DOE/CF-0125

Department of Energy

FY 2017 Congressional Budget Request

Budget in Brief

February 2016 Office of Chief Financial Officer

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OVERVIEW

The Department of Energy (DOE) requests $32.5 billion for FY 2017, an increase of $2.9 billion from the FY 2016 Enacted level of $29.6 billion. The FY 2017 Budget Request consists of $30.2 billion in discretionary funding (appropriated spending) and $2.3 billion in new mandatory spending proposals requiring new legislation.

The DOE Budget Request supports a broad portfolio of programs, including support for the National Laboratory system of 17 laboratories to carry out critical responsibilities for America's security and economy in three areas:

- Building the Future through Science and Clean Energy
- Ensuring Nuclear Security
- Organizing, Managing and Modernizing the Department to Better Achieve Its Enduring Missions

Underpinning all of these priorities is stewardship of the DOE as a science and technology powerhouse, with an unparalleled network of national laboratories, harnessing innovation to successfully address national security, create jobs and increase economic prosperity, boost manufacturing competitiveness, mitigate and adapt to climate change, and enhance energy security.

Energy has been an important driver for recent U.S. economic growth, due to expanded domestic energy production and reduced petroleum imports; increased energy efficiency and productivity; and significant cost reduction and expanded market application of a variety of clean energy generation and energy-efficient industrial, commercial and consumer energy products. DOE has advanced this technology-based energy revolution by supporting the scientific foundations of energy sciences and technology, clean energy and manufacturing technological innovation, early commercial demonstration and deployments, and new technologies and standards to enhance end use energy efficiency. Yet work remains to enhance energy security and U.S. clean energy competitiveness while enabling global climate goals.

The DOE FY 2017 Budget Request includes $12.9 billion for energy, science, and related programs, an increase of $2.8 billion from the FY 2016 Enacted level. The FY 2017 Budget Request includes $11.3 billion in discretionary funding and $1.6 billion in mandatory spending proposals, to support increased investment in leading-edge science and technology, new research facilities to advance the frontiers of science; advanced manufacturing institutes; implementation of the Administration's strategy for nuclear waste management; and crosscutting initiatives to further technological innovation using an enterprise-wide approach to research efforts. The Budget Request takes steps to implement recommendations from the first installment of the Quadrennial Energy Review (QER), released in 2015, to strengthen U.S. energy infrastructures and enhance our collective energy security.

The Request supports ongoing implementation of the President's Climate Action Plan and builds on the systems-based analysis of the Quadrennial Technology Review (QTR) released in 2015. The FY 2017 Budget Request also takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next five years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The Request provides a total of $5,856 million in discretionary funding for clean energy activities that span the full range of research and development from use-inspired basic research to demonstration, representing an increase in discretionary funding of over 21 percent above the FY 2016 baseline of $4,822 million. DOE's funding is 76 percent of the $7.7 billion government-wide Mission Innovation investment in FY 2017.

The FY 2017 Budget Request also includes mandatory funding for clean energy R&D that complements activities supported by discretionary funding. The Request includes $150 million in mandatory funding for DOE's ARPA-E as part of the ARPA-E Trust proposal that seeks $1.85 billion in mandatory funding over five years to reliably increase the program's transformational clean energy technology R&D. In addition, as part of the $1,335 million mandatory proposal for the DOE portion of the Administration's 21st Century Clean Transportation Plan, the Request includes $500 million in FY 2017 to scale-up clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, in particular for intermodal freight and fleets; and establish a mobility systems integration facility to investigate systems level energy implications of vehicle connectivity and automation.

The FY 2017 Budget Request provides a programmatic level of $12.9 billion for the National Nuclear Security Administration (NNSA), $357 million above the FY 2016 Enacted level, to support DOE's nuclear security responsibilities. The Budget Request includes funding to maintain a safe, secure, and effective nuclear deterrent without testing, including life extension programs for major weapons systems and modernization of the Nation's research and production infrastructure. The Request also ensures that the United States is ready to respond to nuclear and radiological incidents at home and abroad and supports programs that reduce the threats of nuclear proliferation globally, including implementation and monitoring of the Joint Comprehensive Plan of Action with Iran to verifiably prevent Iran from obtaining nuclear weapons. Finally, DOE's Request for nuclear security supports activities that provide safe and effective propulsion for the U.S. nuclear Navy.

The FY 2017 Budget Request includes $6.8 billion for Departmental management and performance programs, including environmental cleanup programs to meet the nation's Manhattan Project and Cold War legacy responsibilities. The Request includes $6.1 billion, of which $674 million is mandatory spending from the United States Enrichment Corporation Fund, to uphold the U.S. Government's commitment to states and communities to remediate the environmental legacy of over six decades of nuclear weapons and nuclear research, development, and production. The Request supports major management reforms, including new project oversight, assessment, and cost estimation initiatives as part of ongoing efforts to strengthen effective project and program management across the enterprise. The Request also supports continued implementation of a new and improved Human Resource Management service delivery business model and efforts to improve information technology management and further strengthen cybersecurity.

SCIENCE AND ENERGY

The FY 2017 Budget Request provides a programmatic level of $12.9 billion for science, energy, and related programs is $2.8 billion above the FY 2016 Enacted level and includes $11.3 billion in discretionary funding and $1.6 billion in mandatory spending. The Department's science and energy programs invest in all stages of innovation across a diverse portfolio of clean energy technologies to enhance economic competitiveness in a low-carbon world and secure America's long-term energy security. The Request continues to implement the President's Climate Action Plan through the development and deployment of clean energy technologies that reduce carbon pollution, and it takes the first step in fulfilling the U.S. Government's pledge to Mission Innovation, an unprecedented global initiative across 20 nations to double public clean energy research and development (R&D), in conjunction with commitments for private investments led by a coalition of 28 private investors from ten countries. Following COP-21, this investment will be a critical next step in enabling the transition to a low carbon energy future through innovation and cost reduction.

The FY 2017 Budget Request sustains DOE's role as the largest federal sponsor of basic research in the physical sciences and constructs and operates cutting-edge scientific user facilities at the National Laboratories to maintain the nation's preeminence in science and innovation. The Request supports transformational R&D in critical technology areas, including advanced manufacturing, renewable energy, sustainable transportation, energy efficiency, electricity grid modernization, advanced nuclear reactors, and fossil energy with carbon capture and storage. The Request builds on the analytical foundation provided by the Department's 2015 Quadrennial Technology Review (QTR), as well as the recommendations of the 2015 Quadrennial Energy Review (QER), by funding measures to strengthen U.S. energy infrastructures and enhance our collective energy security posture.

The FY 2017 Budget Request provides a programmatic level of $6.6 billion for energy research, development, demonstration, and deployment activities, of which $5.2 billion is discretionary funding. Highlights include:

- $2.9 billion for Energy Efficiency and Renewable Energy, $829 million above the FY 2016 Enacted level, for a diverse suite of sustained investments in innovation in the areas of sustainable transportation technologies ($853 million), renewable energy generation technologies ($621 million), development of manufacturing technologies and enhanced energy efficiency in our homes, buildings and industries ($919 million), and supporting activities. The Request also includes $215 million for new crosscutting innovation initiatives, including $110 million for Regional Energy Innovation Partnerships, as well as an additional $1.335 billion in mandatory funding to expand investments in low-carbon transportation technologies and fueling infrastructure.

- $994 million for Nuclear Energy, $8 million above the FY 2016 Enacted level, for ongoing R&D in advanced reactor and fuel cycle technologies, as well as completing funding for the Department's commitments for a cost-shared cooperative agreement for licensing technical support of a small modular reactor design and site permits. The Request also

continues implementation of the Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High Level Radioactive Waste by providing $76.3 million for integrated waste management system activities in the areas of transportation, storage, disposal, and consent-based siting.

- $600 million for Fossil Energy Research and Development ($240 million of which is available through repurposing of prior-year balances), $32 million below the FY 2016 Enacted level, to advance research and development in carbon capture and storage, advanced energy systems, cross-cutting areas, and fuel supply impact mitigation. The Budget Request also includes $257 million for the Strategic Petroleum Reserve, $45 million above the FY 2016 Enacted level, to increase the system's durability and reliability and ensure operational readiness.

- $262 million for Electricity Delivery and Energy Reliability, $56 million above the FY 2016 Enacted level, for grid modernization research to support a smart, resilient electric grid for the 21st century and the storage technology that underpins it, as well as funding critical emergency response and grid physical security capabilities. The Request also funds programs to update energy assurance plans and support state and multi-state electricity reliability and support R&D to strengthen energy infrastructure against cyber threats.

- $23 million for the Office of Indian Energy, $7 million above the FY 2016 Enacted level, to support DOE's partnership with the Department of the Interior to address the need for clean, sustainable energy systems on Indian lands through expanded technical assistance and grant programs.

- $8.4 million for the Office of Technology Transitions to expand the commercial impact of the DOE portfolio of activities. The Budget Request will support coordination of technology-to-market activities across the Department, implementation of the statutory Technology Commercialization Fund, and operation of the Clean Energy Investment Center.

Science and Energy

***Strategic Goal**: Advance foundational science, innovate energy technologies, and inform data-driven policies that enhance U.S. economic growth and job creation, energy security, and environmental quality, with emphasis on implementation of the President's Climate Action Plan to mitigate the risks of and enhance resilience against climate change.*

	FY17 ($M)
DOE Programs	***12,852***
Total Discretionary Program	*11,267*
Total Mandatory	*1,585*
✓ Science	5,672
Discretionary	*5,572*
Mandatory	*100*
✓ Electricity Delivery and Energy Reliability	262
✓ Energy Efficiency and Renewable Energy	2,898
Sustainable Transportation	*853*
Renewable Energy	*621*
Energy Efficiency	*919*
Crosscutting Innovation Initiatives	*215*
Program Support	*291*
✓ 21st Century Clean Transportation Plan *(Mandatory)*	1,335
✓ Fossil Energy Research and Development*	600
✓ Office of Indian Energy	23
✓ Nuclear Energy	994
✓ Office of Technology Transitions	8
✓ Advanced Research Projects Agency—Energy	500
Discretionary	*350*
Mandatory	*150*
✓ Loan Programs (Administrative Operations)	15
✓ Loan Authority (non-additive)	[4,000]
Subtotal, Energy RDD&D†	*6,636*
✓ Fossil Energy Petroleum Reserves	278
✓ Energy Information Administration	131
✓ Energy Policy and Systems Analysis	31
✓ International Affairs	19
✓ Power Marketing Administrations	84
Subtotal, Energy Applications	*544*

* FY 2017 Request includes $240 million in use of prior year balances in Fossil Energy Research and Development

† Research, Development, Demonstration, and Deployment

- $500 million for the Advanced Research Projects Agency—Energy (ARPA-E), which fills a unique role in identifying scientific discoveries and cutting-edge inventions and accelerating their translation into technological innovations. Of this, $350 million is requested in discretionary funding, $59 million above the FY 2016 Enacted level, to fund additional early-stage innovative programs as well as to exploit the technological opportunities developed in previous ARPA-E programs. In addition, the Request includes a new legislative proposal for the Advanced Research Projects Agency—Energy Trust, which provides $150 million in FY 2017 and a total of $1.85 billion in mandatory funds over five years to add a new focus on innovative systems level development that will deliver larger, more rapid benefits to the economic, environmental, and energy security of the United States.

- The Request also supports the Department's continued oversight of more than $30 billion in loans, loan guarantees, and conditional commitments, as well as its administration of remaining loan and loan guarantee authority to finance projects in the areas of advanced nuclear energy, renewable energy and efficient energy, advanced fossil energy, and advanced technology vehicles manufacturing and a request for an additional $4 billion of mixed-use loan guarantee authority for innovative energy technology projects that reduce greenhouse gas emissions.

DOE's Office of Science is the largest federal sponsor of basic research in the physical sciences, supporting over 24,000 investigators at over 300 U.S. academic institutions and the DOE laboratories. The FY 2017 Budget Request provides $5.67 billion for Science, $325 million above the FY 2016 Enacted level, to lead basic research in the physical sciences and develop and operate cutting-edge scientific user facilities while strengthening the connection between advances in fundamental science and technology innovation. The FY 2017 Budget Request includes $100 million of mandatory funding for University Grants that will be made available through a competitive, merit-based review of proposals solicited from and provided by the university community in the Office of Science mission areas. The Request provides funding to operate the scientific user facilities at optimal levels in support of more than 31,000 researchers from universities, national laboratories, industry, and international partners. The Request funds activities that, in close coordination with the National Institutes of Health (NIH) and the Presidential BRAIN Initiative, will develop next-generation tools and technologies to support research into the brain. The Request also enables development of accelerator applications, including advanced proton and ion beams for the treatment of cancer, in coordination with NIH.

Highlights of the Budget Request for the Office of Science include:

- $1.94 billion for Basic Energy Sciences, $88 million above the FY 2016 Enacted level, 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 by understanding, predicting, and ultimately controlling matter and energy. The Budget Request supports five new Energy Frontier Research Centers (EFRCs), expanded efforts in materials research and subsurface science, world-class user facilities, and optimal funding at the scientific user facilities.

- $818 million for High Energy Physics, $23 million above the FY 2016 Enacted level, 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. The Request implements activities and projects based on the High Energy Physics Advisory Panel (HEPAP) May 2014 strategic plan, including design support for a reconfigured international Long Baseline Neutrino Facility hosted at Fermilab and initial construction cost for the Deep Underground Neutrino Experiment in South Dakota.

- $662 million for Biological and Environmental Research, $53 million above the FY 2016 Enacted level, to support fundamental research and scientific user facilities to achieve a predictive understanding of complex biological, climatic, and environmental systems for a secure and sustainable energy future, including an expanded focus on regional energy-water systems and continued funding for three Bioenergy Research Centers (BRCs). The Request also includes $10 million for a new initiative in microbiome research that builds on the Department's experience in fundamental genomic science of plants and microbes to understand the fundamental principles governing microbiome interactions in diverse environments.

- $636 million for Nuclear Physics research, $19 million above the FY 2016 Enacted level, to discover, explore, and understand nuclear matter in a variety of different forms, including continued construction of the Facility for Rare Isotope Beams (FRIB).

- $663 million for Advanced Scientific Computing Research, $42 million above the FY 2016 Enacted level, to support research in advanced computation, applied mathematics, computer science and networking, as well as development and operation of high-performance computing facilities. The Request includes $190 million across three Office of Science programs to accelerate development of capable exascale computing systems with a thousand-fold improvement in performance over current high-performance computers in support of the President's National Strategic Computing Initiative (NSCI), and funds research on high-performance computing applications unique to the biomedical research community, including $9 million for the President's BRAIN Initiative, in close coordination with the National Institutes of Health.

- $398 million for Fusion Energy Sciences, $40 million below the FY 2016 Enacted level, to understand the behavior of matter at high temperatures and densities and to develop fusion as a future energy source, including funding for the U.S. contribution to the International Thermonuclear Experimental Reactor (ITER) project.

Mission Innovation

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next five years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The Request provides a total of $5,856 million in discretionary funding for clean energy activities that span the full range of research and development from use-inspired basic research to demonstration, representing an increase in discretionary funding of over 21 percent above the FY 2016 baseline of $4,822 million.

Mission Innovation

	FY17 ($M)
✓ Energy Efficiency and Renewable Energy	2,108
Sustainable Transportation	*881*
Renewable Energy	*501*
Energy Efficiency	*487*
Crosscutting Innovation Initiatives	*239*
✓ Electricity Delivery and Energy Reliability	177
✓ Fossil Energy	564
✓ Nuclear Energy	808
✓ Science	1,853
✓ ARPA-E, Discretionary	350
Total, Mission Innovation	*5,856*

The DOE program components supporting Mission Innovation include elements of use-inspired basic research sponsored by the Office of Science, ARPA-E and portions of the applied energy programs that support clean energy research and development activities. Mission Innovation investments will be leveraged by private capital that drives innovation and clean energy deployment. The Initiative is complemented by a separate private sector-led effort, the Breakthrough Energy Coalition, that includes over 28 investors from 10 countries targeting new investments at an earlier stage of the innovation cycle in Mission Innovation participating countries. Together, these initiatives will drive innovation essential for economic growth enabled by affordable and reliable energy, for energy security, for U.S. competitiveness, and for a transition to a low carbon energy future.

NUCLEAR SECURITY

The President's 2010 National Security Strategy, the Nuclear Posture Review (NPR), and the ratification of the New Strategic Arms Reduction Treaty underscored the importance of the DOE's nuclear mission and the lasting mandate for DOE to maintain a safe, secure, and effective stockpile for as long as nuclear weapons exist. DOE advances the President's vision to eliminate and secure nuclear material, reduce nuclear stockpiles, and increase global cooperation.

The FY 2017 Budget Request proposes $12.9 billion for the National Nuclear Security Administration, $357 million above the FY 2016 Enacted level, to invest in our nuclear security by modernizing and maintaining our nuclear security enterprise, refurbishing and extending the life of our nuclear deterrent, reducing the threats of nuclear proliferation, and supporting the safe and reliable operation of our nuclear Navy.

Nuclear Security

Strategic Goal: *Strengthen national security by maintaining and modernizing the nuclear stockpile and nuclear security infrastructure, reducing global nuclear threats, providing for nuclear propulsion, improving physical and cybersecurity, and strengthening key science, technology, and engineering capabilities.*

Supporting DOE Programs	**FY17 ($M)**
✓ Weapons Activities	9,200
✓ Defense Nuclear Nonproliferation	1,800
✓ Naval Reactors	1,400
✓ Federal Salaries and Expenses	413
Total, NNSA	*12,900*

The Budget Request includes $9.2 billion for Weapons Activities, $396 million above the FY 2016 Enacted level, to sustain a credible and effective nuclear deterrent while continuing to reduce the size of the active stockpile. The Budget Request supports the work, as laid out in the Stockpile Stewardship and Management Plan, of the science-based Stockpile Stewardship Program to ensure a safe, secure and effective nuclear stockpile in the absence of underground nuclear testing through a sustained, long-term research program. Highlights include:

- $1.34 billion for Life Extension Programs (LEPs) and Major Alterations, $38M above FY 2016, to support execution of the Nuclear Weapons Council-approved "3+2" strategy to consolidate the stockpile to three ballistic missile warheads and two air delivered systems, reducing the number of weapons in the deployed stockpile and simplifying maintenance requirements. As part of that strategy, the Request continues timely execution of approved LEPs, including the W76 LEP, the B61 LEP, the W88 Alt 370, and the W80-4 LEP.

- $69 million, $17 million above FY 2016, to make progress towards meeting the commitment to accelerate dismantlement of retired U. S. nuclear warheads by 20%.

- $2.72 billion for Infrastructure and Operations, $443 million above FY 2016, to halt the growth in deferred maintenance; dispose of the Kansas City Bannister Federal Complex; upgrade aging infrastructure to address safety and programmatic risks, improve productivity, and lower operating costs; and complete the design, and support continued construction on approved subprojects of the Uranium Processing Facility (UPF).

- $95 million for exascale computing, $31 million above FY 2016 Enacted, to improve the performance of the nuclear weapons computer codes needed to ensure the safety, security, and reliability of the nuclear stockpile without conducting nuclear tests, as well as increased funds for enhanced subcritical experiment capabilities.

- $283 million for Secure Transportation Asset, $46 million above FY 2016, for conceptual design and systems prototyping of the new Mobile Guardian Transporter (MGT).

