physics research in Quantum Chromodynamics, Nuclear Structure and Astrophysics and Fundamental Symmetries at universities and laboratories and preserves critical core competencies. An effort in QIS research is initiated.
- Operations of the Relativistic Heavy Ion Collider to study matter created moments after the "Big-Bang,"; the Continuous Electron Beam Accelerator Facility to continue the scientific program with the recently upgraded 12 GeV machine to pursue opportunities for new discoveries and an improved understanding of quark confinement;

and operations of the Argonne Tandem Linac Acceleratory System for compelling research in nuclear structure and astrophysics.

- Isotope production facilities to ensure mission readiness for isotope production. These facilities provide isotopes in short supply that are crucial to the Nation's federal complex, research enterprise, and industry. Operation of the Enriched Stable Isotope Prototype Plant is maintained and poised to begin to replenish U.S. inventory and reduce dependence on foreign suppliers.
- Construction of the Facility for Rare Isotope Beams (FRIB) at Michigan State University will continue consistent with the performance baseline profile; FRIB will provide world-class capability and new discovery potential in nuclear structure and nuclear astrophysics.
- Fabrication of high priority instrumentation including the Gamma-Ray Energy Tracking Array Major Items of Equipment (MIE), a premiere gamma-ray tracking device that will enable provision of advanced, high resolution gamma ray detection capabilities for FRIB; the Stable Isotope Production Facility MIE, which will provide increased domestic capability for production of critically needed enriched stable isotopes, and reduce the nation's dependency on foreign supply; and the initiation of the sPHENIX MIE, to study high particle jet production in heavy ion collisions at RHIC.

- **Workforce Development for Teachers and Scientists**

Workforce Development for Teachers and Scientists (WDTS) ensures that DOE has the sustained pipeline of science, technology, engineering, and mathematics (STEM) workers to meet national goals and objectives, now and in the future. WDTS funding decreases by \$0.5 million or 2.6 percent, below the FY 2017 Enacted level.

- FY 2019 activities supported by WDTS focus on the training of STEM undergraduate and graduate students at DOE national laboratories and the National Science Bowl® competitions.

- **Science Laboratories Infrastructure**

Science Laboratories Infrastructure (SLI) sustains mission-ready infrastructure and safe and environmentally responsible operations by providing the infrastructure necessary to support leading edge research by the SC national laboratories. SLI decreases by \$3.1 million or 2.4 percent, below the FY 2017 Enacted level. The Request funds:

- Two new construction projects: the Electrical Capacity and Distribution Capability at Argonne National Laboratory (ANL) and the Science User Support Center at Brookhaven National Laboratory (BNL).
- The continuation of six ongoing construction projects: Materials Design Laboratory at ANL; the Integrative Genomics Building at LBNL; the Integrated Engineering Research Center at Fermilab; the Core Facility Revitalization at BNL; and the Energy Sciences Capability at Pacific Northwest National Laboratory.

- **Safeguards and Security**

Safeguards and Security (S&S) program ensures appropriate security measures are in place to support the SC mission requirement of open scientific research and to protect critical assets within SC national laboratories.

- S&S increases by \$3.1 million or 3.0 percent, above the FY 2017 Enacted level to provide for increased support to Cybersecurity.

- **Science Program Direction**

Program Direction (PD) supports the skilled and motivated Federal workforce that plans, develops, and oversees SC investments in world-leading basic research and scientific user facilities, and provides critical oversight to ten of DOE's national laboratories.

- PD decreases by \$2.0 million or 1.1 percent, below the FY 2017 Enacted level. The decrease will be accommodated through a restriction in hiring and an organizational review to identify opportunities for functional consolidation and position reductions while improving organizational efficiencies.

ENVIRONMENTAL MANAGEMENT

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Environmental Management by Site					
Brookhaven	0	0	2,000	+2,000	N/A
Carlsbad/Waste Isolation Pilot Plant (WIPP)	324,720	322,515	403,487	+78,767	+24.3%
Idaho National Laboratory	390,088	387,439	359,226	-30,862	-7.9%
Oak Ridge	498,164	494,782	408,526	-89,638	-18.0%
Paducah	272,310	270,461	270,224	-2,086	-0.8%
Portsmouth	381,971	379,377	415,458	+33,487	+8.8%
Richland	916,176	909,954	747,097	-169,079	-18.5%
River Protection	1,499,965	1,489,779	1,438,513	-61,452	-4.1%
Savannah River	1,369,429	1,360,130	1,656,180	+286,751	+20.9%
Lawrence Berkeley National Laboratory	9,200	9,138	0	-9,200	-100.0%
Lawrence Livermore National Laboratory	1,396	1,387	1,704	+308	+22.1%
Los Alamos	194,000	192,683	191,629	-2,371	-1.2%
Nevada	62,176	61,754	60,136	-2,040	-3.3%
Sandia National Laboratories	4,130	4,102	2,600	-1,530	-37.0%
Separation Process Research Unit (SPRU)	3,685	3,660	15,000	+11,315	+307.1%
West Valley Demonstration Project	69,628	69,155	63,687	-5,941	-8.5%
Energy Technology Engineering Center	10,459	10,388	8,038	-2,421	-23.1%
Moab	37,884	37,627	34,993	-2,891	-7.6%
Excess Facilities	0	0	150,000	+150,000	N/A
Other Sites	14,889	14,788	4,889	-10,000	-67.2%
Headquarters Operations	14,979	14,878	12,979	-2,000	-13.4%
Technology Development	25,025	24,855	25,000	-25	-0.1%
Uranium Thorium Reimbursements	30,000	29,796	30,000	0	N/A
Program Direction	290,050	288,080	300,000	+9,950	+3.4%
D&D Fund Deposit	563,000	559,177	0	-563,000	-100.0%
Offsets	-564,416	-559,177	0	+564,416	+100.0%
Total, Environmental Management by Site	6,418,908	6,376,728	6,601,366	+182,458	+2.8%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **Office of Environmental Management (EM)** supports the Department of Energy (DOE) to meet the challenges of the nation’s Manhattan Project and Cold War legacy responsibilities.

EM was established in 1989 and is responsible for the cleanup of millions of gallons of liquid radioactive waste, thousands of tons of spent (used) nuclear fuel and nuclear materials, disposition of large volumes of transuranic and mixed/low-level waste, huge quantities of contaminated soil and water, and deactivation and decommissioning of thousands of excess facilities. This environmental cleanup program results from six decades of nuclear weapons development and production and Government-sponsored nuclear energy research. It involves some of the most dangerous materials known to humankind. To date, EM has completed cleanup activities at 91 sites in 30 states and in the Commonwealth of Puerto Rico. EM is currently responsible for cleaning up the remaining 16 sites in 11 states.

Program Highlights

- **Savannah River**

At the Savannah River Site, the largest portion of the FY 2019 Request supports the Liquid Tank Waste Management Program. The liquid waste tanks pose the highest public, worker, and environmental risk at the site; therefore, stabilization and preparation for disposal are a high priority. The project scope includes the operation of the Defense Waste Processing Facility to produce 135 to 175 canisters of vitrified high-level waste and management of the tank farms. In addition, the Request supports Salt Waste Processing Facility start-up, construction of Saltstone Disposal Unit #7, design and construction of Saltstone Disposal Unit # 8 and #9 and operation of the Actinide Removal Process and Modular Caustic Side Extraction Unit at 200,000 gallons. This unit will be needed until the Salt Waste Processing Facility begins operation. The FY 2019 Request supports the ramp up of the Saltstone Facility to 24/7 operations and the Effluent Treatment Facility. The request also supports the Savannah River Site to maintain H Canyon/HB Line in a safe condition, provides safe, secure storage for spent (used) nuclear fuel in L-Area, supports continuity of K-Area operations to include maintaining the K-Area adequately, and store special nuclear material safely and securely. The increase over the FY 2017 Enacted level provides additional support to the Salt Waste Processing Facility to ensure reliability and ability of operations to support production rates; increased support of canister double stacking operations; ramp up of construction for Salt Disposal Unit #7; and additional funding for Salt Disposal Units #8 and #9 activities.

- **Office of River Protection**

The Office of River Protection's primary goal is the safe management and treatment of approximately 56 million gallons of radioactive liquid waste currently stored in 177 underground storage tanks at Hanford, 17 of which have completed waste retrieval and are transitioning to closure. Its mission includes operation, maintenance, engineering, and construction activities in the tank farms, as well as managing a multi-year construction project to build the Waste Treatment and Immobilization Plant to process and immobilize the tank waste in a solid glass form that is safe for permanent disposal. The FY 2019 Request reflects continued progress toward important cleanup required by the Consent Decree and Tri-Party Agreement with the State of Washington. It will maintain safe operations of the tank farms to protect workers, the public and environment; meet regulatory commitments; enable the development and maintenance of infrastructure necessary to enable waste treatment operations; and continue focus on construction, startup and commissioning of the facilities needed to immobilize direct fed low-activity waste by December 2023 per the consent decree. The FY 2019 Request includes funding for Waste Treatment and Immobilization Plant (\$690 million) and Low Activity Waste Pretreatment System (\$56 million). The mission of the Low Activity Waste Pretreatment System is to remove cesium in order to supply a low activity waste feed stream directly to the Low Activity Waste Facility; the decrease from FY 2017 reflects the reduction in cost of the design activities for the Low Activity Waste Pretreatment System, as the Department pursues a two-phased pretreatment strategy.

- **Richland**

The Richland Operations Office manages all cleanup activities at Hanford not managed by the Office of River Protection, while also providing site-wide services shared by the two offices. Cleanup activities include soil and groundwater remediation, facility decontamination and decommissioning, stabilization and disposition of nuclear materials and spent nuclear fuel, and disposition of waste other than the tank waste managed by the Office of River Protection. Richland's FY 2019 Request represents continued achievement of important cleanup progress required by the Tri-Party Agreement. It will maintain Richland safe operations; provide Hanford site-wide services; continue groundwater remediation; operate waste management facilities; support certification of large/small container contact-handled transuranic mixed low-level waste or remote-handled transuranic mixed low-level waste; continue preparation to move cesium-strontium capsules to dry storage; continue K-Area decontamination and decommissioning remediation; and support K- West Basin sludge removal progress. The decrease from the FY 2017 Enacted level reflects the decommissioning and demolition of the Plutonium Finishing Plant facilities to slab-on-grade, and completed scope and facility modifications to prepare for installation of sludge removal systems for the K West Basin.