The FY 2017 Budget Request includes $1.8 billion for Defense Nuclear Nonproliferation, $132 million below the FY 2016 Enacted level, to continue the critical missions of securing or eliminating nuclear and radiological materials worldwide, countering illicit trafficking of these materials, preventing the proliferation of nuclear weapon technologies and expertise, and ensuring that the United States remains ready to respond to high consequence nuclear and radiological incidents at home or abroad, and applying technical and policy solutions to solve nonproliferation and arms control challenges around the world. The program requires less budget authority in FY 2017 compared to FY 2016 due to the availability of prior-year carryover balances. Highlights include:

- $270 million, $70 million below FY 2016, to terminate the Mixed Oxide (MOX) Fuel Fabrication Facility. In addition, $15 million is requested to pursue a dilute and dispose option that will disposition surplus U.S. weapon-grade plutonium by diluting it and disposing of it at a geologic repository at significantly lower cost and less time than the MOX option. The Department will complete pre-conceptual design for the dilute and dispose (D&D) option and begin conceptual design in late FY 2017.

- $272 million, $37 million above FY 2016, to sustain emergency response and nuclear counterterrorism capabilities that are applied against a wide range of high-consequence nuclear or radiological incidents and threats.

The Request includes $1.4 billion for Naval Reactors, an increase of $45 million from the FY 2016 level, to support the fleet and maintain progress refueling the land-based research and training reactor. The request fully supports current costs for the Ohio-Class Replacement schedule and the Spent Fuel Handling Recapitalization Project.

The Request also includes $413 million for NNSA Federal Salaries and Expenses for the salary, benefits, and support expenses of 1,715 federal full-time equivalents (FTEs) to provide appropriate federal oversight of the nuclear security enterprise responsible for managing and executing NNSA's weapons activities and nonproliferation missions.

MANAGEMENT AND PERFORMANCE

The FY 2017 Budget Request provides $6.8 billion for Departmental management, performance, and related corporate support activities to position the Department to meet the nation's Manhattan Project and Cold War legacy responsibilities and to continue institutionalizing an enterprise-wide focus on improving the efficiency and effectiveness of DOE programs.

The Budget Request includes $6.1 billion for Environmental Management, $99 million below the FY 2016 Enacted level, to address its responsibilities for the cleanup of large quantities of liquid radioactive waste, spent nuclear fuel, contaminated

soil and groundwater, and deactivating and decommissioning excess facilities used by the nation's nuclear weapons program. The Budget Request total includes a proposal for $674 million in mandatory funding made available from the United States Enrichment Corporation Fund for deactivating, decommissioning, and demolition of the excess gaseous diffusion plants at Oak Ridge, Tennessee, Paducah, Kentucky, and Portsmouth, Ohio, and for the Title X Uranium/Thorium Reimbursement Program. Currently, the U.S. Government holds $5.4 billion in funds from uranium enrichment activities; the FY 2017 Budget Request proposes to make available a portion of these funds for these activities.

Highlights of the FY 2017 Budget Request for Environmental Management include:

- $1.5 billion, $85 million above the FY 2016 Enacted level, to support the Department's proposal to amend the Consent Decree between DOE and the State of Washington for completion of the Waste Treatment and Immobilization Plant and retrieval of waste from 19 Single Shell Tanks. The Budget Request would enable construction of a new facility to allow DOE to begin treating low level waste by the end of 2022, avoiding the need to wait for completion of facilities affected by the technical issues. The Request continues construction of the low activity waste (LAW) facility, the analytical laboratory, and balance of facilities while addressing technical issues with the pretreatment facility and the high-level waste facility as well as support for the planning and design of the LAW pretreatment system at the tank farms;
- $271 million to maintain critical progress toward returning to normal operations at the Waste Isolation Pilot Plant, with a goal of the safe resumption of waste emplacement underground by the end of 2016.

Management and Performance

Strategic Goal*: Position the Department of Energy to meet the challenges of the 21st century and the nation's Manhattan Project and Cold War legacy responsibilities by employing effective management and refining operational and support capabilities to pursue departmental missions.*

Supporting DOE Programs	**FY17 ($M)**
✓ Environmental Management	6,119
Discretionary	*5,445*
Mandatory	*674*
✓ Legacy Management	154
✓ Environment, Health, Safety and Security	197
✓ Chief Information Officer	93
✓ Management	59
✓ Project Management Oversight and Assessments	18
✓ Cost Estimating and Program Evaluation	5
✓ Chief Human Capital Officer	25
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Building on the Department's continued emphasis on management and performance, the FY 2017 Budget Request funds a number of initiatives that identify and institutionalize improvements and efficiencies in Departmental operations, to include evidence-based reviews on project management; human resource delivery and talent management; information technology infrastructure; and investments to improve Departmental infrastructure.

The Department is also aggressively pursuing implementation of a Secretarial initiative to improve project management, for which the Request includes $18 million for an independent office on project management oversight and assessments. With senior management focus on DOE's total project portfolio, DOE will be able to hold contractors and programs accountable for large and at-risk projects, receiving early warning notifications and quarterly updates. The Budget Request also includes $5 million to establish an independent, statutory office, similar to that at the Department of Defense, to set cost estimating policy and provide timely unbiased program evaluation analysis and cost estimation.

The Request supports the Human Resources (HR) Shared Services Centers, which allows for a more efficient and effective HR model across DOE. It also invests in implementing recommendations resulting from a talent management study conducted in FY 2016, which will help to develop a corporate approach to talent acquisition in order to consistently and effectively attract, develop, and retain the best workforce to meet mission needs.

The Request supports several critical information technology improvements, including implementation of Federal Information Technology Acquisition Reform Act (FITARA) requirements to provide a common baseline for roles, responsibilities, requirements, and authorities for the management of information technology (IT) in federal civilian

agencies. The Request also includes efforts to modernize and further secure the Department's legacy IT infrastructure, including core networking layers, data centers, and access technologies.

The Request also supports safe and reliable world class facilities by investing in new infrastructure in all mission areas and establishing a sustainable trajectory for the Department's existing infrastructure by ensuring no increase in the backlog of deferred maintenance across the complex.

The FY 2017 Budget Request reflects the establishment of the Office of Energy Jobs Development in 2016, consolidating ongoing activities across the Department (formerly coordinated via the Jobs Strategy Council), to compile survey data and deliver an annual energy jobs and workforce report that details growth/shifts in the energy and advanced manufacturing industries, fills the data gaps that currently exist in Bureau of Labor Statistics data gathering on renewable energy, energy efficiency, and advanced manufacturing jobs, and identifies jobs skills needed in the energy sector.

CROSSCUTTING ACTIVITIES TO ADVANCE NATIONAL ENERGY GOALS

DOE's crosscutting initiatives were first proposed in FY 2015 to enhance enterprise-wide planning and improve collaboration across organization boundaries for key science and technology areas with impact across DOE's missions. Each crosscutting initiative reflects a comprehensive and integrated work plan to optimize programmatic objectives and efficiently allocate resources. The crosscutting initiatives help bolster DOE's efforts to institutionalize enhanced program management and coordination across program offices, while accelerating progress on key national priorities.

Collaborative Efforts to Advance National Energy Goals

Management collaboration and funding coherence on high-priority efforts

		FY17 ($M)
✓	Grid Modernization	379
✓	Supercritical Carbon Dioxide Technology	36
✓	Subsurface Technology and Engineering	258
✓	Energy-Water Nexus	96
✓	Exascale Computing	285
✓	Cybersecurity	333
✓	Advanced Materials for Energy Innovation	113

The FY 2017 Budget Request continues six existing crosscutting initiatives started in FY 2015 and FY 2016, and proposes a new initiative, Advanced Materials for Energy Innovation. Together, the seven initiatives closely coordinate $1.5 billion in crosscutting R&D across the enterprise focusing on:

- Electricity grid technology modernization to accelerate the development of the technologies and tools to enable modernization of the grid to support U.S. economic growth, environmental quality and security objectives;
- Subsurface science, technology, and engineering to coordinate efforts to develop next-generation technologies for energy generation, storage, and disposal applications through mastery of the subsurface, with a science-based focus on advanced imaging of geophysical and geochemical signals;
- Supercritical carbon dioxide technology to enable large-scale commercialization of the supercritical carbon dioxide (sCO2) power cycle, which has the potential for higher thermal efficiencies with lower capital cost compared to steam-based power systems and can provide significant benefits for electric power generation, including reducing the costs of carbon capture and storage;
- The energy-water nexus and the Nation's transition to more resilient and sustainable coupled energy-water systems, including a new focus on desalination technology and regional data, modeling and analysis test beds;
- Exascale computing, a joint Science-NNSA collaboration, to significantly accelerate the development and deployment of capable exascale computing systems, applications and software infrastructure to meet national security needs and to provide next-generation tools for scientific discovery;
- Cybersecurity to protect the Department of Energy enterprise from a range of cyber threats and improve cybersecurity in the electric power and oil and natural gas subsectors;
- Advanced materials for energy innovations that have the potential to revolutionize entire industries by employing advanced synthesis, modeling, and characterization to accelerate and reduce the cost of materials qualification in a wide variety of clean energy applications.

FUNDING BY APPROPRIATION

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request[1]	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Department of Energy Budget by Appropriation						
Energy and Water Development, and Related Agencies						
Energy Programs						
Energy Efficiency and Renewable Energy	1,914,195	1,840,847	2,069,194	2,898,400	+829,206	+40.1%
Electricity Delivery and Energy Reliability	146,975	143,901	206,000	262,300	+56,300	+27.3%
Nuclear Energy	833,379	821,883	986,161	993,896	+7,735	+0.8%
Office of Technology Transitions	0	0	0	8,400	+8,400	N/A
21st Century Clean Transportation Plan Investments	0	0	0	1,335,000	+1,335,000	N/A
Fossil Energy Programs						
Clean Coal Technology	-6,600	-2,876	0	0	0	N/A
Fossil Energy Research and Development	560,587	548,885	632,000	600,000	-32,000	-5.1%
Use of Prior Year Balances	0	0	0	-240,000	0	N/A
Naval Petroleum and Oil Shale Reserves	19,950	20,640	17,500	14,950	-2,550	-14.6%
Elk Hills School Lands Fund	15,580	15,580	0	0	0	N/A
Strategic Petroleum Reserve	200,000	200,000	212,000	257,000	+45,000	+21.2%
Northeast Home Heating Oil Reserve	1,600	1,600	7,600	6,500	-1,100	-14.5%
Total, Fossil Energy Programs	**791,117**	**783,829**	**869,100**	**638,450**	**-230,650**	**-26.5%**
Uranium Enrichment Decontamination and Decommissioning (UED&D) Fund	625,000	625,000	673,749	673,749	0	N/A
Energy Information Administration	117,000	117,000	122,000	131,125	+9,125	+7.5%
Non-Defense Environmental Cleanup	246,000	246,030	255,000	218,400	-36,600	-14.4%
Science	5,067,738	5,132,813	5,347,000	5,672,069	+325,069	+6.1%
Advanced Research Projects Agency - Energy (ARPA-E)	279,982	279,982	291,000	500,000	+209,000	+71.8%
Departmental Administration	125,043	135,686	130,971	144,866	+13,895	+10.6%
Office of Indian Energy	0	0	0	22,930	+22,930	N/A
Office of the Inspector General	40,500	40,500	46,424	44,424	-2,000	-4.3%
Title 17 - Innovative Technology						
Loan Guarantee Program	17,000	17,000	17,000	10,000	-7,000	-41.2%
Advanced Technology Vehicles Manufacturing Loan Program	4,000	4,000	6,000	5,000	-1,000	-16.7%
Total, Energy Programs	**10,207,929**	**10,188,471**	**11,019,599**	**13,559,009**	**+2,539,410**	**+23.0%**
Atomic Energy Defense Activities						
National Nuclear Security Administration						
Weapons Activities	8,180,359	8,180,609	8,846,948	9,243,147	+396,199	+4.5%
Defense Nuclear Nonproliferation	1,615,248	1,612,651	1,940,302	1,807,916	-132,386	-6.8%
Naval Reactors	1,233,840	1,233,840	1,375,496	1,420,120	+44,624	+3.2%
Office of the Administrator	-413	-413	0	0	0	N/A
Federal Salaries and Expenses	370,000	370,000	363,766	412,817	+49,051	+13.5%
Total, National Nuclear Security Administration	**11,399,034**	**11,396,687**	**12,526,512**	**12,884,000**	**+357,488**	**+2.9%**
Environmental and Other Defense Activities						
Defense Environmental Cleanup	4,990,017	4,989,555	5,289,742	5,226,950	-62,792	-1.2%
Other Defense Activities	753,449	753,449	776,425	791,552	+15,127	+1.9%
Total, Environmental and Other Defense Activities	**5,743,466**	**5,743,004**	**6,066,167**	**6,018,502**	**-47,665**	**-0.8%**
Total, Atomic Energy Defense Activities	**17,142,500**	**17,139,691**	**18,592,679**	**18,902,502**	**+309,823**	**+1.7%**
Power Marketing Administrations						
Southeastern Power Administration	0	0	0	0	0	N/A
Southwestern Power Administration	11,400	11,400	11,400	11,057	-343	-3.0%
Western Area Power Administration	91,740	91,740	93,372	95,581	+2,209	+2.4%
Falcon and Amistad Operating and Maintenance Fund	228	228	228	232	+4	+1.8%
Colorado River Basins Power Marketing Fund	-23,000	-23,000	-23,000	-23,000	0	N/A
Total, Power Marketing Administrations	**80,368**	**80,368**	**82,000**	**83,870**	**+1,870**	**+2.3%**
Federal Energy Regulatory Commission (FERC)	0	0	0	0	0	N/A
Subtotal, Energy and Water Development and Related Agencies	**27,430,797**	**27,408,530**	**29,694,278**	**32,545,381**	**+2,851,103**	**+9.6%**
Uranium Enrichment Decontamination and Decommissioning Fund Discretionary Payments	-463,000	-463,000	0	-155,100	-155,100	N/A
Uranium Enrichment Decontamination and Decommissioning Fund Contribution	463,000	463,000	0	155,100	+155,100	N/A
Excess Fees and Recoveries, FERC	-28,485	-17,325	-23,587	-9,426	+14,161	+60.0%
Title XVII Loan Guarantee Program Section 1703 Negative Credit Subsidy Receipt	0	0	-68,000	-37,000	+31,000	+45.6%
Total, Funding by Appropriation	**27,402,312**	**27,391,205**	**29,602,691**	**32,498,955**	**+2,896,264**	**+9.8%**

[1] FY 2017 Request includes mandatory spending: $1.335B for Clean Transportation Plan, $674M for UED&D Fund, $150M for ARPA-E, and $100M for Science.

FUNDING BY ORGANIZATION

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request[1]	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Department of Energy Budget by Organization						
National Nuclear Security Administration						
Weapons Activities	8,180,359	8,180,609	8,846,948	9,243,147	+396,199	+4.5%
Defense Nuclear Nonproliferation	1,615,248	1,612,651	1,940,302	1,807,916	-132,386	-6.8%
Naval Reactors	1,233,840	1,233,840	1,375,496	1,420,120	+44,624	+3.2%
Federal Salaries and Expenses	369,587	369,587	363,766	412,817	+49,051	+13.5%
Total, National Nuclear Security Administration	**11,399,034**	**11,396,687**	**12,526,512**	**12,884,000**	**+357,488**	**+2.9%**
Science and Energy						
Science	**5,067,738**	**5,132,813**	**5,347,000**	**5,672,069**	**+325,069**	**+6.1%**
Energy						
Energy Efficiency and Renewable Energy	1,914,195	1,840,847	2,069,194	2,898,400	+829,206	+40.1%
Electricity Delivery and Energy Reliability	146,975	143,901	206,000	262,300	+56,300	+27.3%
Fossil Energy	791,117	783,829	869,100	878,450	+9,350	+1.1%
Use of Prior Year Balances	0	0	0	-240,000	-240,000	N/A
Nuclear Energy	833,379	821,883	986,161	993,896	+7,735	+0.8%
Office of Indian Energy Policy and Programs	16,000	16,000	16,000	22,930	+6,930	+43.3%
Office of Technology Transitions	0	0	0	8,400	+8,400	N/A
21st Century Clean Transportation Plan Investments	0	0	0	1,335,000	+1,335,000	N/A
Total, Energy	**3,701,666**	**3,606,460**	**4,146,455**	**6,159,376**	**+2,012,921**	**+48.5%**
Total, Science and Energy	**8,769,404**	**8,739,273**	**9,493,455**	**11,831,445**	**+2,337,990**	**+24.6%**
Advanced Research Projects Agency - Energy (ARPA-E)	**279,982**	**279,982**	**291,000**	**500,000**	**+209,000**	**+71.8%**
Energy Information Administration	**117,000**	**117,000**	**122,000**	**131,125**	**+9,125**	**+7.5%**
Credit Programs						
Title 17 - Innovative Technology						
Loan Guarantee Program	17,000	17,000	17,000	10,000	-7,000	-41.2%
Advanced Technology Vehicles Manufacturing Loan	4,000	4,000	6,000	5,000	-1,000	-16.7%
Total, Credit Programs	**21,000**	**21,000**	**23,000**	**15,000**	**-8,000**	**-34.8%**
Management and Performance						
Environmental Management	5,861,017	5,860,585	6,218,491	6,119,099	-99,392	-1.6%
Office of Legacy Management	171,811	171,811	167,180	154,320	-12,860	-7.7%
Environment, Health, Safety and Security Mission Support	180,911	182,911	180,998	197,212	+16,214	+9.0%
Chief Information Officer	71,959	71,959	73,218	93,074	+19,856	+27.1%
Management	62,946	62,946	65,000	59,114	-5,886	-9.1%
Project Management Oversight and Assessments	0	0	0	18,000	+18,000	N/A
Chief Human Capital Officer	24,500	24,500	24,500	25,424	+924	+3.8%
Hearings and Appeals	5,242	5,242	5,500	5,919	+419	+7.6%
Office of the Energy Jobs Development	0	0	0	3,700	+3,700	N/A
Economic Impact and Diversity	9,000	8,800	10,000	11,319	+1,319	+13.2%
Total, Management and Performance	**6,387,386**	**6,388,754**	**6,744,887**	**6,687,181**	**-57,706**	**-0.9%**
Corporate Management						
Office of the Secretary	5,008	5,008	5,008	5,300	+292	+5.8%
Cost Estimating and Program Evaluation	0	0	0	5,000	+5,000	N/A
Strategic Partnership Projects and Revenues	-928	-928	-6,800	-20,300	-13,500	-198.5%
Other Revenues	-77,171	-77,171	-77,171	-85,171	-8,000	-10.4%
Chief Financial Officer	47,000	47,000	47,024	53,084	+6,060	+12.9%
Congressional and Intergovernmental Affairs	4,700	4,246	6,300	6,200	-100	-1.6%
Public Affairs	3,431	3,231	3,431	3,431	0	N/A
General Counsel	31,000	30,554	31,000	33,000	+2,000	+6.5%
International Affairs	13,000	24,943	18,000	19,107	+1,107	+6.2%
Energy Policy and Systems Analysis	31,181	31,181	31,297	31,000	-297	-0.9%
Office of Small and Disadvantaged Business Utilization	2,253	2,253	3,000	3,300	+300	+10.0%
Total, Corporate Management	**59,474**	**70,317**	**61,089**	**53,951**	**-7,138**	**-11.7%**
Specialized Security Activities	**203,115**	**203,115**	**230,377**	**237,912**	**+7,535**	**+3.3%**
Office of Enterprise Assessments	**73,534**	**71,534**	**73,534**	**76,473**	**+2,939**	**+4.0%**
Office of the Inspector General	**40,500**	**40,500**	**46,424**	**44,424**	**-2,000**	**-4.3%**
Power Marketing Administrations	**80,368**	**80,368**	**82,000**	**83,870**	**+1,870**	**+2.3%**
Federal Energy Regulatory Commission	**-28,485**	**-17,325**	**-23,587**	**-9,426**	**+14,161**	**+60.0%**
Title XVII Loan Guarantee Program Section 1703						
Negative Credit Subsidy Receipt	**0**	**0**	**-68,000**	**-37,000**	**+31,000**	**+45.6%**
Total, Funding by Organization	**27,402,312**	**27,391,205**	**29,602,691**	**32,498,955**	**+2,896,264**	**+9.8%**

[1] FY 2017 Request includes mandatory spending: $1.335B for Clean Transportation Plan, $674M for UED&D Fund, $150M for ARPA-E, and $100M for Science.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
National Nuclear Security Administration						
Weapons Activities	8,180,359	8,180,609	8,846,948	9,243,147	+396,199	4.5%
Defense Nuclear Nonproliferation	1,615,248	1,612,651	1,940,302	1,807,916	-132,386	-6.8%
Naval Reactors	1,233,840	1,233,840	1,375,496	1,420,120	+44,624	3.2%
Federal Salaries and Expenses	369,587	369,587	363,766	412,817	+49,051	13.5%
Total, National Nuclear Security Administration	**11,399,034**	**11,396,687**	**12,526,512**	**12,884,000**	**+357,488**	**+2.9%**

Appropriation Overview

National Nuclear Security Administration (NNSA) directly contributes to meeting the DOE Strategic Plan Goal for "Nuclear Security" and plays a critical role in meeting strategic objectives in the "Management and Performance" goal. The primary mission of NNSA is to support the security and safety of our nation. NNSA pursues four major national security endeavors consistent with DOE's Strategic Plan: (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 2017 Budget Request supports national security priorities articulated in the 2010 Nuclear Posture Review, the Stockpile Stewardship and Management Plan, and the 2015 National Security Strategy of the United States. These priorities are reflected in the DOE Strategic Plan and guide decisions on allocation of resources in the President's Budget Requests.