- **Oak Ridge**

At Oak Ridge, the FY 2019 Request will maintain EM facilities in a safe, compliant, and secure manner; operate EM waste management facilities such as the on-site disposal facility, sanitary landfills, and liquid, gaseous and waste operations at Oak Ridge National Laboratory; continue development of Comprehensive Environmental Response, Compensation and Liability Act documentation for the new On-Site Disposal Facility; continue demolition of remaining facilities at East Tennessee Technology Park; and finalize design and initiate early site preparation activities for the Outfall 200 Mercury Treatment Facility at the Y-12 National Security Complex. The processing of legacy transuranic waste debris will continue at the Transuranic Waste Processing Center and technology maturation and design will continue for the Sludge Processing Facility Buildout project. The request also supports continued preparation of Building 2026 to support processing of the remaining U-233 materials at Oak Ridge National Laboratory. The decrease from the FY 2017 Enacted level is attributed to the completion of Building K-27 demolition and waste disposal activities and the decontamination and decommissioning of the remaining facilities in the East Tennessee Technology Park; as well as completing the Y-12 Colex West side equipment removal.

- **Idaho**

The Idaho Cleanup Project is responsible for the treatment, storage, and disposition of a variety of radioactive and hazardous waste streams, including removal and disposition of targeted buried waste sitting above the Snake River Plain Aquifer. The project is also responsible for removing or deactivating unneeded facilities, and removing DOE's inventory of spent (used) nuclear fuel from Idaho and preparing the high-level waste for shipment from Idaho. Idaho's FY 2019 Request will support key requirements to continue progress in meeting the Idaho Settlement Agreement commitments. These include supporting operations of the Advanced Mixed Waste Treatment Project to ship transuranic and mixed low level wastes and continuing progress towards closing the tank farm, including treatment of sodium bearing waste. The FY 2019 Request will also continue progress toward buried waste exhumation under the Accelerated Retrieval Project; exhumations at eight out of nine retrieval areas have been completed and will continue exhumations at the ninth retrieval area. The funding request also supports planning activities for the receipt of offsite spent (used) nuclear fuel from foreign and domestic research reactors; transferring fuel from wet storage to dry storage; and commissioning and start-up of the Integrated Waste Treatment Unit. The decrease from the FY 2017 Enacted level is attributed to progress in legacy waste treatment, completion of retrieval in the aboveground transuranic waste storage area, and efficiencies in waste exhumation.

- **Carlsbad**

The Carlsbad Field Office is responsible for managing the National Transuranic Waste Program and the Waste Isolation Pilot Plant (WIPP), the Nation's only mined geologic repository for the permanent disposal of defense-generated transuranic waste. The FY 2019 Request will continue WIPP operations including waste emplacements, shipments, maintaining enhancements/improvements established in response to various reports and required actions, and progression of the line-item capital asset projects. Line item projects are 15-D-411, Safety Significant Confinement Ventilation System (\$84.2 million) and 15-D-412, Utility Shaft Project (formerly Exhaust Shaft) (\$1 million) to increase airflow in the WIPP underground for simultaneous mining and waste emplacement operations. The FY 2019 Request also supports the Central Characterization Project and maintains shipping capability between the generator sites and WIPP and inter-site shipments using Type B transportation containers, including maintenance and support for transportation containers. Waste characterization at DOE waste generator sites will be funded by their respective site. Waste characterization certification of legacy transuranic waste at Savannah River Site, Oak Ridge National Laboratory, and Los Alamos National Laboratory will be funded by the Waste Isolation Pilot Plant, whereas the Idaho National Laboratory funds its waste characterization certification. The increase from the FY 2017 enacted levels is attributed to the resumption of waste emplacement activities and the Safety Significant Confinement Ventilation project, activities required to sustain corrective actions implemented during the recovery effort, and activities to increase operations to a rate of up to ten shipments a week. As well as, increase to address critical infrastructure repair/replacement of facility structures, systems, and components in order to return the Waste Isolation Pilot Plant to its operational capacity.

- **Paducah**

The Paducah site is responsible for a multifaceted portfolio of processing and cleanup activities. The site operates one of two depleted uranium hexafluoride (DUF6) conversion facilities in the EM portfolio, with the Paducah facility expected to continue operations for approximately thirty years. Additionally, Paducah manages high-priority groundwater remediation; deactivation and decommissioning of excess facilities; and disposition of mixed and low-level waste. In addition to ongoing environmental cleanup and DUF6 operations, Paducah's FY 2019 Budget Request supports activities to continue the environmental remediation and further stabilize the gaseous diffusion plant. The stabilization activities include non-destructive characterization, facility modifications, surveillance and maintenance, and activities to remove hazardous materials. The request also supports completion of the Northeast Plume Optimization project, and demolition of C-400 Cleaning Building completion. The decrease from the FY 2017 Enacted level is attributed to the completion of deactivation of the C-400 Cleaning Building and completion of the Northeast Plume Optimization project.

- **Portsmouth**

The FY 2019 Budget Request will support the deactivation and decommissioning project at the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio. The majority of the Request will be used for deactivation and decommissioning of gaseous diffusion plant ancillary facilities and systems, disposal of waste, small equipment removal, utility optimizations, and hazardous material abatement. The FY 2019 Request also includes funding for design and construction of an on-site landfill for the disposal of waste expected to be generated from the demolition of the Portsmouth Gaseous Diffusion Plant and associated facilities. In addition, the request will continue progress on the deactivation and decommissioning of the Portsmouth Gaseous Diffusion Plant and support safe operation of the site's Depleted Uranium Hexafluoride Conversion Facility. The increase from the FY 2017 Enacted level supports decontamination and decommissioning activities.

- **Los Alamos National Laboratory**

In FY 2019, planning for retrieval and repackaging of the below-grade transuranic waste will include the evaluation and recommendation regarding disposition of the 33 remote-handled transuranic waste shafts. Other FY 2019 activities will continue to focus on surface and groundwater management. Investigation and development of corrective measures for remediation of the hexavalent chromium plume continue in Mortandad and Sandia Canyon watersheds, and design of the selected remedies will begin in FY 2019. The FY 2019 request will also support technical discussions with the regulators, additional documentation that may be required, possible public meetings, and other support to obtain the decision of the regulator to allow going forward with remedy projects development in possibly three Material Disposal Areas (A, C, and T).

- **Separations Process Research Unit**

The FY 2019 budget request enables the Separations Process Research Unit site to provide for completion of verification sampling; contractor demobilization and closeout activities associated with returning the land and facilities to the site landlord, Naval Reactors; and initiation of procurement actions to transport and treat Separations Process Research Unit transuranic waste at a select location, return and provide interim storage.

- **Excess Facilities**

The FY 2019 request positions EM to support the targeted effort proposed in the FY 2018 Budget to fund deactivation and decommissioning activities for selected excess high-risk contaminated facilities at the Y-12 National Security Complex and the Lawrence Livermore National Laboratory that are not in the current project inventory of the Environmental Management program.

LEGACY MANAGEMENT

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Legacy Management					
Legacy Management	140,306	139,353	140,575	+269	+0.2%
Program Direction	14,014	13,919	18,302	+4,288	+30.6%
Subtotal, Legacy Management	154,320	153,272	158,877	+4,557	+3.0%
Rescission of Prior Year Balances	-1,066	0	0	+1,066	+100.0%
Total, Legacy Management	153,254	153,272	158,877	+5,623	+3.7%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

Legacy Management (LM) ensures the long-term protection of human health and the environment after site cleanup is completed. LM’s responsibilities include DOE Environmental Management closure sites, former uranium mills, sites remediated as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP), and selected sites conveyed to DOE under other authorities. LM also funds the pensions and post-retirement benefits for former contractor personnel after site closure.

LM provides funding for Long-Term Surveillance and Maintenance (LTS&M), Archives and Information Management (AIM), Pensions and Benefits Continuity, Asset Management, Environmental Justice (EJ), Public and Intergovernmental Engagement, and Program Direction.

Program Highlights

The majority of LM’s activities are long term and focus on maintaining the Department’s legal, regulatory, community, and contractual commitments. Management of closure site activities by LM enables other DOE programs to focus on risk reduction and site closure. By the end of FY 2019, LM expects to have responsibility for long-term management of 100 sites. LM’s functions span both physical and human resources. In the physical environment, LM conducts long-term surveillance and maintenance of environmental remedies (e.g., groundwater monitoring and disposal cell maintenance) to protect human health and the environment. For each site, LM maintains both the physical and electronic records and responds to over 1,600 requests for information each year. LM is responsible for the pension plan contributions and post-retirement benefits (e.g., medical and life insurance) for former contractor workers from eight sites. In addition, LM manages the sites’ natural resources, promotes reuse, including transfer of sites to external parties; is responsible for the Department’s Uranium Leasing Program.

DEPARTMENTAL ADMINISTRATION

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Departmental Administration					
Administrative Operations					
Office of the Secretary	5,089	5,054	5,395	+306	+6.0%
Chief Financial Officer Management	49,242	48,908	48,912	-330	-0.7%
Project Management Oversight and Assessment	52,924	52,565	54,872	+1,948	+3.7%
Chief Human Capital Officer	12,373	12,289	15,005	+2,632	+21.3%
Chief Information Officer	24,500	24,334	25,625	+1,125	+4.6%
Office of Indian Energy Policy and Programs	74,492	73,986	96,793	+22,301	+29.9%
Congressional and Intergovernmental Affairs	16,000	15,891	10,005	-5,995	-37.5%
Office of Small and Disadvantaged Business Utilization	6,200	6,158	6,212	+12	+0.2%
Economic Impact and Diversity	3,000	2,980	3,170	+170	+5.7%
General Counsel	10,169	10,100	10,005	-164	-1.6%
Energy Policy and Systems Analysis	33,000	32,776	33,075	+75	+0.2%
Office of Policy	31,000	30,789	0	-31,000	-100.0%
International Affairs	0	0	2,510	+2,510	N/A
Public Affairs	18,000	17,878	24,545	+6,545	+36.4%
Technology Transitions	3,431	3,408	6,594	+3,163	+92.2%
Subtotal, Administrative Operations	6,906	6,859	8,505	+1,599	+23.2%
Strategic Partnership Projects	346,326	343,975	351,223	+4,897	+1.4%
Subtotal, Departmental Administration	40,000	39,728	40,000	0	N/A
Adjustments					
Use of Prior Year Balances and Other Adjustments	-20,610	-20,470	-2,000	+18,610	+90.3%
Rescission of Prior Year Balances	-137	0	0	+137	+100.0%
Defense Related Administrative Support	-119,716	-118,903	-153,689	-33,973	-28.4%
Subtotal, Departmental Administration (Gross)	245,863	244,330	235,534	-10,329	-4.2%
Miscellaneous Revenues	-125,171	-124,321	-96,000	+29,171	+23.3%
Total, Departmental Administration (Net)	120,692	120,009	139,534	+18,842	+15.6%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **Departmental Administration (DA)** appropriation funds 15 management and mission support organizations that have enterprise-wide responsibility for administration, accounting, budgeting, contract and project management, congressional and intergovernmental liaison, energy policy, information management, life-cycle asset management, legal services, workforce diversity and equal employment opportunity, ombudsman services, small business advocacy, sustainability, Indian energy policy, technology transition activities and public affairs.