The FY 2017 budget for NNSA is a fiscally-responsible budget that supports the President's agenda to maintain a safe, secure, and effective nuclear weapons stockpile; modernize our nuclear security enterprise; reduce the threat of nuclear proliferation; and support the U.S. Navy's nuclear propulsion program. NNSA has pursued a disciplined process in defining the requirements to meet nuclear security and non-proliferation policy goals and to support the Navy. NNSA will continue to refine the necessary amounts of funding to address validated requirements based on detailed Analysis of Alternatives and Independent Cost Estimates. NNSA also needs to significantly modernize its infrastructure in the coming

Key FY 2015 Accomplishments

- ✓ Maintained a safe, secure, and effective nuclear weapons stockpile without testing (for over 20 years)
- ✓ Completed all scheduled deliveries of the W76-1 Life Extension Program (LEP) to the Navy
- ✓ Conducted three development drop tests of the B61-12 LEP from an F-15E for the Air Force
- ✓ Completed Phase 6.1 concept studies for W80-4 for Air Force's Long Range Standoff system (LRSO) and obtained Nuclear Weapon Council approval to begin Phase 6.2, Feasibility Study and Design Options
- ✓ Increased shot rate at the National Ignition Facility (NIF), with 356 shots in FY 2015 compared to 191 in FY 2014; Omega conducted its 25,000th target shot, achieving a significant milestone in its 45th year of operation
- ✓ Completed on time and $20 million under budget, the Uranium Processing Facility (UPF) Site Readiness subproject at the Y-12 National Security Complex
- ✓ Provided technical support to the successful negotiation of the Joint Comprehensive Plan of Action (JCPOA) to address Iran's nuclear program.
- ✓ Completed removal or disposal of a total of 169 kilograms of vulnerable nuclear material.
- ✓ Helped prevent the illicit trafficking of nuclear and radiological materials, technology and expertise by installing 25 fixed and 20 mobile radiation detection systems worldwide.
- ✓ Secured 142 domestic and international civilian buildings containing high-priority nuclear and radiological material.
- ✓ Maintained organizational readiness to respond to and mitigate radiological or nuclear incidents worldwide.
- ✓ Increased funding for the *Ohio*-Class Replacement reactor and continued the S8G Prototype Refueling projects supporting the Navy's *Ohio*-Class Replacement ship construction schedule and the Navy's nuclear operator training mission.
- ✓ Readied the first Ford Class aircraft carrier reactor plant for initial testing.
- ✓ Maintained NNSA Federal Salaries and Expenses Federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at 3.9%, less than the FY 2015 target of less than 6%.

years and will work to address this challenge In future budgets.

Program Highlights

The **Weapons Activities** FY 2017 Budget Request reflects an increase from FY 2016 Enacted levels to meet the Administration's commitments to the programs and capabilities required to sustain a safe, secure, and effective nuclear stockpile. Increases are requested for Directed Stockpile Work, including continued increase funding for the W80-4 life extension program in support of the Air Force Long-Range Standoff program, the W88 Alt 370, and for Weapons Dismantlement and Disposal to make progress towards meeting the commitment to accelerate dismantlement of retired U. S. nuclear warheads by 20%. The Weapons Request also includes increases for Infrastructure and Operations which includes funding to halt the growth in deferred maintenance; dispose of the Kansas City Bannister Federal Complex; and increase investment to upgrade aging infrastructure to address safety and programmatic risks, improve productivity, and lower operating costs. This Request also increases funding for the Uranium Processing Facility (UPF) to complete the design, and support continued construction on approved subprojects. Research, Development, Test, and Evaluation (RDT&E) reflects an increase in support of exascale computing and enhanced subcritical experiment capabilities. The Request includes increased funding for the Secure Transportation Asset for conceptual design and systems prototyping of the Mobile Guardian Transporter (MGT).

The **Defense Nuclear Nonproliferation (DNN)** FY 2017 Budget Request is a decrease below the FY 2016 Enacted levels. The DNN appropriation includes all NNSA funding to prevent, counter and respond to global nuclear dangers in one appropriation, and strengthens existing collaborations and shared missions between the Defense Nuclear Nonproliferation Program and the Nuclear Counterterrorism and Incident Response (NCTIR) Program. Nuclear threat reduction is one of the three pillars of the NNSA mission, as identified in the 2015 DOE/NNSA Enterprise Strategic Vision. The NNSA strategy addresses 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.

DNN requires less budget authority in FY 2017 compared to FY 2016 Enacted levels primarily because DNN has prior year carryover balances available to execute programs and the termination of the Mixed Oxide Fuel Fabrication Facility (MFFF) as NNSA pursues a dilute and dispose option. There are also reductions in DNN's Research and Development (R&D) and Nonproliferation and Arms Control (NPAC) programs as a return to baseline funding, completion of prior work, costs savings initiatives, and postponement or reduction of select activities. The Request reflects increases in NCTIR for NNSA's contribution for a highly secure mobile communications capability, replacement of and improvements to deployable technical equipment for emergency response based on recapitalization needs, execution of a joint DOE-FBI Stabilization Program, development of more comprehensive emergency management policies and practices, and to continue supporting standoff disablement activities.

The **Naval Reactors** FY 2017 Budget Request reflects an increase for the Navy's fleet of nuclear-powered aircraft carriers and submarines and supports three major projects. The three consist of the *Ohio*-Class Replacement Reactor Systems Development, the Land-based S8G Prototype Refueling Overhaul, and the Spent Fuel Handling Recapitalization Project, which are needed to deliver mission requirements for the Navy. In addition, the Request funds Naval Reactors' Operations and Infrastructure, Development, Construction and Program Direction activities.

The **NNSA Federal Salaries and Expenses** The FY 2017 Budget Request provides funding for the salary, benefits, and support expenses of 1,715 federal full-time equivalents (FTEs) to provide appropriate federal oversight of the nuclear security enterprise responsible for managing and executing NNSA's mission. The FY 2017 Request reflects an increase above the FY 2016 Enacted level, which includes a rescission of prior year balances for the Albuquerque Facility. This level of funding provides for 60 FTEs (25 above the authorized 1,690) from anticipated FY 2016 levels to support increases for appropriate oversight principally in LEPs and major project management, provides a cost of living increase, provides benefit escalation consistent with government-wide projections, funds additional Field Site background investigations, and transfers funding to the Department's Working Capital Fund, primarily for Office Personnel Management (OPM) credit monitoring and the Department's accounting systems.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
National Nuclear Security Administration						
Weapons Activities						
Directed Stockpile Work	2,692,588	2,709,731	3,387,792	3,330,527	-57,265	-1.7%
Science	412,091	412,091	423,059	441,984	+18,925	4.5%
Engineering	136,005	136,005	131,377	139,487	+8,110	6.2%
Inertial Confinement Fusion Ignition and High Yield	512,895	512,895	511,050	522,959	+11,909	2.3%
Advanced Simulation and Computing	598,000	598,000	623,006	663,184	+40,178	6.4%
Advanced Manufacturing Development	107,200	107,200	130,056	87,105	-42,951	-33.0%
Readiness in Technical Base and Facilities (RTBF)	2,033,400	2,033,562	0	0	0	N/A
Secure Transportation Asset	219,000	219,924	237,118	282,732	+45,614	19.2%
Nuclear Counterterrorism Incident Response	177,940	178,190	0	0	0	N/A
Counterterrorism and Counterproliferation Programs	46,093	46,093	0	0	0	N/A
Infrastructure and Operations	0	0	2,279,124	2,721,952	+442,828	19.4%
Site Stewardship	76,531	76,531	0	0	+0	N/A
Defense Nuclear Security	636,123	636,123	682,891	670,133	-12,758	-1.9%
Information Technology and Cybersecurity	179,646	179,646	157,588	176,592	+19,004	12.1%
Legacy Contractor Pensions	307,058	307,058	283,887	248,492	-35,395	-12.5%
Domestic Uranium Enrichment Research, Development and Demonstration	97,200	97,200	0	0	0	N/A
Subtotal, Weapons Activities	**8,231,770**	**8,250,249**	**8,846,948**	**9,285,147**	**+438,199**	**5.0%**
Use of Prior Year Balances	0	-18,229	0	0	0	N/A
Prior Year Balance Rescission	-51,411	-51,411	0	-42,000	-42,000	N/A
Total, Weapons Activities	**8,180,359**	**8,180,609**	**8,846,948**	**9,243,147**	**+396,199**	**4.5%**

Appropriation Overview

One of the statutory missions of NNSA is to maintain and enhance the safety, security, and effectiveness of the U.S. nuclear weapons stockpile to meet national security requirements. The mission is carried out in partnership with the Department of Defense (DOD), with NNSA providing research, development, and production activities supporting the U.S. nuclear weapons stockpile.

The work performed by NNSA in the **Weapons Activities** programs ensures the accomplishment of Department of Energy (DOE) Strategic Objective 4—Maintain the safety, security and effectiveness of the Nation's nuclear deterrent without nuclear testing, as well as Strategic Objective 5—Strengthen key science, technology and engineering talent, capabilities, and information resources and modernize the infrastructure, especially in nuclear science and technology, to enhance national security.

While the majority of this account supports the nuclear weapons program, NNSA's critical security—both physical and cybersecurity—are also funded here, in direct support of DOE Strategic Goal 6—Reduce global nuclear security threats.

For FY 2016, efforts will continue to strengthen the science and technology base to enable continued success of the Stockpile Stewardship Program without nuclear explosive testing. Progress on weapons system life extension programs will continue, with Phase 6.3 (Development Engineering) concluding for the B61-12, and Phase 6.2 (Feasibility Study and Design Options) accelerating for the W80-4 in order to support a first production unit (FPU) in 2025. Investments to modernize and upgrade the nuclear security infrastructure increase to address safety and programmatic risks.

Investments in plutonium and uranium also increase to ensure the long term viability of manufacturing capabilities and processes.

The FY 2017, progress on core missions will continue, with additional investments in infrastructure to arrest the growth in deferred maintenance; dispose of the Kansas City Bannister Federal Complex; increase investments for upgrading aging infrastructure to address safety and programmatic risks, improve productivity, and lower operating costs. For UPF, the increase is to support the execution and construction to meet completion by FY 2025 while maintaining a total cost of $6,500,000,000. The Request for Directed Stockpile Work includes increases to transition the W88 Alt 370 to Phase 6.4 including CHE Refresh, to maintain the FY 2025 FPU for the W80-4 LEP, and to accelerate the completion of all weapons retired prior to FY 2009 by the end of FY 2021 (one year earlier than previous plans). Increased funding is requested for Research, Development, Test, and Evaluation (RDT&E) for exascale computing and enhanced subcritical experiment capabilities. An increase is requested for the Secure Transportation Asset for the development and testing of the selected alternative for the Mobile Guardian Transporter (MGT). These increases are partially offset by a proposed change in strategy for reimbursing Management and Operations (M&O) contractor pension costs by capping reimbursement to normal cost. This change is expected to result in cost avoidance of approximately $84,000,000 in FY 2017 and $277,000,000 over the Future-Years Nuclear Stockpile Plan (FYNSP) period which will be used to address some programmatic and infrastructure issues. Please see the NNSA Pension Exhibit in Volume II of the FY 2017 DOE Budget Request for more information regarding the pension financing strategy change.

Program Highlights

- **Directed Stockpile Work (DSW)**
  Directed Stockpile Work (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. For FY 2017, DSW will transition the W88 Alt 370 activities from Phase 6.3 (Development Engineering) to Phase 6.4 (Production Engineering) in accordance with the integrated schedule towards a FY 2020 FPU; and the W80-4 Life Extension Program will ramp up at a slower pace than planned in the FY 2016-2020 FYNSP. Planned technology maturation activities in Phase 6.2 (Design Definition and Cost Study) will be reduced, but the slower ramp up is not expected to impact planned FPU in FY 2025 in support of the Air Force Long Range Standoff (LRSO) program. Increases are also included for Plutonium Sustainment to fabricate four to five development (DEV) W87 pits and in Weapons Dismantlement and Disposition to make progress towards meeting the commitment to accelerate dismantlement of retired U.S. nuclear warheads by 20%.

- **Research, Development, Test and Evaluation (RDT&E)**
  Focuses on RDT&E efforts to develop and maintain critical capabilities, tools, and processes needed to support science based stockpile stewardship, refurbishment, and continued certification of the stockpile over the long-term in the absence of underground nuclear testing. For FY 2017, focus will be on annual assessments and will provide for increases in four key areas to support future LEP options and system certification including: Hydrodynamic and subcritical experiments, Enhanced Capabilities for Subcritical Experiments, Certification Readiness Exercises, and Assessment of the performance of U.S. nuclear weapons in hostile environments. The Inertial Confinement Fusion Ignition and High Yield program continues operations at NNSA's three major high energy density facilities; the National Ignition Facility, the Z Pulsed Power facility, and Omega with the goal of providing key data that reduces uncertainty in calculations of nuclear weapons performance and builds on previous work and accomplishments.

- **Infrastructure and Operations formerly Readiness in Technical Base and Facilities (RTBF)**
  Maintains, operates, and modernizes the National Nuclear Security Administration (NNSA) infrastructure in a safe, secure, and cost-effective manner to enable program results. Infrastructure and Operations efforts provide a comprehensive approach to arresting the declining state of NNSA infrastructure while maximizing return on investment, enabling program results, and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools through Capabilities Based Investments and Line Item Construction projects. For FY 2017, funding will continue the stabilization of deferred maintenance, dispose of the Kansas City Bannister Federal Complex, and 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. Funding is also requested to complete the design of the Uranium Processing Facility (UPF), and associated buildings, support structures and process equipment. The increase also supports continued construction in approved subprojects supporting UPF infrastructure and site preparation activities.

  Key FY 2015 Accomplishments

  - ✓ Completed all scheduled deliveries for the W76-1 LEP to the Department of the Navy, and completed recovery of the FY 2013 War Reserve Build requirements.
  - ✓ Completed concept study activities for the W80-4 LEP and obtained NWC approval to begin Feasibility Study and Design Options.
  - ✓ Continued meeting scientific challenges of increased understanding of Primary and Secondary performance.
  - ✓ Significantly increased quarterly shot rate on NIF, with 356 shots in FY 2015.
  - ✓ Completed on time and $20 million under budget, the Uranium Processing Facility (UPF) Site Readiness subproject at the Y-12 National Security Complex.
  - ✓ Omega conducted its 25,000th target shot, achieving a significant milestone in its 45th year of operation.
  - ✓ Embarked on activities and research that will lead to future deployment of exascale capability for national security applications.
  - ✓ Acquired dynamic plutonium data at extreme pressures (millions of atmospheres) and high strain-rates that are otherwise inaccessible in the absence of nuclear testing.
  - ✓ Reached record HED pressures in plutonium and uranium experiments at SNL's Z Facility.

- **Secure Transportation Asset (STA)**
  Supports the safe, secure movement of nuclear weapons, special nuclear material, and weapon components to meet projected DOE, DOD, and other customer requirements. The Program Direction in this account provides for the secure transportation workforce, including Federal agents. In FY 2017, the STA will continue asset modernization and workforce capability initiatives. These initiatives include restoration of Federal agent strength levels to 370, the Safeguards Transporter (SGT) Risk Reduction Initiatives to manage the SGT beyond its design life, to design and develop systems for the selected SGT replacement referred to as the Mobile Guardian Transporter (MGT), deployment of Mission Management System (MMS) Phase I, and replacement of vehicles and tractors.

- **Defense Nuclear Security (DNS)**
  Provides protection for NNSA personnel, facilities, and nuclear weapons and materials from a full spectrum of threats, most notably terrorism. Provides for safeguards and security requirements including protective forces and systems at NNSA sites. In FY 2017, the Request includes funding to backfill vacant positions in key security program areas at the sites, such as classification protection, technical surveillance countermeasures, and nuclear materials measurements, accounting, and physical inventory. It also supports increased maintenance for existing site security systems, and includes preliminary planning and design funds for future line item construction projects for Perimeter Intrusion Detection and Assessment Systems (PIDAS) at the Pantex and Y-12 sites. Funding for projects to address the backlog of security infrastructure upgrades that were initiated in FY 2016 is not requested and is pending further reassessment and study.

- **Information Technology (IT) and Cybersecurity**
  Supports information technology and cybersecurity solutions, including continuous monitoring, cloud-based technologies and security technologies (i.e., identity, credential, and access management) to help meet increased proliferation-resistance and security. In addition, by consolidating and transitioning many IT services to more efficiently run data centers, the program indirectly supports the climate goals mission of DOE. In FY 2017, the program will support the recapitalization of the Enterprise Secure Network, modernize the Cybersecurity infrastructure, implement the Identity Control and Access Management project at NNSA Headquarters and site elements, implement

and coordinate Public Key Infrastructure and other Committee on National Security Systems requirements and continue to leverage the NNSA Network Vision framework to increase the efficiency and cost-effectiveness of NNSA Information Technology (IT) services, consistent with the DOE Cyber Strategy.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Strengthen NNSA's science and technology base underpinning the Stockpile Stewardship Program to maintain U.S. nuclear weapon safety, security, and effectiveness without nuclear explosive testing. NNSA will also continue making progress on weapons system life extension programs, with Phase 6.3 (Development Engineering) concluding for the B61-12, and Phase 6.2 (Feasibility Study and Design Options) accelerating for the W80-4 to support the FPU in 2025. Investments to modernize and upgrade the nuclear security infrastructure were increases to address safety and programmatic risks. Investments in plutonium and uranium also increased to ensure the long term viability of manufacturing capabilities and processes.