The DA appropriation also budgets for estimated Strategic Partnership Projects which includes expenses and collections resulting in a net offset, and receives Miscellaneous Revenues from other sources. Additionally, the DA offices receive funding from the Other Defense Activities (ODA) appropriation, Defense-Related Administrative Support (DRAS), which is used to offset expenses that support defense-related administrative activities at DOE.

Program Highlights

In FY 2019, the DA Budget reflects a dedication to strengthen enterprise-wide management and mission support functions. Highlights include:

- **Office of Technology Transitions (OTT):** For FY 2019, funding will fully establish the OTT as an integral function within DOE and to operate the Technology-to-Market functions transferred and centralized from other offices. The resources requested are required to maintain adequate staffing to fulfill Congressional and Administration direction to increase DOE engagement for the transition of new and evolving energy technology to the U.S. markets.
- **Chief Information Officer (CIO):** CIO will continue to work on modernization initiatives building upon prior year activities. This includes improving cybersecurity, scaling capacity commensurate with demand, and establishing a foundation for future IT enterprise capabilities. CIO will collaborate with the Department of Homeland Security to improve security protection for information and information systems/continuous diagnostic mitigation across the entire DOE enterprise. Also, CIO will identify its High Value Assets (HVA) and expand its HVA Program to include Inventory Management, Assessment Management, Remediation Oversight, and Reporting.
- **Office of Policy (OP):** OP will serve as the principal policy office advising the Secretary of Energy and will report to the Under Secretary of Energy. The office will serve as the focal point for coordination within the Department on the formulation, analysis, and implementation of energy policy and related programmatic options and initiatives. OP will carry out strategic studies, policy analyses, and coordinate analytical capabilities. OP will also conduct assessments on the strength, resiliency, and anticipated challenges of national energy systems and identify and prioritize ways in which DOE programs may be strengthened to contribute to the economic well-being and national energy security of the United States.
- **Office of Management (MA):** MA's activities include policy development and oversight, and delivery of procurement services to DOE Headquarters (HQ) organizations, and the management of HQ facilities. MA also fulfills the statutory and Executive Order responsibilities of the Chief Acquisition Officer, Senior Real Property Officer, Senior Procurement Executive, Federal Historic Preservation Officer, and the Department's Advisory Committee Management Officer.
- **Office of Project Management Oversight and Assessments (PM):** PM is accountable to and serves the Deputy Secretary as the Executive Secretariat for the Department's Energy Systems Acquisition Advisory Board, the Project Management Risk Committee, Cost Estimating and Program Evaluation and overseeing the Project Management Career Development Program.

ENTERPRISE ASSESSMENTS

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Enterprise Assessments					
Enterprise Assessments	24,580	0	24,068	-512	-2.1%
Program Direction	51,000	0	52,702	+1,702	+3.3%
Subtotal, Enterprise Assessments	75,580	75,067	76,770	+1,190	+1.6%
Rescission of Prior Year Balances	-1	0	0	+1	+100.0%
Total, Enterprise Assessments	75,579	75,067	76,770	+1,191	+1.6%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

Enterprise Assessments (EA) supports the Department’s mission priorities and strategic plan for the secure and safe operation of the nuclear weapons complex, science and energy research, and environmental cleanup activities by conducting independent assessments of security and safety performance throughout the Department, holding contractors accountable for violations of security and safety regulations, and providing training programs that institutionalize enterprise security and safety lessons learned. EA activities complement, but do not replace the responsibility of DOE line management to ensure compliance with security and safety requirements. EA is organizationally independent of the DOE entities that develop and implement security and safety policy and programs and therefore can objectively provide timely information to DOE senior leadership, contractor organizations, and other stakeholders on whether national security material and information assets are appropriately protected; and whether Departmental operations provide for the safety of its employees and the public. EA activities also evaluate whether the Department is effective in promoting protection strategies and informed risk management decisions. In addition, EA has been designated to implement congressionally authorized contractor enforcement programs pertaining to classified information security, nuclear safety, and worker safety and health. Also, EA operates the DOE National Training Center (NTC) in Albuquerque, New Mexico, and maintains collaborative relationships with security and safety related organizations within and outside the Department.

Program Highlights

EA’s key initiatives in FY 2019 are:

- Strengthening the Department’s ability to protect national security assets (special nuclear material [SNM], controlled unclassified information, and classified matter) by:
 - Conducting comprehensive independent security performance assessments and follow-up assessments at DOE National Security / Category I SNM sites (those with high value assets),
 - Utilizing “limited notice” safeguards and security performance tests to provide accurate, up-to-date assessments of DOE site security response capabilities, and
 - Focusing on insider threats from employees who may seek to compromise National security and/or the ability of the Department to meet its mission.
- Enhancing the methods and tools used to conduct comprehensive independent cybersecurity assessments, including unannounced “red team” performance testing, to identify vulnerabilities in the Department’s National Security, Intelligence, scientific, and other information systems against external and internal attacks.
- Conducting independent performance assessments on nuclear safety, worker safety and health, and emergency management of the Department’s high hazard nuclear construction projects and operations such as those at the Los Alamos National Laboratory, Y-12 National Security Complex, Savannah River Site, Hanford Site, and Idaho National Laboratory.

- Supporting and promoting secure and safe operations throughout the Department by:
 - Maintaining and operating the NTC to provide advanced security and safety training programs, implementing the training reciprocity program to enhance performance and increase operational efficiency and effectiveness across the Department, and supporting security and safety related qualification programs.
 - Administering the DOE contractor Enforcement activities for violations of the Department’s security and safety requirements.

OFFICE OF HEARINGS AND APPEALS

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Office of Hearings and Appeals					
Office of Hearings and Appeals	5,500	5,463	5,739	+239	+4.3%
Subtotal, Office of Hearings and Appeals	5,500	5,463	5,739	+239	+4.3%
Use of Prior Year Balances	-80	0	-2000	-1,920	-2,400.0%
Total, Office of Hearings and Appeals	5,420	5,463	3,739	-1,681	-31.0%

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Appropriation Overview

Office of Hearings and Appeals (OHA) is the central administrative adjudicatory body for the Department of Energy. OHA’s jurisdiction includes conducting evidentiary hearings to determine an employee’s eligibility for a security clearance, Freedom of Information Act and Privacy Act appeals, and requests for exception relief from DOE regulations and orders, such as regulatory relief from the appliance energy efficiency standards. OHA also offers alternative dispute resolution (ADR) services such as mediation for a variety of matters. OHA utilizes video conferencing to conduct hearings at DOE field sites in order to reduce travel and other costs.

Program Highlights

Over the last nine years, OHA has reduced its case-processing time in all areas of its jurisdiction without compromising the high quality of its decisions. The Request supports salaries and benefits for 22 FTEs operating in OHA’s Personnel Security and Appeals Division, Employee Protection and Exceptions Division, and the Alternative Dispute Resolution Office.

ENERGY INFORMATION ADMINISTRATION

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Energy Information Administration					
National Energy Information System	122,000	121,171	115,035	-6,965	-5.7%
Total, Energy Information Administration	122,000	121,171	115,035	-6,965	-5.7%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **U.S. Energy Information Administration (EIA)** is the statistical and analytical agency within the U.S. Department of Energy (DOE). EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. EIA is the nation’s premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. Government.

EIA conducts a wide range of data collection, analysis, forecasting, and dissemination activities to ensure that its customers, including Congress, federal and state government, the private sector, the broader public, and the media, have ready access to timely, reliable, and relevant energy information. EIA’s data and analysis help inform important energy-related decisions, including utilization strategies; availability of energy sources; business and personal investment decisions; and policy development.

Program Highlights

EIA has evolved its program in recent years to provide an expanding customer base with coverage of increasingly complex and interrelated energy markets. For example, EIA has addressed new energy developments such as the advent of shale gas, tight oil, and distributed solar, as well as the changing economics of nuclear energy, and the removal of restrictions on U.S. crude oil exports. The agency’s ability to adapt to a changing industry landscape has been essential to the nation’s ongoing dialogue on important energy issues.

The FY 2019 budget request will enable EIA to continue core statistical and analysis activities that produce reports critical to EIA’s customer base, including:

- Weekly Natural Gas Storage Report (WNGSR), which is designated as one of the nation’s Principal Federal Economic Indicators
- Weekly Petroleum Status Report (WPSR), which provides statistics on oil and petroleum product stocks, imports, and production
- Short-Term Energy Outlook (STEO), which provides monthly forecasts of U.S. and global supply, consumption, trade, stocks, and prices with a horizon of 12 to 24 months
- Annual Energy Outlook (AEO), which projects U.S. energy supply, consumption, and trade over a 25- to 30-year period

The FY 2019 budget request will also enable EIA to follow through on planned cybersecurity initiatives and maintain recent program enhancements that have improved its coverage of a dynamic U.S. energy sector.