In FY 2017, the Budget Request proposes to:

- Continue efforts related to the core mission of maintaining and modernizing the stockpile through life extension programs with the W88 Alt 370 transitioning to Phase 6.4 (Production Engineering). Funding is requested for additional investments in infrastructure to arrest the growth in deferred maintenance and dispose of the Kansas City Bannister Federal Complex. Increases are also requested to accelerate the dismantlement of retired weapons by 20% supporting the United States commitment at Nuclear Non-Proliferation Treaty (NPT) Review Conference, collaborate with the DOE Office of Science on critical technologies leading to exascale computing capabilities for national security and other uses, continue investments in plutonium and uranium capabilities and processes, and support design and development of the new Mobile Guardian Transporter.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
National Nuclear Security Administration						
Defense Nuclear Nonproliferation						
Defense Nuclear Nonproliferation Programs						
Material Management and Minimization	0	0	316,584	341,094	+24,510	7.7%
Global Material Security	0	0	426,751	337,108	-89,643	-21.0%
Nonproliferation and Arms Control	0	0	130,203	124,703	-5,500	-4.2%
Defense Nuclear Nonproliferation R&D	393,401	386,308	419,333	393,922	-25,411	-6.1%
Nonproliferation Construction	0	0	340,000	270,000	-70,000	-20.6%
Global Threat Reduction Initiative	325,752	330,552	0	0	0	N/A
Nonproliferation and International Security	141,359	141,359	0	0	0	N/A
International Material Protection & Cooperation	270,911	270,607	0	0	0	N/A
Fissile Materials Disposition	430,000	440,000	0	0	0	N/A
Subtotal, Defense Nuclear Nonproliferation Programs	**1,561,423**	**1,568,826**	**1,632,871**	**1,466,827**	**-166,044**	**-10.2%**
Nuclear Counterterrorism and Incident Response Program	0	0	234,390	271,881	+37,491	16.0%
Legacy Contractor Pensions	102,909	102,909	94,617	83,208	-11,409	-12.1%
Subtotal, Defense Nuclear Nonproliferation	**1,664,332**	**1,671,735**	**1,961,878**	**1,821,916**	**-139,962**	**-7.1%**
Use of Prior Year Balances	-22,963	-32,963	-21,576	0	+21,576	-100.0%
Prior Year Balance Rescission	-26,121	-26,121	0	-14,000	0	N/A
Total, Defense Nuclear Nonproliferation Appropriation	**1,615,248**	**1,612,651**	**1,940,302**	**1,807,916**	**-132,386**	**-6.8%**

Appropriation Overview

Nuclear threat reduction is one of the three pillars of the NNSA mission, as identified in the *2015 DOE/NNSA Enterprise Strategic Vision.* To achieve this mission, the NNSA strategy is 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.

Since FY 2016, all funding for NNSA's threat reduction activities has been consolidated in the Defense Nuclear Nonproliferation (DNN) appropriation. This appropriation funds the DNN program, which primarily supports efforts to prevent nuclear threats, as well as the Nuclear Counterterrorism and Incident Response (NCTIR) program, which primarily supports efforts to counter and respond to nuclear threats. These two programs provide policy and technical leadership to prevent or limit the spread of materials, technology, and expertise relating to weapons of mass destruction; advance technologies that detect the proliferation of weapons of mass destruction worldwide; eliminate and secure inventories of surplus materials and infrastructure usable for nuclear weapons; ensure a technically trained response to nuclear and radiological incidents worldwide; support the Department's enterprise-wide approach to emergency management; and reduce the danger that hostile nations or terrorist groups may acquire nuclear devices or weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise that could be used to develop nuclear weapon capabilities by states or non-state actors.

These activities are carried out within the context of a dynamic global security environment, which is described in NNSA's annual report entitled *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats*. This environment is characterized by the persistent vulnerability of nuclear and radiological materials (particularly in regions of conflict); the pressure on arms control and nonproliferation regimes from enduring interest in nuclear weapons capabilities

by state- and non-state actors; the global expansion of nuclear power and possible spread of fuel cycle technology; the increasing opportunities for illicit nuclear material trafficking due to expanding global trade volumes and increasingly sophisticated procurement networks; and the rapid advance of technology (including cyber) that may shorten nuclear weapon development pathways and directly affect nuclear safeguards and security missions.

Program Highlights

- **Material Management and Minimization (M^3)**
  M^3 presents an integrated approach to addressing the persistent threat posed by nuclear materials through a full cycle of materials management and minimization efforts. Consistent with the priorities articulated in the National Security Strategy of the United States and the Nuclear Posture Review, the primary objective of the program is to achieve permanent threat reduction by minimizing and, when possible, eliminating weapons-usable nuclear material around the world. Increases in FY 2017 are to: accelerate reactor conversions in Kazakhstan and the United States; fully fund cooperative agreements to support the establishment of a reliable, domestic, non-HEU-based production capability for Mo-99; implement the Uranium Lease and Take Back (ULTB) Program. These increases are partially offset by a decrease in funding needed for fuel return efforts following the completion of key removals for the 2016 Nuclear Security Summit and the use of uncosted balances expected to be available to continue to support Russian-origin and Gap removal projects.

Key FY 2015 Accomplishments

- ✓ Provided technical support to the successful negotiation of the Joint Comprehensive Plan of Action (JCPOA) to address Iran's nuclear program.
- ✓ Completed removal or disposal of a total of 169 kilograms of vulnerable nuclear material.
- ✓ Helped prevent the illicit trafficking of nuclear and radiological materials by installing 25 fixed and 20 mobile radiation detection systems worldwide.
- ✓ Advanced U.S. capabilities to monitor arms control treaties and detect foreign nuclear programs.
- ✓ Secured 142 domestic and international civilian buildings containing high-priority nuclear and radiological material.
- ✓ Supported two IAEA international training courses on identification and prevention of the insider threat to nuclear material (China and Finland).
- ✓ Maintained organizational readiness to respond to and mitigate radiological or nuclear incidents worldwide.

- **Global Material Security (GMS)**
  Supports the President's nuclear security agenda and the Secretary's goal of enhancing nuclear security through nonproliferation by working with partner countries to increase the security of vulnerable stockpiles of nuclear weapons, weapons-usable nuclear materials, and radiological materials and to improve partner countries' abilities to deter, detect, and interdict illicit trafficking. The decrease reflects a commitment to reduce prior year carryover balances, permitting a lower FY 2017 Budget Request.

- **Nonproliferation and Arms Control (NPAC)**
  NPAC develops and implements programs and strategies to: strengthen international nuclear safeguards; control the spread of dual-use WMD material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and develop programs and strategies to address nonproliferation and arms control challenges and opportunities. The FY 2017 Budget Request reflects primarily: a reduction in funding due to the completion or delay of certain projects; a return to baseline funding following the one-time increase of $3.5M by Congress in the FY 2016 budget for improvements in the export control process; and cost-savings in export licensing activities achieved through operational efficiencies.

- **Defense Nuclear Nonproliferation Research and Development (DNN R&D)**
  DNN R&D drives the innovation of unilateral and multi-lateral technical capabilities to detect, identify, and characterize: 1) foreign nuclear weapons programs, 2) illicit diversion of special nuclear materials, and 3) nuclear detonations. 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, including Nuclear Counterterrorism and Incident Response (NCTIR) -related R&D, conduct technology demonstrations, and develop prototypes for integration into operational systems. The FY 2017 Budget decrease includes: a portion of projected savings resulting from a change in the NNSA strategy regarding the reimbursement of contractor pension

funding; a reduction in planned activities for arms control-related R&D; and a return to the baseline Nuclear Detonation Detection (NDD) program after development of a mitigation path for supply chain interruptions.

- **Nonproliferation Construction**
  Nonproliferation Construction consolidates construction costs for DNN projects. The goal of the current Nonproliferation Construction program is to construct facilities to dispose of at least 34 metric tons (MT) of surplus U.S. weapon-grade plutonium in accordance with U.S. policy and the amended U.S.-Russia Plutonium Management and Disposition Agreement (PMDA). Currently, the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF) is the only project in this program and would enable the Department to dispose of weapon-grade plutonium by fabricating it into mixed oxide fuel and irradiating it in commercial nuclear. The Consolidated and Further Continuing Appropriations Act, 2015, directed that construction on the MFFF project continue and that cost studies and technology alternative studies be conducted. The National Defense Authorization Act for FY 2015 mandated an independent assessment and validation of the 2014 Plutonium Working Group (PWG) analysis and the Department requested Aerospace Corporation, a federally funded research and development center (FFRDC), conduct this assessment. Aerospace Corporation completed two reports documenting its assessment of the April 2014 analysis. Additionally, in June 2015 the Secretary of Energy assembled a Red Team to assess options for the disposition of surplus weapon-grade plutonium. These analyses confirmed that the MOX fuel approach will be significantly more expensive than anticipated and will require approximately $800 million to $1 billion annually for decades. As a result, beginning in FY 2017 the MOX project will be terminated. The Department will complete pre-conceptual design for the dilute and dispose (D&D) option to establish critical decision-0 (CD-0), Approve Mission Need, and begin conceptual design in late FY 2017.

- **Nuclear Counterterrorism and Incident Response (NCTIR)**
  The FY 2017 Request for the NCTIR Program supports programs to strategically manage and deploy expert scientific teams and equipment to provide a technically trained, rapid response to nuclear or radiological incidents and accidents worldwide. NCTIR evaluates and assesses nuclear or radiological threats, and leverages that knowledge to provide interagency policy and contingency planning; training; and capacity building. Specifically, this knowledge supports nuclear incident engagement to strengthen and exercise national and international radiological and nuclear counterterrorism, counterproliferation, and incident response capabilities. Finally, NCTIR also executes the DOE's Emergency Management and Operations Support program that provides policy and implementation of emergency management for all DOE/NNSA offices and sites, and manages the Emergency Operations Centers, Emergency Communications Network and Continuity of Operations Program (COOP) activities.

Planned and Proposed Accomplishments

In FY 2016, the Department 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. DNN planned new accomplishments for FY 2016 include supporting implementation and compliance monitoring of the Joint Comprehensive Plan of Action (JCPOA), supporting the Nuclear Security Summit in March-April, 2016, and beginning preliminary planning for the dilute and dispose alternative for plutonium disposition.

In FY 2017, the Budget Request proposes to:

- Support implementation of the JCPOA, termination of the MOX fuel fabrication project, and continued refinement of the dilute and dispose alternative for plutonium disposition.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
National Nuclear Security Administration						
Naval Reactors						
Naval Reactors Operations and Infrastructure	390,000	390,000	445,196	449,682	+4,486	1.0%
Naval Reactors Development	411,180	411,180	446,896	437,338	-9,558	-2.1%
S8G Prototype Refueling	126,400	126,400	133,000	124,000	-9,000	-6.8%
Ohio Replacement Reactor Systems Development	156,100	156,100	186,800	213,700	+26,900	14.4%
Program Direction	41,500	41,500	42,504	47,100	+4,596	10.8%
Construction	113,320	113,320	121,100	148,300	+27,200	22.5%
Subtotal, Naval Reactors	**1,238,500**	**1,238,500**	**1,375,496**	**1,420,120**	**+44,624**	**3.2%**
Use of Prior Year Balances	0	0	0	0	0	N/A
Rescission of Prior Year Balances	-4,660	-4,660	0	0	0	N/A
Total, Naval Reactors	**1,233,840**	**1,233,840**	**1,375,496**	**1,420,120**	**+44,624**	**3.2%**

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 Strategic Objective 7, 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 (73 submarines, 10 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.

Key FY 2015 Accomplishments

- ✓ Provided technical resolution support while the nuclear fleet steamed over two million miles.
- ✓ Advanced the *Ohio*-Class Replacement and the S8G Prototype Refueling projects supporting the Navy's *Ohio*-Class Replacement ship construction schedule and the Navy's nuclear operator training mission.
- ✓ Advanced the Spent Fuel Handling Recapitalization Project to 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.

In addition to supporting the existing nuclear fleet, Naval Reactors has three major DOE initiatives: the *Ohio*-Class Replacement 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 *Ohio*-Class Replacement 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 *Ohio*-Class Replacement 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 2017 Request will support critical prototype maintenance during planned S8G prototype availability period, facility and systems maintenance and regulatory requirements across the Program's four DOE sites, and necessary general plant projects and capital equipment to recapitalize aging infrastructure and equipment.

- **Naval Reactors Development**
  The FY 2017 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 decrease from FY 2016 Enacted levels occurs as major development efforts and designs complete and efforts transition to supporting production and performing analysis needed to support future operation and project execution.

- ***Ohio*-Class Replacement Reactor System Development**
  The increase over FY 2016 Enacted levels support reactor plant system and long lead time component development and production plans.

- **Construction**
  The increase over FY 2016 Enacted levels is driven by the Engineroom Team Trainer Facility Project.

- **Program Direction**
  The FY 2017 Request places Naval Reactors in a position to execute its mission and provide federal oversight of the program's four DOE laboratories.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Advance the Ohio-Class Replacement Project by finalizing the reactor vessel and core structure final design and complete diagrams for the reactor and propulsion plant systems, manufacture the Technology Demonstration Core for the S8G Prototype Refueling, begin construction of facilities supporting the refueling overhaul of the prototype, and maintain progress of the Spent Fuel Handling Recapitalization Project by finalizing technical and functional requirements for preliminary design of the facility.

In FY 2017, the Budget Request proposes to:

- Advance development of alternate clad fuel element manufacturing supporting both the Ohio-Class Replacement Project and S8G Prototype Refueling, begin manufacturing of the Technology Demonstration Core power unit for the S8G Prototype, and begin construction of the Engine Room Team Trainer facility to house the first simulator-based engine room environment.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
National Nuclear Security Administration						
NNSA Federal Salaries And Expenses						
Federal Salaries and Expenses	370,000	370,000	383,666	412,817	+29,151	+7.6%
Subtotal, NNSA Federal Salaries and Expenses	**370,000**	**370,000**	**383,666**	**412,817**	**+29,151**	**+7.6%**
Rescission of Prior Year Balances (OA)	-413	-413	-19,900	0	+19,900	+100.0%
Total, NNSA Federal Salaries And Expenses	**369,587**	**369,587**	**363,766**	**412,817**	**+49,051**	**+13.5%**

Appropriation Overview

NNSA's **Federal Salaries and Expenses** pays for costs associated with recruiting, training, and maintaining a federal staff to oversee the execution and management of about $11 billion in weapons activities and nonproliferation funding across the nuclear security enterprise. The NNSA workforce consists of a diverse cadre of project managers, scientists, engineers, foreign affairs specialists, and highly technical support staff. This appropriation also provides for mission support functions in information technology and cybersecurity, financial management, human capital management, corporate project management, legal services, procurement and contract management, safety and health, and cost estimating and program evaluation. The Department of Energy and NNSA work to reduce overlap in mission support functions to minimize the amount of funding required to achieve our mission. The account also funds NNSA contributions to the Department's Working Capital Fund (WCF), NNSA space and occupancy expenses, and other administrative expenses.

FSE funds federal staff geographically located in Washington, DC; Germantown, Maryland; Albuquerque, New Mexico; and at seven federal field offices: Kansas City Field Office; Lawrence Livermore Field Office; Los Alamos Field Office; Nevada Field Office; NNSA Production Office; Sandia Field Office; and Savannah River Field Office.

Program Highlights

The FY 2017 Budget Request provides funding for the salary, benefits, and support expenses of 1,715 federal full-time equivalents (FTEs) to provide federal oversight of the nuclear security enterprise responsible for managing and executing NNSA's mission. The FY 2017 Request of $412,817,000 reflects a $49,051,000 increase above the FY 2016 Enacted level, which includes a prior year rescission of $19,900,000. This level of funding supports 60 FTEs (25 above the authorized 1,690) from anticipated FY 2016 levels to support increases for appropriate oversight, principally in Life Extension Programs (LEPs) and major project management, provides a 1.3 percent cost of living increase, provides for a 5.5 percent increase in benefit escalation consistent with government-wide projections, funds additional Field Site background investigations, and transfers funding to the Department's Working Capital Fund, primarily for Office Personnel Management (OPM) credit monitoring and the Department's accounting systems (iMANAGE).

Key FY 2015 Accomplishments

- ✓ Taken steps to reduce spending on federal program direction.
- ✓ Offered early retirement incentives to help right-size the workforce and as a cost savings measure.
- ✓ Reduced federal FTEs by 10.4% relative to the FY 2012 level of 1,886 FTEs.
- ✓ Identified efficiencies, particularly in travel and support services
- ✓ Maintained NNSA Federal Salaries and Expenses Federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at 3.9%, less than the FY 2014 target of less than 6%.

NNSA's FY 2015 Federal Management Financial Integrity Act (FMFIA) report identified NNSA's current staffing levels as a reportable condition. NNSA has also benchmarked its current staffing profile for the LEPs and contract management against comparable programs in the Department of Defense. In March 2015, NNSA conducted a staffing level review to include entry-level hiring requirements based on overall organizational succession planning goals, current staffing ratios, organizational retirement trends and retirement eligibility data, and opportunities to address skills mix issues and balances of the current workforce. The results of the study suggested NNSA support a Federal staffing level of approximately 1,740 FTEs in the FSE account. In FY 2016, NNSA will undertake a detailed and comprehensive staffing review to identify the appropriate FTE level and skills set mix to address the pending retirement bow wave, and meet mission needs for anticipated increased work scope in major mission areas, particularly in LEPs and construction projects. In FY 2017, NNSA

will fund a staffing level of 1,715 FTEs, an increase of 60 FTEs (25 above the authorized 1,690) from anticipated FY 2016 levels, and request an additional 25 for a total of 1,740 FTEs in FY 2018 and the outyears pending the results of a detailed staffing review.