OFFICE OF THE INSPECTOR GENERAL

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Office of the Inspector General					
Office of the Inspector General	48,692	48,361	51,330	+2,638	+5.4%
Subtotal, Office of the Inspector General	48,692	48,361	51,330	+2,638	+5.4%
Use of Prior Year Balances	-4,268	-4239	0	+4,268	+100.0%
Total, Office of the Inspector General	44,424	44,122	51,330	+6,906	+15.5%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **Office of the Inspector General (OIG)** reviews the integrity, economy and efficiency of DOE programs and operations, including the National Nuclear Security Administration and the Federal Energy Regulatory Commission. The OIG has the authority to inquire into all DOE programs and activities as well as related activities. Audits, inspections, investigations and other reviews are used to detect and prevent fraud, waste, abuse, and violations of law.

The Federal Information Security Modernization Act of 2014 directs the OIG to conduct an annual evaluation of DOE’s information security systems. The OIG is also charged with reviewing the Department’s efforts to eliminate improper payments, in conformance with the Improper Payments Elimination and Recovery Act of 2010. The OIG routinely conducts reviews of the most significant management challenges facing the Department, to include its Environmental Management programs. In addition, the OIG addresses alleged violations of law that impact Department programs, operations, facilities and personnel.

Program Highlights

The OIG focuses its efforts to enhance the efficiency and effectiveness of Department’s programs and operations in the following key areas:

- **Hotline Allegations.** The OIG uses hotline allegations to identify potential areas of fraud, waste, and abuse.
- **Contractor Whistleblower Retaliation.** OIG conducts reviews of alleged contractor whistleblower retaliation that serve to inform health and safety issues throughout the Department.
- **Contract Review.** OIG assesses the Department’s award and administration of approximately \$27 billion in contracts.
- **Cybersecurity Oversight Efforts.** The OIG frequently partners with other agencies to address attacks impacting the Department.
- **NNSA Modernization Efforts.** NNSA is undertaking a massive modernization effort that involves major projects (e.g., weapons complex transformation) that benefit from OIG reviews that proactively seek to identify opportunities to improve the efficiency and effectiveness of such operations.
- **Environmental Management.** The Department’s environmental liability of \$371.8 billion was added to the Governmental Accountability Office’s High Risk List in 2017. The OIG routinely reviews the efficacy of the Department’s environmental programs, which annually expend approximately \$6.5 billion.
- **Loan Guarantee Programs.** The potential elimination of the Title 17 Innovative Technology Loan Guarantee program will require the OIG to hire experts to assist with reviews to confirm compliance with loan terms and conditions and program termination requirements.

- **Mission Support Costs.** OIG assists in identifying potential costs savings in areas such as the estimated \$5.9 billion spent each year on National Laboratory support costs.
- **Cost Accounting Standards (CAS).** OIG provides reviews of Department contractors' incurred costs and compliance with Cost Accounting Standards.

The FY 2019 Budget Request includes an increase of \$6.9 million from FY 2017. The increase enables the OIG to maintain its current operating level and to address new emerging issues impacting security, health, and safety issues across the Department.

FEDERAL ENERGY REGULATORY COMMISSION

	(\$K)				
	FY 2017 Enacted	FY 2018 Annualized CR*	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted	
				\$	%
Federal Energy Regulatory Commission (FERC)					
Just and Reasonable Rates, Terms and Conditions	159,650	159,984	171,318	+11,668	+7.3%
Safe, Reliable, Secure, and Efficient Infrastructure	123,576	121,498	130,090	+6,514	+5.3%
Mission Support through Organizational Excellence	63,574	62,963	68,492	+4,918	+7.7%
FERC Revenues	-346,800	-344,445	-369,900	-23,100	-6.7%
Subtotal, Federal Energy Regulatory Commission	0	0	0	0	N/A
Fees and Recoveries in Excess of Annual Appropriations	-16,645	-9,000	-16,000	+645	+3.9%
Total, Federal Energy Regulatory Commission	-16,645	-9,000	-16,000	+645	+3.9%

*Note.—A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115–56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution.

Appropriation Overview

The **Federal Energy Regulatory Commission (FERC or the Commission)** is an independent agency within the Department of Energy (DOE) that regulates the transmission and wholesale sale of electricity in interstate commerce; the transmission and sale of natural gas for resale in interstate commerce; and the transportation of oil by pipeline in interstate commerce. FERC also reviews proposals to build liquefied natural gas (LNG) terminals as well as interstate natural gas pipelines, and licenses and inspects non-Federal hydropower projects. The Commission protects the reliability of the Nation’s bulk-power system and oversees environmental matters related to natural gas pipeline and non-Federal hydro projects. The Commission enforces its regulatory requirements through civil penalties and other means.

FERC’s mission is to assist consumers in obtaining reliable, efficient, and sustainable energy services at a reasonable cost through appropriate regulatory and market means. FERC seeks to ensure that rates, terms, and conditions of service are just, reasonable, and not unduly discriminatory or preferential, relying on competitive markets where appropriate. Through its oversight and enforcement authorities, FERC seeks to increase compliance with its rules and regulations and deter market manipulation. FERC’s responsibilities also include promoting the development of strong and secure energy infrastructure that operates safely, reliably, and efficiently in the public interest.