FY 2016 Planned and FY 2017 Projected Accomplishments

FSE's planned FY 2016 and projected FY 2017 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 6%; 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.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Science and Energy (Discretionary Funding)						
Science	5,067,738	5,132,813	5,347,000	5,572,069	+225,069	+4.2%
Energy Efficiency and Renewable Energy	1,914,195	1,840,847	2,069,194	2,898,400	+829,206	+40.1%
Sustainable Transportation	602,000	543,271	635,950	852,900	+216,950	+34.1%
Renewable Energy	456,000	451,023	478,050	620,600	+142,550	+29.8%
Energy Efficiency	642,000	632,328	721,000	919,000	+198,000	+27.5%
Crosscutting Innovation Initiatives	0	0	0	215,000	+215,000	N/A
Corporate Support Programs	237,000	237,750	238,000	290,900	+52,900	+22.2%
Rescissions and Use of Prior Year Balances	−22,805	−23,525	−3,806	0	+3,806	100.0%
Electricity Delivery and Energy Reliability	146,975	143,901	206,000	262,300	+56,300	+27.3%
Fossil Energy Research and Development*	560,587	548,885	632,000	600,000	−32,000	-5.1%
Clean Coal Technology	−6,600	−2,876	0	0	0	N/A
Petroleum Reserves	237,130	237,820	237,100	278,450	+41,350	+17.4%
Nuclear Energy	833,379	821,883	986,161	993,896	+7,735	+0.8%
Office of Indian Energy Policy and Programs	0	0	0	22,930	+22,930	N/A
Office of Technology Transitions	0	0	0	8,400	+8,400	N/A
Advanced Research Projects Agency - Energy	279,982	279,982	291,000	350,000	+59,000	+20.3%
Energy Information Administration	117,000	117,000	122,000	131,125	+9,125	+7.5%
Loan Programs Office	21,000	21,000	23,000	15,000	−8,000	-34.8%
Total, Science and Energy (Discretionary Funding)*	**9,171,386**	**9,141,255**	**9,913,455**	**11,132,570**	**+1,219,115**	**+12.3%**
Science and Energy (Mandatory Funding)						
Science - University Grants	0	0	0	100,000	+100,000	N/A
21st Century Clean Transportation Plan Investments	0	0	0	1,335,000	+1,335,000	N/A
Advanced Research Projects Agency - Energy - Mandatory	0	0	0	150,000	+150,000	N/A
Total, Science and Energy (Mandatory Funding)	**0**	**0**	**0**	**1,585,000**	**+1,585,000**	**N/A**
Total, Science and Energy*	**9,171,386**	**9,141,255**	**9,913,455**	**12,717,570**	**+2,804,115**	**+28.3%**

*FY 2017 Request includes $240 million in use of prior year balances in Fossil Energy R&D

Overview

The Department of Energy's Science and Energy programs support a diverse portfolio of innovation to advance clean energy technologies, achieve energy security, and promote economic growth and job creation. The FY 2017 Budget Request for Science and Energy programs directly contributes to the Department's Strategic Plan (Goal 1) by leading in foundational science and transformational research, development, demonstration, and deployment of an extensive range of clean energy technologies. Important linkages exist across the Department's basic research and applied energy programs, and the FY 2017 Budget Request puts forth a balanced, efficient portfolio that builds upon these links.

The FY 2017 Budget Request supports ongoing implementation of the President's Climate Action Plan and builds on the systems-based analysis of the Quadrennial Technology Review (QTR) released in 2015. The FY 2017 Budget Request also takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next five years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The Request provides a total of $5,856 million in discretionary funding for clean energy activities that span the full range of research and

development from use-inspired basic research to demonstration, representing an increase in discretionary funding of over 21 percent above the FY 2016 baseline of $4,822 million. DOE's funding is 76 percent of the $7.7 billion government-wide Mission Innovation investment in FY 2017.

The FY 2017 Budget Request also includes mandatory funding for clean energy R&D that complements Mission Innovation activities supported by discretionary funding. The Request includes $150 million in mandatory funding for DOE's ARPA-E as part of the ARPA-E Trust proposal that seeks $1.85 billion in mandatory funding over five years to reliably increase the program's transformational clean energy technology R&D. In addition, as part of the $1,335 million mandatory proposal for the DOE portion of the Administration's 21st Century Clean Transportation Plan, the Request includes $500 million to support scale-up of clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, particularly for intermodal freight and fleets; and establish a mobility systems integration facility to investigate systems level energy implications of vehicle connectivity and automation.

To sustain the Nation's primacy in transformational scientific discovery, the Request also increases funding for basic research and the user facilities that support the work of over 31,000 researchers annually. The 2015 Quadrennial Technology Review provided a systems-based analytical foundation that informed the program proposals in the FY 2017 Request.

Building on pilot efforts since FY 2015, the FY 2017 Budget Request also includes a set of coordinated, multi-program crosscutting initiatives that focus unique program and national laboratory expertise around shared challenges and opportunities. DOE's science and energy programs play a central role in the Advanced Materials; Cybersecurity, Energy-Water Nexus; Exascale Computing; Grid Modernization; Subsurface Science, Technology and Engineering RD&D; and Supercritical CO_2 technology crosscuts. Funding for these initiatives is in the program offices' budget requests.

Other areas of emphasis in this Budget Request include traineeship and STEM programs to augment the Nation's domestic clean energy workforce, expanded financial support for deployment projects on tribal and Alaska Native land, a heightened focus on technology transfer, and infrastructure investments to maintain and renew DOE's laboratory capabilities.

Program Highlights

The Office of Science (SC) FY 2017 Budget Request funds basic research programs in physics, chemistry, materials science, biology, environmental science, applied mathematics, and computational science. The Budget Request for SC supports the President's Mission Innovation initiative and includes increased funding for Energy Frontier Research Centers and the DOE Bioenergy Research Centers, continued funding for exascale computing system research and development, research to build the scientific foundation needed to develop a fusion energy source, as well as robust funding levels to support scientific inquiry in the fields of high energy and nuclear physics at universities and laboratories. The Budget Request also maintains operations of SC's scientific user facilities at optimal levels, and continues construction of critical, new user facilities and provides increased investment in infrastructure renewal to sustain the SC enterprise. In addition to the FY 2017 Budget Request, an authorization proposal for the Office of Science for $100 million of mandatory funding for University Grants will be transmitted to Congress, which will be made available through a competitive merit-based review of proposals solicited from and provided by the university community.

The Energy Efficiency and Renewable Energy (EERE) FY 2017 Budget Request provides increased funding for high-impact applied research, development, demonstration and deployment activities in sustainable transportation, renewable power, and end-use energy efficiency. In FY 2017, EERE will engage in Crosscutting Innovation Initiatives, focusing on specific high-impact innovation acceleration. The Request reflects an expanded focus on technology development as part of the Energy-Water Nexus crosscut by including a proposal for a Desalination Hub, as well as through continued support for applied materials research, subsurface technology, and grid integration activities. The Request also supports initial funding of one additional Clean Energy Manufacturing Innovation Institute in EERE. New in FY 2017 is mandatory funding for a transportation initiative supported by the Administration that will help accelerate the transformation of the nation's transportation systems with game-changing battery technology, cleaner vehicle fleets, and increased access to alternative fuel supplies.

The Electricity Delivery and Energy Reliability (OE) FY 2017 Budget Request reflects an increase from FY 2016 Enacted levels strengthen, transform, and improve energy infrastructure so that consumers have access to reliable, secure, and clean sources of energy. In conjunction with private industry and Federal, state, local, and tribal governments, OE supports a variety of initiatives to modernize the electric grid, including energy system measurement, modeling and risk analysis, technology research and development around distribution networks, enhanced research and tool development for cybersecurity incident management, enhanced energy storage R&D, industrial materials for grid application, and programs supporting state and local energy assurance and regional and state distribution-level reform.
The Fossil Energy Research and Development (FER&D) FY 2017 Budget Request advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels that are important to our Nation's security and economic prosperity. The FER&D Request funds post- and pre-combustion CO_2 capture and compression technologies, including a new emphasis on optimizing carbon capture from natural gas systems and large pilot tests for post-combustion capture. Funding for carbon storage will develop and validate technologies to ensure safe and permanent geologic storage of captured CO_2 from both coal and natural gas power systems and research priorities identified through the Subsurface crosscut. The Request includes substantial funding for support of a 10MWe pilot test facility of supercritical CO_2 technology. The Request also supports programs to detect, quantify, mitigate, and communicate to stakeholders about methane emissions. The FER&D Request also funds the National Energy Technology Laboratory to deliver world-class capabilities for fossil energy research.

The Fossil Energy Strategic Petroleum Reserve (SPR) FY 2017 Budget Request continues to support the full operational readiness and drawdown capability of the SPR. Increased funding over the FY 2016 Enacted level supports more cavern remediation and enhanced infrastructure investment for timely replacement of equipment and physical systems and to reduce deferred maintenance. The FE 2017 Request also supports continued inventory maintenance for the Northeast Home Heating Oil Reserve. The Northeast Gasoline Supply Reserve is fully funded through FY 2017 from the use of prior year balances from the 2014 SPR test sale.

The Nuclear Energy (NE) FY 2017 Budget Request continues implementation of the Integrated Waste Management System, maintains the schedule for selecting and certifying accident tolerant fuel, and completes funding for the Small Modular Reactor Licensing Technical Support program. Funding is requested to support Department infrastructure maintenance of primary roads and disposition excess contaminated facilities at the Idaho National Laboratory. The Budget Request investments in critical maintenance at the Advanced Test Reactor (ATR) and Advanced Test Reactor Critical Facility (ATRC) that will improve reliability and availability of the ATR in order to meet research customer demands.

The Advanced Research Projects Agency—Energy (ARPA-E) FY 2017 Budget Request supports ARPA-E's investment in early-stage transformational energy technologies that can be advanced with modest investments. The Budget Request will also provide limited funding for qualification and field testing that aims to increase the likelihood that projects will be able to attract private sector investment for commercial development after ARPA-E's support has ended. In addition, under the proposed ARPA-E Trust, the program will add a new focus on innovative systems level development that will deliver larger, more rapid impacts from the transformational energy technologies developed under ARPA-E's existing core programs.

The Indian Energy Policy and Programs (IE) FY 2017 Budget Request supports ongoing technical assistance, education, capacity building and financial assistance to Indian Tribes, Alaska Native Tribes and corporations, and Tribal energy resource development organizations. The increased funding over the FY 2016 Enacted level supports expanded technical assistance and competitive grant programs through intertribal networks to support clean energy development and deployment for Tribes.

The Office of Technology Transitions (OTT) FY 2017 Budget Request supports work to expand the commercial impact of the Department's RDD&D portfolio. This work includes management of the Technology Commercialization Fund, the Clean Energy Investment Center, coordinating tech-to-market activities across the Department, and a suite of collaborations and partnership programs with the National Laboratories.

The Energy Information Administration (EIA) FY 2017 Budget Request funds maintains EIA's core energy activities, while also expanding the data collection and analysis program to serve several emerging stakeholder needs; revamp petroleum data and

analysis to provide more regional detail, enhance commercial building energy efficiency data, expand international analysis, including Canada-Mexico collaboration and key economies in Asia and collect transportation energy consumption data.

The FY 2017 Budget Request proposes funding for administrative expenses for the Title 17 Innovative Technology Loan Guarantee Program, which encourages early commercial use of new or significantly improved technologies in energy projects, and the Advanced Technology Vehicles Manufacturing (ATVM) Loan Program, which supports the development of advanced technology vehicles and associated components in the United States.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Science (Discretionary Funding)						
Advanced Scientific Computing Research	541,000	523,411	621,000	663,180	+42,180	+6.8%
Basic Energy Sciences	1,733,200	1,682,924	1,849,000	1,936,730	+87,730	+4.7%
Biological and Environmental Research	592,000	572,618	609,000	661,920	+52,920	+8.7%
Fusion Energy Sciences Program	467,500	457,366	438,000	398,178	-39,822	-9.1%
High Energy Physics	766,000	745,232	795,000	817,997	+22,997	+2.9%
Nuclear Physics	595,500	580,744	617,100	635,658	+18,558	+3.0%
Workforce Development for Teachers and Scientists	19,500	19,500	19,500	20,925	+1,425	+7.3%
Science Laboratories Infrastructure	79,600	79,600	113,600	130,000	+16,400	+14.4%
Safeguards and Security	93,000	93,000	103,000	103,000	0	N/A
Program Direction	183,700	183,700	185,000	204,481	+19,481	+10.5%
Small Business Innovation Research (SC)	0	132,905	0	0	0	N/A
Subtotal, Science (Discretionary Funding)	**5,071,000**	**5,071,000**	**5,350,200**	**5,572,069**	**+221,869**	**+4.1%**
SBIR/STTR (DOE)	0	65,075	0	0	0	N/A
Rescission of Prior Year Balances	-3,262	-3,262	-3,200	0	+3,200	-100.0%
Total, Science (Discretionary Funding)	**5,067,738**	**5,132,813**	**5,347,000**	**5,572,069**	**+225,069**	**+4.2%**
Science (Mandatory Funding)						
University Grants (Mandatory Funding)	0	0	0	100,000	+100,000	N/A
Total, Science (Mandatory Funding)	**0**	**0**	**0**	**100,000**	**+100,000**	**N/A**
Total, Science	**5,067,738**	**5,132,813**	**5,347,000**	**5,672,069**	**+325,069**	**6.1%**

Appropriation Overview

Science (SC) is the single largest supporter of basic research in the physical sciences in the United States and funds programs in physics, chemistry, materials science, biology, environmental science, applied mathematics, and computational science. The Office of Science 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. SC supports researchers at all of the DOE laboratories and about 300 institutions. Over 31,000 researchers from universities, national laboratories, industry, and international partners are expected to use SC user facilities in FY 2016. SC programs invest in foundational science, including basic research in clean energy, to transform our understanding of nature and strengthen the connection between advances in fundamental science and technology innovation.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The SC FY 2017 Budget Request of $5.572 billion includes $1.853 billion for the support of Mission Innovation, an increase of $276 million from the FY 2016 Enacted level of $1.577 billion. Through this initiative, SC will align and increase the synergy between its activities and those of other federal entities to ensure a secure and clean energy future for the United States. The FY 2017 Budget Request for SC's Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, and Fusion Energy Sciences programs will address promising areas of research with the potential to accelerate the U.S. toward attaining this goal. SC's activities in this area are discussed in greater detail in the respective program's budgets.

In addition to the FY 2017 Request, an authorization proposal for the Office of Science for $100 million of mandatory funding for University Grants will be transmitted to Congress, for a total FY 2017 Budget of $5.672 billion. Funding will be made available through a competitive merit-based review of proposals solicited from and provided by the university community. The solicitations will be designed to open new paths as well as accelerate ongoing activities of interest to the SC basic research endeavors in the

mission areas of Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics and Nuclear Physics.

Program Highlights

- **Advanced Scientific Computing Research**
  Advanced Scientific Computing Research (ASCR) supports advanced computational research, applied mathematics, computer science, and networking as well as development and operation of multiple, large high performance and leadership computing user facilities and high performance networking. The Request funds:
  - Research, development, and design to ultimately achieve capable exascale systems with a thousand fold improvement in true application performance over current high performance computers.
  - 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 program.
  - 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.
  - ASCR increases by $42.2 million, or 6.8 percent, relative to the FY 2016 Enacted level. The Request provides for significantly expanded investments in Research and Engineering Prototypes to develop critical technologies and system integration for exascale, including initiation of exascale node and system architecture design efforts.

- **Basic Energy Sciences**
  Basic Energy Sciences (BES) supports fundamental research to understand, predict, and ultimately control matter and energy 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. 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 to overcome hurdles in basic science that require team efforts

Key FY 2015 Accomplishments

- ✓ *National Synchrotron Light Source-II (NSLS-II) project completed on time and within budget*. Construction of the most advanced storage-ring-based light source facility in the world at Brookhaven National Laboratory was completed in March 2015, about three months ahead of schedule. The planning, design, and construction of this 627,000-square-foot facility spanned 10 years at a total project cost of $912 million. This premier BES scientific user facility produces extremely bright beams of x-rays, providing unprecedented capabilities to accelerate advances in chemistry, biology, energy, geology, physics, and materials science. NSLS-II has been officially designated as a user facility and started serving general users in July 2015.
- ✓ *Chemistry and materials by predictive design.* Molecular assemblies with novel functions, useful in chemical separation, purification, detoxification, and decontamination, have been discovered by coupling predictive theory and computation, and subsequently validated by experiments. The Materials Genome Initiative supports the integration of theory and experimental research to accelerate materials discovery; new computer codes and extensive databases for predictive materials science research are now publicly available and in wide use by scientists and engineers from the public and private sectors.
- ✓ *Biosystems Design Research*. Researchers within the Genomic Science activity recently developed a new genetic system for photosynthetic diatoms that will enable investigations of the biofuel and bioproduct production potential of these microbes. Lack of a robust genetic system often limits the use of most microorganisms as platforms for genetic engineering. This new technique, while applicable to diatoms, may also hold promise for range of other currently genetically intractable microorganisms needed for biotechnological purposes. Similarly, new high throughput methods to track genetic manipulations within genetically tractable microorganisms are needed to accelerate biotechnological research.
- ✓ *Dedicated astronomical surveys user in an era of precision measurement in cosmology (HEP Cosmic Frontier).* The Baryon Oscillation Spectroscopic Survey (BOSS) measured the scale of the universe at a time five billion years ago to a precision of 1% and the rate of cosmic structure growth to 10%, using the full data set from its successful five year survey of 1.5 million galaxies and quasars. The Dark Energy Survey (DES) experiment completed its second year of a five-year survey using precision imaging observations, providing complementary measurements to BOSS data. DES released the largest map to date of the dark matter distribution in the universe, measured by gravitational lensing. DES also discovered nine new dwarf galaxies, satellites of our Milky Way galaxy, which will be laboratories for dark matter physics. Jointly with the Fermi Gamma-ray Space Telescope (FGST), the DES dwarf galaxy measurements were used to place tight limits on dark matter properties.

with a scope and complexity beyond that possible in single-investigator or small-group awards. An increase in funding will fully-fund up to five new awards in the area of subsurface science, with an emphasis on advanced imaging of geophysical and geochemical signals.
  - 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.
  - Computational Chemical Sciences to develop codes that are well-adapted to anticipated exascale architectures.
  - Research to enable advancement of clean energy technologies. Specific emphases will target novel materials and chemistry for energy efficiency and for use in extreme environments.
  - Operation of BES user facilities at optimal levels: five x-ray light sources, two neutron scattering centers, and five research centers for nanoscale science with electron beam characterization capabilities.
  - Continued construction of the Linac Coherent Light Source-II (LCLS-II) at SLAC National Accelerator Laboratory (SLAC).
  - Support for the Advanced Photon Source Upgrade Major Item of Equipment (MIE) project.
  - Development of imaging and sensing tools and technologies at x-ray light sources and nanoscale research centers as part of the BRAIN initiative.
  - BES increases by $87.7 million or 4.7 percent from the FY 2016 Enacted level. The Request continues support for on-going core research at approximately 10 percent above the FY 2016 Enacted level, supports optimal operations of five synchrotron light sources, five nanoscale research centers, and two neutron scattering centers.

- **Biological and Environmental Research**

  Biological and Environmental Research (BER) supports fundamental research that spans scales extending from the genome to the global climate system. More specifically, BER seeks to understand how genomic information is translated to functional capabilities, and how that knowledge can enable more confident redesign of microbes and plants for sustainable biofuels production and improved carbon storage. BER also supports research to advance our understanding of the role of atmospheric, terrestrial, ocean, and subsurface interactions in order to better describe and predict future climate change and plan for future energy and resource needs. The Request funds:
  - Research in foundational genomics, including the three DOE Bioenergy Research Centers (BRCs), to provide advances fundamental biological system science, using approaches that include genome sequencing, 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 from molecules to mesoscale.
  - Microbiome research to understand the functional interactions between microbes and plants in targeted environments of relevance to BER's bioenergy and environmental science challenges.
  - Fundamental research on clouds, aerosols, and the terrestrial carbon cycle over a range of environmental conditions at diverse climate-sensitive locations to advance understanding of how the Earth's dynamic, physical, and biogeochemical systems (the atmosphere, land, oceans, sea ice, and subsurface) interact and influence climate and environmental change.
  - Research in climate model development and validation, combining advanced software code development, numerical methods and Earth system models with human systems components to understand the interdependencies of water, energy and climate change applied to spatial scales as small as ten kilometers.
  - Integrated data management through the Climate and Environmental Data, Analysis and Visualization activity.
  - Operation of the three BER scientific user facilities, the Joint Genome Institute, the Atmospheric Radiation Measurement Climate Research Facility, and the Environmental Molecular Sciences Laboratory.
  - BER increases by $52.9 million or 8.7 percent above the FY 2016 Enacted level to support core research in Genomic Science, three DOE BRCs, and the development of regional-scale data, modeling, and analysis test beds to support analysis of dynamic energy-water systems.

- **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. The Request funds:
  - Operation of two major scientific user facilities: the DIII-D facility; and the NSTX-U at Princeton Plasma Physics Laboratory, which has resumed operations after completion of its upgrade.
  - Experimental and theoretical research on enhanced performance of high-temperature magnetically confined plasmas.

- Research carried out through international partnerships, high-performance computer simulations based on theoretical models, advanced materials development, measurement technique innovation, and discoveries in basic plasma science and high energy density laboratory plasma physics.
- Activities of eight Scientific Discovery Through Advanced Computing (SciDAC) centers, three in partnership with ASCR.
- The U.S. Contribution to the ITER project, which will continue to further design several subsystems (e.g., Tokamak Cooling Water system, Disruption Mitigation systems, Diagnostics systems); continue fabrication of Central Solenoid magnet component, Steady State Electrical Network components, Toroidal Field conductor fabrication, and Tokamak Cooling Water System piping; and cash contributions for ITER Organization operations.
- The FES Request decreases by $39.8 million or 9.1 percent from the FY 2016 Enacted level.

- **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. The Request funds:
  - Activities and projects identified by the high energy physics community and described in the High Energy Physics Advisory Panel (HEPAP) May 2014 strategic plan as high priority, including support for developing an enhanced Long Baseline Neutrino Facility hosted at Fermilab, with international partners.
  - Core research and user facility operations that maintain a productive program while new investments are being made.
  - Upgrades to the CMS and ATLAS detectors at the Large Hadron Collider to maintain their capabilities; and continued support for the operation of the current detectors and associated research activities.
  - Accelerator Stewardship that enables 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 (NIH), and compact accelerators for environmental remediation.
  - Muon to Electron Conversion Experiment (Mu2e) project, which will proceed to the construction phase and will provide a unique window into charged lepton flavor violation.
  - New, next-generation projects to search for dark matter, LUX-ZEPLIN and SuperCDMS-SNOlab; and to further studies of dark energy, the Dark Energy Spectroscopic Instrument.
  - HEP increases by $23.0 million or 2.9 percent above the FY 2016 Enacted level and is consistent with the HEPAP Particle Physics Project Prioritization Panel report recommendations.

- **Nuclear Physics**

  Nuclear Physics (NP) supports research to discover, explore, and understand all forms of nuclear matter. The Request funds:
  - Research in Nuclear Physics at universities and laboratories that will foster significant advances in nuclear structure, nuclear astrophysics, the study of matter at extreme conditions, hadronic physics, fundamental properties of the neutron, neutrinoless double beta decay, and isotope production and processing techniques.
  - Relativistic Heavy Ion Collider operations to enable studies of spin physics and explorations of new phenomena to illuminate the properties of the quark gluon plasma.
  - Continuous Electron Beam Accelerator Facility (CEBAF) operations to initiate the full scientific program with the recently upgraded 12 GeV machine and new scientific equipment in the experimental halls, which will open the opportunity for new discoveries and an improved understanding of quark confinement.
  - Argonne Tandem Linac Accelerator System operations to exploit the capabilities of the Californium Rare Ion Breeder Upgrade as well as newly completed instrumentation to research the properties of nuclei and stellar nucleosynthesis.
  - Continued construction at Michigan State University of the Facility for Rare Isotope Beams (FRIB) to provide world-class capability and new discovery potential in nuclear structure and nuclear astrophysics.
  - Initiation of the Gamma-Ray Energy Tracking Array MIE, a premiere gamma-ray tracking device to exploit the full scientific potential of FRIB.
  - Research investments in the Isotope subprogram for a new graduate traineeship activity in the fields of radiochemistry and nuclear chemistry with an emphasis in isotope production; and to develop new cutting-edge approaches for important isotopes that are not currently available to the public in sufficient quantities, such as the

establishment of a full-scale production capability of the promising alpha-emitter, actinium-225, to enable clinical trials for cancer therapy.
  - Initiation of the Stable Isotope Production Facility MIE to enable the production of a broad range of enriched stable isotopes, a capability that has not been available in the U.S. for almost 20 years.
  - NP increases $18.6 million or 3.0 percent above the FY 2016 Enacted level to support research, facility operations, the initiation of two new MIEs, and construction of FRIB.

- **Workforce Development for Teachers and Scientists**
  - Workforce Development for Teachers and Scientists ensures that DOE has the sustained pipeline of science, technology, engineering, and mathematics workers to meet national goals and objectives, now and in the future.

- **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 increases by $16.4 million or 14.4 percent above the FY 2016 Enacted level to support:
    - Two new construction projects: the Integrated Engineering Research Center at Fermi National Accelerator Laboratory, and the Core Facility Revitalization at Brookhaven National Laboratory (BNL);
    - The continuation of three ongoing construction projects: Materials Design Laboratory at Argonne National Laboratory; Photon Science Laboratory Building at SLAC, and the Integrative Genomics Building at Lawrence Berkeley National Laboratory (LBNL); and
    - General Plant Project improvements at LBNL, SLAC, the Thomas Jefferson National Accelerator Facility, and Ames National Laboratory.

- **Safeguards and Security**
  - Safeguards and Security 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 laboratories.

- **Science Program Direction**
  - Program Direction (PD) supports a skilled and motivated Federal workforce to develop and oversee SC investments in world-leading research and scientific user facilities. PD also provides public access to DOE scientific findings to further leverage the Federal science investment and advance the scientific enterprise.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Maintain and enhance operations of the major Scientific User Facilities that currently serve over 31,000 researchers.
- Continue effective execution of major ongoing science construction projects, including LCLS-II, FRIB and Mu2e, and establish a sound plan for the Long Baseline Neutrino Facility (LBNF) to proceed as a major new international effort.
- Develop a multi-year joint Science-NNSA program to achieve exascale computing, implementing the President's Executive Order on National Strategic Computing Initiative.
- Address future plans, including cost and schedule, for ITER.
- Open the most advanced storage-ring-based light source facility, the National Synchrotron Light Source II (NSLS-II) at BNL.
- Initiate participation in the NIH working group to enable cancer researchers to explore the unique capabilities of the DOE national laboratories to accelerate progress in understanding, detecting, and treating cancer.

In FY 2017, the Budget Request proposes to:

- Expand investment in the discovery science, and the data, modeling and analysis foundations for key technology crosscutting areas, especially Advanced Materials; Subsurface Science, Technology and Engineering; and the Energy-Water Nexus.
- Transition the Exascale Computing Initiative to the Science Exascale Computing Project, which will be managed according to the project management principles of DOE Order 413.3b.
- Recompete SciDAC partnerships with new activities that will include accelerating the development of clean energy technologies.

- Increase funding for the BRCs to accelerate innovation and translation of research results to industry.
- Expand upon the outcomes of working group efforts with NIH, initiated in FY 2016, in cancer research in accelerator technologies, isotope production, and access to the Office of Science scientific user facilities.
- Continue the U.S. Contribution to the ITER project to further design and fabrication of several subsystems.
- Enhance operations of the major Scientific User Facilities to provide services to more than 31,000 researchers
- Transition CEBAF at the Thomas Jefferson National Accelerator Facility to full operation for science data taking, which will provide a total of 2,890 hours of beam time for commissioning and research. All four halls will begin implementation of experiments.
- Continue effective execution of major ongoing science construction projects, including the LCLS-II, FRIB, LBNF, and Mu2e, and selected SLI buildings that will modernize the laboratory campus.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Energy Efficiency and Renewable Energy (Discretionary Funding)						
Sustainable Transportation						
Vehicle Technologies	280,000	272,526	310,000	468,500	+158,500	+51.1%
Bioenergy Technologies	225,000	175,915	225,000	278,900	+53,900	+24.0%
Hydrogen and Fuel Cell Technologies	97,000	94,830	100,950	105,500	+4,550	+4.5%
Total, Sustainable Transportation	**602,000**	**543,271**	**635,950**	**852,900**	**+216,950**	**+34.1%**
Renewable Energy						
Solar Energy	233,000	230,800	241,600	285,100	+43,500	+18.0%
Wind Energy	107,000	105,936	95,450	156,000	+60,550	+63.4%
Water Power	61,000	59,999	70,000	80,000	+10,000	+14.3%
Geothermal Technologies	55,000	54,288	71,000	99,500	+28,500	+40.1%
Total, Renewable Energy	**456,000**	**451,023**	**478,050**	**620,600**	**+142,550**	**+29.8%**
Energy Efficiency						
Advanced Manufacturing	200,000	194,175	228,500	261,000	+32,500	+14.2%
Federal Energy Management Program	27,000	27,000	27,000	43,000	+16,000	+59.3%
Building Technologies	172,000	168,153	200,500	289,000	+88,500	+44.1%
Weatherization and Intergovernmental Programs	243,000	243,000	265,000	326,000	+61,000	+23.0%
Total, Energy Efficiency	**642,000**	**632,328**	**721,000**	**919,000**	**+198,000**	**+27.5%**
Crosscutting Innovation Initiatives	**0**	**0**	**0**	**215,000**	**+215,000**	**N/A**
Corporate Support						
Program Direction	160,000	160,750	155,000	170,900	+15,900	+10.3%
Strategic Programs	21,000	21,000	21,000	28,000	+7,000	+33.3%
Facilities and Infrastructure	56,000	56,000	62,000	92,000	+30,000	+48.4%
Total, Corporate Support	**237,000**	**237,750**	**238,000**	**290,900**	+52,900	+22.2%
Subtotal, Energy Efficiency and Renewable Energy	**1,937,000**	**1,864,372**	**2,073,000**	**2,898,400**	**+825,400**	**+39.8%**
Use of Prior Year Balances	0	-720	0	0	0	N/A
Rescission of Prior Year Balances	-22,805	-22,805	-3,806	0	+3,806	+100.0%
Total, Energy Efficiency and Renewable Energy (Discretionary Funding)	**1,914,195**	**1,840,847**	**2,069,194**	**2,898,400**	**+829,206**	**+40.1%**
Energy Efficiency and Renewable Energy (Mandatory Funding)						
21st Century Clean Transportation Plan Investments	0	0	0	1,335,000	+1,335,000	N/A
Total, Energy Efficiency and Renewable Energy (Mandatory Funding)	**0**	**0**	**0**	**1,335,000**	**+1,335,000**	**N/A**
Total, Energy Efficiency and Renewable Energy	**1,914,195**	**1,840,847**	**2,069,194**	**4,233,400**	**+2,164,206**	**+104.6%**

Appropriation Overview

The Office of Energy Efficiency and Renewable Energy (EERE) is the U.S. Government's primary clean energy technology organization. EERE works with many of America's best innovators and businesses to research, develop, demonstrate, and support the deployment (RDD&D) of cutting-edge technologies and break down market barriers in sustainable transportation, renewable power, and energy efficiency. EERE implements a range of strategies aimed at reducing U.S. reliance on oil, increasing energy affordability, ensuring environmental responsibility, enhancing energy security, offering Americans a broader range of energy choices, and creating jobs.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The EERE FY 2017 Budget Request of $2.898 billion includes $2.108 billion for the support of Mission Innovation, an increase of $702 million from the Enacted FY 2016 of $1.406 billion. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security. In addition, as part of the Administration's 21st Century Clean Transportation Plan, the FY 2017 Budget Request of $1.335 billion of mandatory funds, including $500 million for clean energy R&D, will support scale-up of clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, particularly for intermodal freight and fleets; and establish a mobility systems integration facility to investigate systems level energy implications of vehicle connectivity and automation.

Program Highlights

Sustainable Transportation

- **Vehicle Technologies**
  FY 2017 funding supports a number of aggressive vehicle technology goals: battery energy storage, electric drive research and development, and advanced power electronics initiatives in support of the EV Everywhere Grand Challenge that aims to reduce the combined battery and electric drive system costs of plug-in electric vehicles by up to 50 percent by 2022. Efforts include improvements in lightweight materials and manufacturing processes through the Advanced Materials Crosscut. Work will continue on the Co-Optimization of Fuels and Engines effort, in coordination with the Bioenergy Technologies, to link R&D across fuels and engines early in the R&D cycle; and on SuperTruck II to achieve improved freight hauling efficiency goals. New in FY 2017, Transportation as a System initiative will explore opportunities for energy efficiency above the program's traditional vehicle-level focus, at a system level. Major funding changes are the result of enhanced support for these activities, in particular, and for increased investment in next-generation lithium-ion technology and beyond lithium-ion R&D, which show great promise in meeting battery cost and performance goals.

- **Bioenergy Technologies**
  FY 2017 funding emphasizes development of innovative processes to convert cellulosic and algal- and other microbial-based feedstocks to bio-based gasoline, jet, and diesel fuels at a cost of $3.00 per gallon gasoline equivalent (gge), focusing on processes to develop "drop-in" hydrocarbon biofuels, from non-food sources. Efforts include a collaboration with the Vehicles Technologies, co-optimization of fuels and engines through the Co-Optimization of Fuels and Engines effort and the leveraging of recently developed synthetic biology tools to improve efficiencies in the conversion of biomass to fuels and related products. Major funding changes are the result of increased investment in algae and other microbes and in R&D to overcome technical barriers to the integrated production of fuels. Funding also fully supports competitively selected pilot or demonstration projects for advanced biofuels technologies through cost-shared partnerships.

- **Hydrogen and Fuel Cell Technologies**
  FY 2017 funding supports the goal to reduce the cost and increase the durability of transportation fuel cell systems, with a targeted cost of $40/kW and durability of 5,000 hours, equivalent to 150,000 miles, by 2020. In addition, the program is working to reduce the cost of hydrogen from renewable resources to less than $4.00/gge – dispensed and untaxed – by 2020. In FY 2017, Fuel Cell R&D will emphasize areas such as stack component R&D, systems, and balance of plant components. Hydrogen Fuel R&D will focus on technologies and materials that will reduce the cost to produce, compress, transport, and store hydrogen from renewable sources. Funding also provides resources to advance the development of quality control tools for the manufacturing of fuel cell components and systems.

Renewable Power

- **Solar Energy**
  FY 2017 funding supports the SunShot Initiative goal to make solar power cost-competitive without subsidies by 2020, equivalent to a cost of solar power of $.06/kWh. A major emphasis will support DOE's Grid Modernization crosscut through advanced power electronics solutions for distributed solar, coordinated demonstration projects targeting multiple grid attributes, improved accuracy and availability of solar forecasting technologies, and partnerships with utilities on future business and operational models to reduce "soft costs" of solar installation. SunShot will also support the Clean Energy Manufacturing Initiative by developing and demonstrating innovative manufacturing technologies to increase U.S. competitiveness. Efforts include developing the next generation of photovoltaic modules, integrating advanced concentrating solar power components, and researching solar thermal-based desalination technologies in support of DOE's Energy-Water Nexus crosscut.

- **Wind Energy**
  FY 2017 funding emphasizes offshore wind advanced demonstration projects, as well as complementary research and development targeting technology and deployment challenges to achieve a 16.7 cents/kWh cost target for offshore wind by 2020. Funding also supports innovative concepts for taller wind towers, turbines, and systems capable of accessing and using the stronger and more consistent winds at elevation. Additionally, funding will advance the Atmosphere to Electrons Initiative to optimize wind farms. Funding supports DOE's Grid Modernization Initiative, and ongoing efforts to address the impacts of wind development on wildlife.

- **Water Power**
  FY 2017 funding continues the HydroNEXT initiative focusing on innovative, low-cost water diversion technologies to enable new stream reach hydropower, to progress to a cost target of 10.9 cents/kWh by 2020 from small, low-head new stream developments. FY 2017 funding also supports RD&D of marine and hydrokinetic technologies, including procurement of materials and construction of a grid-connected open-water test facility and development of concepts for revolutionary wave-energy converters.

- **Geothermal Technologies**
  FY 2017 funding supports full implementation of the Frontier Observatory for Research in Geothermal Energy (FORGE), including on-site research and development in enhanced geothermal technologies; and DOE's Subsurface Science, Technology and Engineering RD&D (Subsurface) crosscut to reduce the cost and risk of geothermal development. FY 2017 funding will expand temperature-gradient well drilling under the program's "Play Fairway Analysis," which assesses exploration risk and the probability of finding new geothermal resources on a regional scale, resulting in maps and studies that will reduce the industry's drilling and development risks, and will identify new prospective areas for geothermal exploration and development.

Energy Efficiency

- **Advanced Manufacturing**
  FY 2017 funding enables the RD&D of industrial efficiency and crosscutting clean energy manufacturing technologies; and supports the deployment of one additional Clean Energy Manufacturing Innovation Institute, with continued support of five existing institutes, as part of the larger interagency National Network of Manufacturing Institutes. Funding initiates an Energy Innovation Hub to develop integrated technological system solutions and enable technologies for de-energizing, de-carbonizing, and reducing the cost of desalination. Funding also supports Industrial Assessment Centers and the Presidential Better Building's initiative to help American commercial and industrial buildings become at least 20 percent more energy efficient over the next 10 years.

- **Federal Energy Management Program**
  FY 2017 funding supports major Administration initiatives to assist all Federal agencies in meeting aggressive energy, water, greenhouse gas and other sustainability goal by implementing commercially available, but underused technologies, to achieve deep energy savings. Additionally, FY 2017 funding initiates one new voluntary leadership challenge to reduce energy use in energy-intensive federal facilities, and increases focus on energy management at large Federal campuses.

- **Building Technologies**
  FY 2017 funding supports an increased emphasis on emerging technologies R&D in areas such as lighting, heating and cooling and building envelope, needed to support the reduction of the Nation's energy use by 50 percent; supports the equipment and appliance standards programs to establish minimum energy efficiency requirements pursuant to Federal statutes; and supports building to grid integration activities focused on improving the efficiency and resiliency of the electric grid, including connected buildings and building systems. FY 2017 funding establishes an integrated Low-Global Warming Potential (Low-GWP) Advanced Cooling (HVAC) R&D program to address near-term and long-term needs to reduce climate impacts of HVAC and refrigeration technologies; and initiates a Metropolitan Systems effort to develop tools for cities to become low carbon, affordable, livable, economically viable, and more resilient to extreme events.

- **Weatherization and Intergovernmental Programs**
  FY 2017 funding supports the Weatherization Assistance Program, which provides access to home weatherization services for low-income households across the country, including approximately 35,700 homes in FY 2017. The State Energy Program will continue to disseminate best practices to help government facilities and operations reduce annual energy use by 2 percent by 2020. In FY 2017 DOE will also support a Cities, Counties and Communities Energy Program that will provide technical assistance and competitively-awarded funds help catalyze more extensive clean energy solutions in community development and revitalization efforts.