Program Highlights

- **Ensure Just and Reasonable Rates, Terms, and Conditions**

One of the Commission's fundamental statutory responsibilities is to ensure that rates, terms and conditions for wholesale sales and transmission of electric energy and for transportation of natural gas are just and reasonable and not unduly discriminatory or preferential. To fulfill this responsibility, the Commission uses a combination of market and regulatory means, complemented by oversight and enforcement measures. For example, the Commission seeks to improve the competitiveness of organized wholesale electric markets, which in turn encourages entry of new resources, spurs innovation and deployment of new technologies, improves operating performance, and exerts downward pressure on costs. Another example of the Commission's use of market and regulatory means in support of this goal is found in the Commission's requirements for public utility transmission providers to participate in an open and transparent regional transmission planning process. In addition, the Commission approves cost-based, and where appropriate, market-based rates for the interstate transportation of natural gas and oil on jurisdictional pipelines, and for the interstate transmission, and wholesale sales of electric energy. The Commission also reviews proposed mergers and other transactions in the electric industry to ensure that these proposals will not harm the public interest.

Oversight, surveillance and enforcement are essential complements to the Commission’s approach to ensure that rates, terms, and conditions of service are just and reasonable and not unduly discriminatory or preferential. The Commission conducts compliance audits, issues publicly available audit reports, and engages in formal and informal outreach efforts to promote effective compliance programs. Audits are planned and prioritized using a risk-based

approach in order to maximize the impact of the Commission's resources. The Commission also conducts public and non-public investigations of possible violations of the statutes, regulations, rules, orders, and tariffs administered by the Commission. These investigations often rely upon oversight and surveillance that employ sophisticated technology to monitor market behavior. When violations of sufficient seriousness are discovered, the Commission attempts to resolve the resulting investigation through settlement with appropriate sanctions and future compliance improvements before initiating further enforcement proceedings.

- **Promote Safe, Reliable, Secure, and Efficient Infrastructure**

The Commission plays an important role in the development of energy infrastructure that operates efficiently, safely and reliably. One aspect of the Commission's role in energy infrastructure development stems from siting authority that includes licensing non-federal hydropower projects, certificating interstate natural gas pipelines and storage projects, authorizing liquefied natural gas (LNG) facilities, and, in certain circumstances, permitting electric transmission lines. Throughout all of these processes, the Commission's goal is to expedite application processing without compromising environmental responsibilities or public participation. The Commission encourages, and sometimes requires, project proponents to engage in early involvement with state and federal agencies, Indian tribes, affected landowners and the public. Another aspect of the Commission's role in energy infrastructure development stems from the Commission's responsibility for the safety of LNG and non-federal hydropower facilities throughout the entire life cycle of a project: design review, construction and operation. To meet this mandate, the Commission primarily relies on physical inspections of the facilities. The Commission continues to incorporate risk-informed decision making into its dam safety program. By doing so, the Commission is focusing its resources on those structures that pose the greatest risk to public safety.

The Commission also has an important role in protecting the reliability of the Nation's electric transmission grid. A Commission-certified Electric Reliability Organization (ERO) develops and enforces mandatory Reliability Standards, subject to the Commission's oversight and approval. The Reliability Standards address the planning and operation, as well as the cyber security and physical protection of the Nation's electric transmission grid. The Commission may also, upon its own motion or upon complaint, order the ERO to submit a proposed reliability standard or a modification of an existing reliability standard that addresses a specific reliability matter. To that end, the Commission incorporates performance data-driven, risk-informed decision making into its reliability oversight. In addition, the Commission works collaboratively with the governmental and private sectors to utilize state-of-the-art practices as necessary to address advanced cyber and physical security threats to jurisdictional energy infrastructure. The Commission works with the owners and operators of key critical infrastructure facilities to identify and share threat information, analyze system vulnerabilities, and assist with effective mitigation.

- **Mission Support Through Organizational Excellence**

The public interest is best served when the Commission operates in an efficient, responsive and transparent manner. The Commission achieves this operational state by maintaining processes and providing services in accordance with governing statutes, authoritative guidance, and prevailing best practices. Facilitating understanding of how the Commission carries out its responsibilities and maintaining public trust in the Commission are important components of the Commission's commitment to organizational excellence. Trust and understanding increase acceptance of Commission decisions. Through the use of the Commission's eLibrary and eSubscriptions web pages, the public can obtain extensive information concerning documents both submitted to and issued by the Commission. The Commission also manages several social media sites to promote transparency and open communication. More generally, the Commission prioritizes resource allocations and makes prudent investments to meet specific program activities and challenges.

The Commission thus makes continued investments in its human capital, information technology (IT) resources, and physical infrastructure. The Commission allocates over two-thirds of its budget to directly cover the compensation costs of its employees on an annual basis. The Commission continues to focus its human capital efforts on the competencies and positions most affected by the potential loss of approximately 30 percent of its staff to retirement in the next five years. The Commission also will pursue a number of new projects that will advance priority IT initiatives. These projects will modernize core mission and support systems, expand existing data analytics and visualization capabilities, and improve the agency's cyber security posture. Through the successful execution of these projects, the Commission expects to maintain a cost-effective suite of IT products and services that will meet its near-term mission needs and provide a scalable platform to support future needs beyond 2020, while meeting applicable security mandates. The

Commission is also undergoing a multi-year renovation effort within its headquarters building which commenced in FY 2018 and will conclude in FY 2021. The renovation project will enable the agency to realize significant space savings. The FY 2019 request includes increases of approximately \$16.7 million to continue the modernization effort.