- **Crosscutting Innovation Initiatives**
  In order to enable the required acceleration of clean energy innovation and commercialization in the U.S., EERE is establishing a new Crosscutting Innovation Initiatives program in FY 2017. This program will strengthen regional clean energy innovation ecosystems, accelerate next-generation clean energy technology pathways, and encourage clean energy innovation and commercialization collaborations between our National Laboratories and American entrepreneurs. First, the program will support a Regional Energy Innovation Partnerships, a new competition to establish regionally-focused clean energy innovation partnerships around the country. These regionally focused and directed partnerships will support regionally relevant technology neutral clean energy RD&D needs and opportunities to support accelerated clean energy technology commercialization, economic development, and manufacturing. Second, through a Next-Generation Innovation funding opportunity, the program will accelerate next-generation clean energy technology pathways. This funding opportunity will be open to off-road RD&D projects with the greatest potential to change the trajectory of EERE core program technology pathways. Third, a new Small Business Partnerships program will competitively provide technology RD&D resources to small businesses through the DOE's National Labs to support their efforts to commercialize promising new clean energy. Fourth, Energy Technology Innovation Accelerators will leverage the technical assets and facilities of the National Laboratories to enable American entrepreneurs to conduct RD&D that leads to the creation of new clean energy businesses.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Achieve high-volume modeled costs for batteries of $250/kWh (currently $289/kWh) en route to a 2022 goal of $125/kWh as part of the EV Everywhere Grand Challenge. EERE will also reach 360 workplace charging challenge partners by the end of 2016.
- Publish a long-range, national Hydropower Vision study.
- Announce a selection for the Smart Manufacturing National Network for Manufacturing Innovation (NNMI). By the end of 2016, DOE will have established eight clean energy manufacturing research facilities: five NNMI institutes, two manufacturing demonstration facilities, and the Critical Materials Institute.
- Issue 14 final energy efficiency standards as part of the Administration's goal to reduce carbon pollution by at least 3 billion metric tons cumulatively by 2030.
- Continue a strong emphasis on tech to market activities, including expansion of the Cyclotron Road program to an additional laboratory and completion of the Lab Corps pilot.

In FY 2017, the Budget Request proposes to:

- Initiate a multi-year effort on low-GWP advanced cooling (HVAC) R&D to move beyond today's refrigerants with potentially harmful environmental impacts to develop near-term low-GWP solutions and, over the long term reach an end-state with no refrigerants required.
- Make final site selection for the full implementation of the FORGE program, a fully-instrumented field laboratory for enhanced geothermal systems research.
- Establish a new Energy-Water Desalination Hub to serve as a focal point for research, development and demonstration on integrated technological system solutions and enabling technologies for de-energizing, de-carbonizing, and reducing the cost of desalination to provide clean and safe water.
- Launch the sixth Clean Energy Manufacturing Innovation Institute as part of a multi-agency NNMI.

($K)

	FY 2015 Enacted	FY 2015 Current[a]	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016 $	FY 2017 vs FY 2016 %
Electricity Delivery and Energy Reliability						
Clean Energy Transmission and Reliability	34,262	33,336	39,000	30,300	-8,700	-22.3%
Smart Grid Research and Development	15,439	14,930	35,000	30,000	-5,000	-14.3%
Cybersecurity for Energy Delivery Systems	45,999	44,756	62,000	45,500	-16,500	-26.6%
Energy Storage	12,000	11,604	20,500	44,500	+24,000	+117.1%
Transformer Resilience and Advanced Components	0	0	5,000	15,000	+10,000	+200.0%
Grid Institute	0	0	0	14,000	+14,000	N/A
National Electricity Delivery	6,000	6,000	7,500	6,500	-1,000	-13.3%
State Distribution-Level Reform Program	0	0	0	15,000	+15,000	N/A
Infrastructure Security and Energy Restoration	6,000	6,000	9,000	17,500	+8,500	+94.4%
State Energy Assurance	0	0	0	15,000	+15,000	N/A
Program Direction	27,606	27,606	28,000	29,000	+1,000	+3.6%
Subtotal, Electricity Delivery and Energy Reliability	**147,306**	**144,232**	**206,000**	**262,300**	**+56,300**	**+27.3%**
Rescission of prior year balances	-331	-331	0	0	0	0.0%
Total, Electricity Delivery and Energy Reliability	**146,975**	**143,901**	**206,000**	**262,300**	**+56,300**	**+27.3%**

Appropriation Overview

Electricity Delivery and Energy Reliability (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. 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 enable U.S. economic prosperity and energy innovation in a global clean energy economy, delivering reliable, affordable, and clean electricity to consumers where, when, and how they want it.

OE programs work 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.
- Resiliency—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, Development, and Deployment—pursuing technologies to improve grid reliability, efficiency, flexibility, functionality, and security; and making investments and sponsoring demonstrations aimed at bringing new and innovative technologies to maturity and helping them transition to market.
- 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.
- 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.

[a] Funding reflects the transfer of SBIR/STTR to the Office of Science.

- Emergency Preparedness and Response—pursuing enhancements to the reliability, survivability, and resiliency of energy infrastructure, and facilitating faster recovery from disruptions to energy supply.

The OE mission is reflected in the Strategic Objective 2, support a more economically competitive, environmentally responsible, secure and resilient U.S. energy infrastructure, in the DOE Strategic Plan. OE also plays a critical role in implementation of the President's Climate Action Plan to mitigate the risks and enhance resilience against climate change.

The Request supports the Administration's energy strategy and emphasizes priorities that increase electric grid resilience, including managing risks, increasing system flexibility and robustness, increasing visualization and situational awareness, and deploying advanced control capabilities. The Request also continues crosscutting programs that coordinate across the Department. OE is part of the Grid Modernization and Cybersecurity crosscuts.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The OE FY 2017 Budget Request of $262 million includes $177 million that contributes to the Mission Innovation pledge, an increase of $24 million from the FY 2016 Enacted level of $153 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security.

Key FY 2015 Accomplishments

- ✓ OE worked collaboratively and strategically with other DOE programs and DOE's national laboratories to create the Grid Modernization Laboratory Consortium, to leverage and integrate the laboratories' innovative technologies more effectively.
- ✓ OE received an R&D 100 award for a 6.5kV silicon carbide junction field effect transistor semiconductor that can allow the density of next generation power converters used in energy storage devices to be increased 7 times and improve efficiency by 2 percent.
- ✓ "Data Privacy and the Smart Grid: A Voluntary Code of Conduct," developed to be used by utilities and third parties to protect consumer electricity data, was announced as one of President Obama's next steps help improve consumer awareness, choice and consent, and controls on data access.
- ✓ An OE-funded study on the risk and uncertainty of geomagnetic disturbance impacts on the electric power system resulted in a statistically rigorous estimate that power system engineers and planners can use to assess risks to high impact low frequency events, and has been cited numerous times in rulemaking on reliability standards.
- ✓ A prototype Microgrid Design Toolset (MDT) is being used to plan for and design community microgrids in Massachusetts and New Mexico. The MDT integrates energy assurance planning for uninterrupted power delivery, economic and environmental analyses to optimize costs and reduce CO_2 emissions, and physics-based analyses to meet power quality and reliability requirements.
- ✓ OE built upon the 2014 sea level rise study assessing impacts on energy infrastructure in New York City, Houston, Miami, and Los Angeles to study 4 additional cities and release an interactive tool online to visualize the results of this work.
- ✓ OE issued a Presidential Permit to Champlain Hudson Power Express Inc. to construct, operate, maintain, and connect a gigawatt high-voltage direct current transmission system from Quebec to New York City.
- ✓ FY 2015 marked the completion of OE's 330 Recovery Act projects. OE funding of $4.5 billion plus private funding from the electric sector resulted in a total investment of $9.5 billion to move us significantly closer to a more resilient, efficient, and secure power grid.

Program Highlights

The FY 2017 Budget Request reflects the Administration's priority on modernizing the electric grid and boosting the resilience of infrastructure. The Request accelerates ongoing efforts to support the Administration's energy strategy and emphasizes programs that increase electric grid resilience, including managing risks, increasing system flexibility and robustness, increasing visualization and situational awareness, and deploying advanced control capabilities.

- **Energy Storage**
  The Energy Storage program supports energy storage technology cost reductions, performance improvements, and reliability and safety validations, and works toward an equitable regulatory environment and industry acceptance. The FY 2017 Request initiates 3–4 new highly leveraged, cost-shared demonstrations with states encompassing 5MW+ of energy storage assets.

- **Transformer Resilience and Advanced Components (TRAC)**
  TRAC increases investments in the development of technologies and assessments to mitigate system vulnerabilities such as geomagnetic disturbances and electromagnetic pulses. Activities will also focus on developing next-generation

transformers to fill a critical gap identified through the 2015 Quadrennial Technology Review. Research efforts will address the unique challenges associated with high power levels (voltage and current), high reliability requirements (25–40 years of field operations), and high costs of critical components.

- **Grid Institute**
  The FY 2017 Budget Request supports initial funding for a new competitively selected Grid Clean Energy Manufacturing Innovation Institute as a part of the multi-agency National Network for Manufacturing Innovation. This Institute will focus on technologies related to critical metals for grid application, and advances will be broadly applicable in multiple industries and markets.

- **State Distribution-Level Reform Program**
  Distribution-Level Reform is new in FY 2017 and will award 5–10 cooperative agreements competitively to states, for a performance period of two years to utilize the grid architecture approach to address their system challenges. Achieving an effective design in any given geographic area will require governmental leadership (Federal and state), technological and analytic expertise, and collaboration among many stakeholders. The states will play important leadership roles and could benefit from the assistance that the proposed program could provide.

- **Infrastructure Security and Energy Restoration**
  The FY 2017 Budget Request supports development of a national energy infrastructure situational awareness visualization exercise program with state, local, tribal and territorial entities; and analysis of new and emerging threats including those resulting from supply chains and electromagnetic pulses.

- **State Energy Assurance**
  The FY 2017 Budget Request supports regional and state activities to improve capabilities to characterize energy sector supply disruptions; communicate among the local, state, regional, Federal, and industry partners; and identify gaps for use in energy planning and emergency response training programs. This will assist OE's state, local, tribal and territorial stakeholders in planning, training, and exercising in advance of energy emergencies.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Finalize the development of a Multi-Year Program Plan for Grid Modernization to create an integrated R&D program plan (between OE and EERE) that will help ensure the future grid will deliver reliable, affordable, secure, resilient, and clean electricity to consumers where they want it, when they want it, and how they want it.
- Develop the specifications for an open source distribution operating system that will enable a whole new level of visibility and control across a utility's entire service territory; development of advanced distribution grids will drive new applications leveraging system data for improved utility operations and stimulate new products and services for consumers.
- Collaborate with industry to mitigate cyber and physical security risks to the grid. In recent years, the energy sector has been subjected to a dramatic increase in focused cyber probes, data exfiltration, and malware development for potential attacks.

In FY 2017, the Budget Request proposes to:

- Issue a funding opportunity for a new NNMI focused on grid applications to help transition innovative materials processes and production technologies to industry.
- Enable transformational R&D on advanced distribution management systems, synchrophasor applications, and, especially, energy storage technologies to modernize and enhance the resilience of the Nation's electric grid backbone.
- Advance cybersecurity technologies and operational capabilities to fortify grid security.
- Launch two new state programs to facilitate reliable and flexible grid modernization by addressing distribution system challenges (State Distribution-Level Reform) and energy assurance planning (State Energy Assurance).

($K)

	FY 2015 Enacted	FY 2015 Current[1]	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016 $	FY 2017 vs FY 2016 %
Fossil Energy Research and Development[2]						
CCS and Advanced Power Systems						
Carbon Capture	116,000	112,400	131,000	170,352	+39,352	+30.0%
Carbon Storage	100,000	96,896	106,000	90,875	-15,125	-14.3%
Advanced Energy Systems	85,000	82,362	90,000	47,800	-42,200	-46.9%
Crosscutting Research and Analysis	49,700	48,260	50,700	59,350	+8,650	+17.1%
Total, CCS and Advanced Power Systems	**350,700**	**339,918**	**377,700**	**368,377**	**-9,323**	**-2.5%**
Fuel Supply Impact Mitigation	25,121	24,341	43,000	26,500	-16,500	-38.4%
Unconventional Fossil Energy Technologies	4,500	4,360	20,321	0	-20,321	-100.0%
NETL Research and Operations	88,029	88,029	91,984	76,070	-15,914	-17.3%
NETL Infrastructure	39,545	39,545	38,950	68,055	29,105	+74.7%
Program Direction	63,105	63,105	60,045	60,998	+953	+1.6%
Subtotal, Fossil Energy Research and Development	**571,000**	**559,298**	**632,000**	**600,000**	**-32,000**	**-5.1%**
Use of Prior Year Balances	0	0	0	-240,000	-240,000	N/A
Rescission of Prior Year Balances	-10,413	-10,413	0	0	0	N/A
Total, Fossil Energy Research and Development	**560,587**	**548,885**	**632,000**	**360,000**	**-272,000**	**-43.0%**

Appropriation Overview

The **Fossil Energy Research and Development (FER&D)** program advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels that are important to our Nation's security and economic prosperity. FER&D leads Federal research, development, and demonstration efforts on advanced Carbon Capture and Storage (CCS) technologies to facilitate achievement of the President's climate goals. FER&D also develops technological solutions for the prudent and sustainable development of our domestic unconventional oil and gas resources.

DOE is proposing a restructuring of the FER&D budget to streamline the structure, align subprograms that support related efforts under the same program, and provide a more comprehensive view of the costs associated with NETL. Importantly, one of the key motivations for the structural change is to eliminate the categorization by fuel type which is no longer appropriate for this R&D portfolio. The new budget structure reflects the fact that the CCS and Advanced Power Systems program supports CCS technologies, storage best practices, and innovative power systems integrated with CCS that are applicable to both coal and natural gas generation. Additional information on the restructuring can be found in Volume 3 in the FER&D chapter of the DOE FY 2017 Congressional Budget Request.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The Fossil Energy R&D FY 2017 Budget Request of $600 million includes $564 million for the support of Mission Innovation, an increase of $31 million from the Enacted FY 2016 of $533 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security.
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[1] Reflects transfer of $11,702,000 to the Office of Science for SBIR/STTR.
[2] FY 2015 and FY 2016 funding is shown in the new, proposed FY 2017 structure.

Program Highlights

- **CCS and Advanced Power Systems (formerly Coal/CCS and Power Systems)**
  The CCS and Advanced Power Systems program conducts research to reduce carbon emissions by advancing the environmental performance and efficiency of fossil energy systems integrated with CCS technologies. In addition, FER&D continues to manage previously funded major CCS demonstration projects.

  It is important to demonstrate that electric generation technology with CCS can be deployed at commercial scale while maintaining reliable, predictable and safe operations. Therefore, the FER&D portfolio includes several major integrated CCS demonstration projects encompassing different technological approaches and applications of CCS. A number of those projects have not yet reached financial close. DOE intends to deobligate $240 million from CCPI projects that have not yet reached financial close and repurpose these funds to support the FY 2017 R&D portfolio.

  - **Carbon Capture**
    Carbon Capture is focused on the development of post-combustion and pre-combustion CO_2 capture and compression technologies for new and existing fossil fuel-fired power plants and industrial sources. The Request will enable selection of one additional large-scale post-combustion capture pilot and will fund a total of three large-scale post-combustion pilots. FY 2017 funding will also enable continued transformational research and development (R&D) technology development for pre- and post-combustion capture. The program will also support a Front End Engineering Design (FEED) study and initial construction of a large pilot facility to capture CO_2 from a natural gas power system. The increase in FY 2017 funding will support two additional (four total) FEED studies for advanced combustion systems. The Advanced Combustion activity is moving under the Carbon Capture program in the proposed 2017 restructuring.

  - **Carbon Storage**
    The overall goal of Carbon Storage is to develop and validate technologies to ensure safe and permanent geologic storage of captured CO_2 from both coal and natural gas power systems. The FY 2017 Request supports: 1) storage field management projects, including the Regional Carbon Sequestration Partnerships, and other field characterization and injection projects; 2) risk and integration tool development; and 3) advanced storage R&D efforts, as part of the Department's cross-functional SubTER technical team, to develop laboratory and bench-scale technologies for identifying and obtaining new subsurface signals, ensuring wellbore integrity, and increasing understanding of the stress state and induced seismicity.

  - **Advanced Energy Systems (AES)**
    The AES mission is to increase the availability and efficiency of fossil energy systems integrated with CO_2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, advanced

Key FY 2015 Accomplishments

- ✓ FE selected six projects as part of a phase 1 effort to develop advanced, 2nd, generation post-combustion carbon capture technologies.
- ✓ The Carbon Storage subprogram selected five Phase I projects that will evaluate the potential benefits of brine extraction associated with carbon storage as a pressure management and enhanced water recovery operation. Extracting Brine from a CO_2 storage reservoir is a reservoir management technique that can improve storage efficiency by using pressure changes to influence the migration trend of the stored CO_2. Additionally, the extracted brine may be treated to produce fresh water, which could be of great value to regions where water resources are scarce.
- ✓ Archer Daniels Midland (ADM) Industrial Carbon Capture and Storage (ICCS) demonstration project at ADM's corn to ethanol biofuels plant – Construction is 97% complete with all of the electrical infrastructure currently in service and construction of the CO_2 pipeline completed. Drilling of all of the injection and monitoring wells is complete and ADM is awaiting EPA authorization to start injection of CO_2 for geological storage which is expected in the first half of 2016.
- ✓ Air Products ICCS demonstration at its hydrogen production facility in Port Arthur, Texas – The project has been operational for 3 years and has captured nearly 2.5 million tonnes of CO_2 which has been used for Enhanced Oil Recovery (EOR).
- ✓ Research Triangle Institute (RTI) has demonstrated over 1,000 hours of operations on the warm gas clean up at the Tampa Electric Company (TECO) facility in FL. This is a Recovery Act funded project that completed the task under budget and is a significant achievement in the IGCC program. RTI continues to run the system seeking 5,000 hours of successful operation.
- ✓ DOE's research findings on foam cement quality were featured in the January 2015 Society of Petroleum Engineers' Journal of Petroleum Technology. These results led to updated API standards and practices on field testing of foam cement that enable operators to install a competent barrier between the well and the formation. This will prevent fluids inside the well from contaminating aquifers and other geologic features that exist outside the well.

turbines, supercritical CO_2 (sCO_2), and solid oxide fuel cells. The decrease in the FY 2017 Budget Request will refocus the program in order to support the Supercritical Transformational Electric Power (STEP) Generation initiative, which is proposed as an activity under AES as part of the FY 2017 restructuring.

STEP supports the Department's sCO_2 crosscut which is focused on technology development for supercritical carbon dioxide-based power conversion cycles. These cycles can be applied to most heat sources, including fossil, nuclear, solar and geothermal applications, while offering significant improvements in efficiency, cost, footprint, and water use. Recognizing that the near-term deployment and potential market applications for commercial sCO_2 power cycles are primarily in the fossil energy area, the STEP pilot project is being managed by the Office of Fossil Energy R&D. FY 2017 funding will support initiation of the design and construction of the STEP facility.

- **Crosscutting Research and Analysis (formerly Crosscutting Research)**
  Crosscutting Research and Analysis fosters the development of innovative systems for improving availability, efficiency, and environmental performance of advanced energy systems with CCS. Crosscutting Research and Analysis leads efforts that support university-based fossil energy research including science and engineering education at minority colleges and universities. Under the proposed restructuring, this subprogram will also support the Mickey Leland Energy Fellowship (MLEF) Program, which aims to increase in the number of women and under-represented minorities entering the scientific and engineering career fields within the U.S. workforce. The increase in the FY 2017 Budget Request will focus on the development of new materials, catalysts, water efficient systems and technologies for power plants, and desalinization technologies for water produced through CCS. FY 2017 funding will also support immersive, interactive visualization technology and data communication optimization methods to improve the design and operation of advanced power systems with CCS.

- **Fuel Supply Impact Mitigation (formerly Natural Gas Technologies)**
  The Fuel Supply Impact Mitigation program is the new proposed name for the Natural Gas Technologies program. The program is comprised of three subprograms. The Environmentally Prudent Development subprogram will continue to conduct research in water quality, water availability, air quality, induced seismicity, and mitigating the impact of development of domestic unconventional oil and gas in collaboration with the Environmental Protection Agency and the Department of the Interior. The Emissions Mitigation and Quantification subprogram, which combines the former Emissions Mitigation from Midstream Infrastructure and the Emissions Quantification from Natural Gas Infrastructure subprograms, will conduct research on reducing methane emissions from natural gas infrastructure in the areas of advanced composite materials, non-reactive coatings with embedded sensors, and internal and external pipeline inspection and repair without the need to evacuate natural gas from the pipeline. Additionally, the subprogram will support emissions quantification research focused on updating and improving component-level emission factors across the natural gas value chain for EPA's Greenhouse Gas Reporting Program and the Greenhouse Gas Inventory. The Gas Hydrates subprogram will conduct investigations to confirm the nature and regional context of gas hydrate deposits in the Gulf of Mexico in coordination with the U.S. Geological Survey.

- **NETL Research and Operations**
  The NETL Research and Operations program is new for FY 2017. This restructuring of NETL operational lines is proposed to better describe NETL's funding requirements, increase consistency with other national laboratories, and increase transparency in how funds are utilized, promoting enhanced visibility into cost drivers and more efficient resource allocation decisions. This program includes certain funds that were part of the former NETL Coal Research and Development program as well as certain funds that were formerly in the NETL portion of Program Direction.

  The new NETL Research and Operations program supports NETL research activities. The program is comprised of the following subprograms: (1) Research and Development, (2) Site Operations, (3) Program Oversight and (4) Feasibility of Recovering Rare Earth Elements. The Research and Development funding supports salaries/benefits and travel for NETL staff directly associated with conducting both intramural and extramural research activities for FER&D programs, including scientists, engineers, and technical project managers. The Site Operations subprogram includes funding for Federal employees and contractors who perform site operations at the laboratories including operational costs such as grounds maintenance and utilities. The Program Oversight subprogram includes funding for Federal employees and contractors performing legal, finance, procurement, information technology, and human resources functions that are necessary for the performance of NETL research-enabling activities.

- **NETL Infrastructure**
  The NETL Infrastructure program is new for FY 2017. This budget line includes the former Supercomputer and Plant and Capital Equipment programs as well as portions of the Environmental Restoration, NETL Coal Research and Development, and Program Direction budget lines.

  The new NETL Infrastructure program supports the upkeep of a lab footprint valued at $600 million in three geographic locations -- Morgantown, WV; Pittsburgh, PA; and Albany, OR. The funding will provide infrastructure repairs and improvements for both laboratory/research facilities and site-wide/general purpose facilities. This budget line also includes fixed occupancy costs for operating and maintaining research facilities and other site-wide facilities, such as support services and other related costs for building maintenance and information technology infrastructure.

  The NETL high performance computer, Joule was commissioned in FY 2012. Given the rapid advances in computing technology, high-performance computers typically have an expected life cycle of approximately three years after which standard warranties run out, replacement parts are not readily available, and maintenance costs rapidly escalate. Increased funding is requested to cover the cost of replacing all of the out-of-warranty high-speed processors. Thanks to advances in technology, the computational power of the next generation equipment will be much greater. It is anticipated that the refresh will upgrade the processing speed from 0.5 pFLOPS to 5 pFLOPS, a 10-fold increase. While the increase in funding is significant, it allows NETL to obtain and maintain a world-class supercomputer capable of using the most advanced software to enable key energy research.

- **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 funding no longer includes support for Federal employees performing research enabling functions. Program Direction at NETL continues to include functions such as legal, finance, procurement, information technology and human resources that are necessary for the performance of NETL activities.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Speed the development of the next-generation CO_2 technologies through R&D and the execution of large-scale pilots. In FY 2016, construction is expected to be completed on two large-scale, coal-based CCUS demonstrations that will provide a technical foundation for new pilot projects validating the potential of emerging technology areas such as oxy-combustion and chemical looping.
- Use the LNG export studies released for public comment in December 2015 that evaluated the impact of LNG exports of 12 billion cubic feet per day (Bcf/d) to 20 Bcf/d, and the comments received on the studies, in the public interest evaluation of pending applications to export LNG to non-FTA countries.

In FY 2017, the Budget Request proposes to:

- Initiate the design and construction of a nominal 10 MWe Supercritical Carbon Dioxide (SCO_2) Pilot Plant Test Facility that supports the DOE Supercritical CO_2 crosscut.
- Complete FEED studies for four advanced combustion pilots and support initial construction of four large-scale pilot projects (including one run on natural gas) of advanced, second generation, carbon capture technologies that are critical to reducing cost and increasing energy efficiency to make low-carbon fossil energy market competitive.

($K)

	FY 2015 Enacted	FY 2015 Current[1]	FY 2016 Enacted	FY 2017 Request[2]	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Fossil Energy Petroleum Accounts						
Naval Petroleum and Oil Shale Reserves						
Production Operations	13,271	13,961	13,330	12,630	-700	-5.3%
Management	6,679	6,679	4,170	2,320	-1,850	-44.4%
Total, Naval Petroleum and Oil Shale Reserves	**19,950**	**20,640**	**17,500**	**14,950**	**-2,550**	**-14.6%**
Total, Elk Hills School Lands Fund	**15,580**	**15,580**	**0**	**0**	**0**	N/A
Strategic Petroleum Reserve						
Facilities Development and Operations	174,999	174,999	186,870	228,069	+41,199	+22.0%
Management for SPR Operations	25,001	25,001	25,130	28,931	+3,801	+15.1%
Total, Strategic Petroleum Reserve	**200,000**	**200,000**	**212,000**	**257,000**	**+45,000**	**+21.2%**
Northeast Home Heating Oil Reserve						
Northeast Home Heating Oil Reserve	7,600	7,600	7,600	6,500	-1,100	-14.5%
Rescission of Prior Year Balances	-6,000	-6,000	0	0	0	N/A
Total, Northeast Home Heating Oil Reserve	**1,600**	**1,600**	**7,600**	**6,500**	**-1,100**	**-14.5%**
Total, Fossil Energy Petroleum Accounts	**237,130**	**237,820**	**237,100**	**278,450**	**+41,350**	**+17.4%**

[1]Includes $690,000 in asset sales for NPOSR that can be used for the lease or replacement personal property at NPR-3.

[2]Does not include the use of $4,000,000 in prior-year balances for Northeast Home Heating Oil Reserve.

Appropriation Overview

Fossil Energy Petroleum Accounts consist of two energy security programs authorized under the Energy Policy and Conservation Act: (1) the Strategic Petroleum Reserve including 695 million barrels of crude oil stockpiled at government-owned Gulf Coast storage sites and 1 million barrels of gasoline stored in commercial facilities in the Northeast (the Northeast Gasoline Supply Reserve) as well as the (2) Northeast Home Heating Oil Reserve 1 million barrels of ultra low sulfur diesel oil – also stored in Northeast commercial terminals. DOE is also responsible for legacy environmental clean-up/remediation at the previously-sold Naval Petroleum Reserve No. 1 (NPR-1 at Elk Hills, California), and will continue post-sale activities in support of Naval Petroleum Reserve No. 3 (NPR-3 at Casper, Wyoming) landfill remediation and closure.

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 U.S. obligations under the International Energy Program, which avails the U.S. of International Energy Agency assistance through its coordinated energy emergency response plans, and provides a deterrent against energy supply disruptions. In 2015, the SPR acquired 4,194,296 barrels of crude oil using proceeds from the operational Test Sale performed in 2014. The acquisition operations were conducted without any safety or environmental incidents. The Northeast Gasoline Supply Reserve 1 million barrel inventory of gasoline continues to be maintained at leased commercial storage terminals along the East Coast to help mitigate the impacts of sudden and unexpected supply disruptions.

Key FY 2015 Accomplishments

- ✓ In FY 2015 the Strategic Petroleum Reserve acquired approximately 4.2 million barrels of crude oil using the proceeds from the 2014 operational Test Sale.
- ✓ On January 30, 2015, the Department of Energy finalized the sale of the Teapot Dome Oilfield located 35 miles north of Casper, Wyoming – known officially as the Naval Petroleum Reserve Number 3 (NPR-3) for the price of $45.2 million.

The FY 2017 Budget Request will provide the program with SPR operational readiness and drawdown capability of 4.25MB/d. The program will continue the degasification of crude oil inventory to ensure its availability and conduct wellbore testing and cavern remediation. Major changes from FY 2016 include: full funding for Protective Force positions at all sites; additional preventive/corrective maintenance related to corrosion; and, the addition of a custody transfer flow metering skid.

The Bipartisan Budget Act of 2015 requires the Department to submit to Congress a Strategic Review of the SPR by May, 2016. The Act also authorized DOE, subject to appropriation, to sell up to $2 billion in SPR oil to fund SPR infrastructure modernization. The results of the SPR Strategic Review will inform SPR infrastructure modernization and shall result in an FY 2017 budget amendment related to SPR modernization

- **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 131 areas of concern (AOCs) for which DOE is responsible for the environmental cleanup, 22 Areas of Concern (AOCs) have received a DTSC certification of "No Further Action"; 66 AOCs are under DTSC review; 20 AOCs require additional testing; and, 23 AOCs are awaiting field investigation or remediation activities. In FY 2017, NPR-1 will continue these assessments and remediation activities.

  The account also funds activities at the Naval Petroleum Reserve 3 (NPR-3) in Wyoming (the Teapot Dome field located 35 miles north of Casper, Wyoming), a stripper well oil field. On January 30, 2015, the Department finalized the sale of the Teapot Dome Oilfield for the price of $45.2 million. In FY 2016, NPR-3/RMOTC will complete Phase III of the disposition plan with activities including closure of contracts, preparation of field IT and equipment for disposal, records management processing, and disposal of personal property. FY 2017 activities include the closure and monitoring activities for the landfill. In nearly 40 years of operation under the Department's management, this stripper oilfield produced over 22 million barrels of oil resulting in over $569 million deposited into the U.S. Treasury.

- **Northeast Home Heating Oil Reserve**
  The Northeast Home Heating Oil Reserve (NEHHOR) FY 2017 Budget continues to maintain a 1 million barrel inventory of ultra-low sulfur distillate (ULSD), in 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. New commercial storage contracts have been awarded and are expected to go in effect on April 1, 2016. The Program will continue to focus its oversight and management on quality analysis of the Reserve as well as information technology support for the sales system.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Complete the long-range strategic review of the Strategic Petroleum Reserve required by Sec 402 of the Bipartisan Budget Act of 2015 and submit the long-range Strategic report to Congress.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Nuclear Energy						
Integrated University Program	5,000	5,000	5,000	0	-5,000	-100.0%
STEP R&D	5,000	4,835	5,000	0	-5,000	-100.0%
SMR Licensing Technical Support	54,500	54,500	62,500	89,600	+27,100	+43.4%
Reactor Concepts Research, Development and Demonstration	133,000	128,611	141,718	108,760	-32,958	-23.3%
Fuel Cycle Research and Development	197,000	191,242	203,800	249,938	+46,138	+22.6%
Nuclear Energy Enabling Technologies	101,000	97,666	111,600	89,510	-22,090	-19.8%
Radiological Facilities Management	25,000	25,000	24,800	7,000	-17,800	-71.8%
Idaho Facilities Management	206,000	206,000	222,582	226,585	+4,003	+1.8%
Idaho Sitewide Safeguards and Security	104,000	104,000	126,161	129,303	+3,142	+2.5%
International Nuclear Energy Cooperation	3,000	3,000	3,000	4,500	+1,500	+50.0%
Program Direction	80,000	80,000	80,000	88,700	+8,700	+10.9%
Transfer from Department of State	0	2,150	0	0	0	N/A
Subtotal, Nuclear Energy	**913,500**	**902,004**	**986,161**	**993,896**	**+7,735**	**+0.8%**
Rescission of Prior Year Balances	-80,121	-80,121	0	0	0	N/A
Total, Nuclear Energy	**833,379**	**821,883**	**986,161**	**993,896**	**+7,735**	**+0.8%**

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, waste storage and management, and security technologies, to help meet energy security, proliferation resistance, and climate goals.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The NE FY 2017 Budget Request of $994 million includes $804 million that contributes to the Mission Innovation pledge, a decrease of $58 million from the FY 2016 Enacted level of $862 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security.

Key FY 2015 Accomplishments

- ✓ Completed development of a key portion of a licensing framework for advanced reactor concepts. This major DOE-NRC cooperative effort is viewed by the advanced reactor vendor community as a defining step needed for deployment of advanced reactors.
- ✓ Issued and began implementation of multi-year plan to ensure safe and reliable long-term operation of the Advanced Test Reactor to support naval reactors programs, accident tolerant fuel development, advanced reactor fuels and materials research, nonproliferation programs and other high priority government, industry and university research.
- ✓ Successfully demonstrated computer based process of swapping out auxiliary salt-water pumps at a commercial power plant. Field-based computer-based procedures improve efficiency and human performance for nuclear power plants.
- ✓ Completed the first 5-year phase of the NE Modeling and Simulation Energy Innovation Hub, simulating all 12 fuel cycle cores for the life of TVA's Watts Bar #1 reactor. This pave the way for broader use of computational tools to reduce uncertainties in plant design and operating margins, decrease operating costs, and reduce the time and expense associated with the development of new nuclear energy technologies.
- ✓ Initiated construction of a new remote-handled low-level waste disposal facility at INL, ensuring wastes from research activities are managed safely and cost-effectively for the long-term.
- ✓ In technical collaboration with the Republic of Korea, DOE designed and is now installing a first-of-a kind engineering-scale demonstration to extract useful transuranic elements from commercial spent fuel in oxide form, and use them to cast metallic fast reactor fuel, which will provide important information regarding future nuclear fuel cycle options.
- ✓ Provided analysis to the President supporting authorization of development of a separate repository for disposal of defense high-level radioactive wastes.
- ✓ Began the process for developing consent based siting criteria for identifying locations for an interim storage facility.

Program Highlights

- **STEP R&D**
  FY 2017 activities to support the Office of Fossil Energy lead STEP pilot scale project and other NE sCO2 R&D activities are consolidated within Reactor Concepts Research, Development and Demonstration.

- **Small Modular Reactor Licensing Technical Support**
  The Request is consistent with the requirements outlined in the cooperative agreement with NuScale Power, and includes funding for site permitting and related licensing activities to support the final year of development for small modular reactor technologies previously selected under this program.

- **Reactor Concepts Research, Development and Demonstration**
  FY 2017 activities will include cost-shared efforts to extend the life of the existing commercial nuclear reactor fleet through research in the areas of materials aging and degradation, safety margin characterization, and safety technologies; and 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 2017 NE's sCO2 R&D activities, including support for the Office of Fossil Energy lead STEP pilot scale project, are consolidated within RCRD&D.

- **Fuel Cycle Research and Development**
  The FY 2017 Budget Request will expand efforts that support the Administration's waste management strategy including continued implementation of the activities to lay the groundwork for consent based interim storage and transportation of nuclear waste, and activities associated with exploring potential alternative disposal options for some DOE-managed spent nuclear fuel and high-level radioactive waste. In addition, FCR&D efforts include research and development (R&D) on deep borehole disposal and extended storage of high burnup used nuclear fuel. The Request also supports continued progress toward the development of one or more light water reactor fuels with enhanced accident tolerance.

- **Nuclear Energy Enabling Technologies**
  The FY 2017 Budget Request supports R&D and strategic infrastructure investments to develop innovative and crosscutting nuclear energy technologies. This program includes a strong investment in modeling and simulation tools, provides access to unique nuclear energy research capabilities through its Nuclear Science User Facilities (NSUF), and addresses workforce needs in critical, focused nuclear energy related fields. Collectively, Nuclear Energy Enabling Technologies supports the goals, objectives and activities of the Gateway for Accelerated Innovation in Nuclear (GAIN) initiative to make NE research capabilities accessible to industry engineers and scientists in a public-private partnership.

- **Radiological Facilities Management**
  FY 2017 activities will include the procurement of 40 and delivery of between 33 and 36 plate fuel elements required annually by university research reactors as determined by need and fuel availability.

- **Idaho Facilities Management and Idaho Sitewide Safeguards and Security**
  Idaho Facilities Management program will continue investments to improve the reliability and availability of the Advanced Test Reactor (ATR), complete the refurbishment of the Transient Reactor Test Facility (TREAT), initiate the resurfacing, reconstruction, and sealing of major primary roads at INL as part of a Departmental effort through the National Laboratory Operations Board (LOB) to focus critical funds on revitalizing general purpose infrastructure at DOE national laboratories and plants, and initiate the disposition of excess contaminated facilities at INL identified through Departmental efforts associated with the Excess Contaminated Facilities Working Group. The Idaho Sitewide Safeguards and Security program will continue to sustain program functionality at the level necessary to assure high confidence in the protection of INL assets and a high degree of customer service by maintaining effective staffing levels, proactive preventative and corrective maintenance programs, and a robust cyber security program. The FY 2017 Request will focus on implementing infrastructure investments, capital improvements, emerging technology investments and enhanced cyber security program capabilities to adequately secure site assets.

- **International Nuclear Energy Cooperation**
  FY 2017 activities include developing new bilateral collaboration with a variety of countries through R&D Agreements, implementing arrangements and Action Plan updates, as well as maintaining existing multilateral cooperation commitments in the International Framework for Nuclear Energy Cooperation and the International Atomic Energy Agency. In FY 2017, INEC will initiate efforts to develop a program for international nuclear energy education outreach, modeled after the Department of State's International Military Education and Training program, with the goal of supporting diplomatic, nonproliferation, climate, and international economic objectives for the safe and secure use of peaceful uses of nuclear technology in emerging countries developing nuclear energy programs.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Support a Small Modular Reactor (SMR) design certification application to Nuclear Regulatory Commission (NRC) by December 2016 and actively pursue a siting agreement for the first domestic deployment of an SMR.
- Develop a consent-based siting process to support a consolidated commercial used fuel storage, a permanent repository and a separate disposal path for defense waste, all supported by transportation planning and R&D activities such as the deep borehole field test.
- Finalize a field test plan for deep borehole disposal and issue an award for site management and borehole characterization.
- Establish the Gateway for Accelerated Innovation in Nuclear (GAIN) to focus advanced nuclear RD&D on the path to commercialization. Complete planning study for future advanced test/demonstration reactor capabilities.
- Continue efforts to resume nuclear reactor transient testing capabilities through the refurbishment and restart of the Transient Reactor Test Facility (TREAT) by 2018.

In FY 2017, the Budget Request proposes to:

- Complete DOE funding commitments for the NuScale Design Certification (DC) Project and early site permits by supporting NRC application review, NuScale's engineering and analytical efforts to respond to NRC review, and work toward finalizing the SMR design.
- Continue the Integrated Waste Management System storage, transportation and consent-based siting activities.
- Complete characterization of and initiate drilling of the field test borehole.
- Continue light water reactor sustainability efforts to maintain carbon free power generation by the current fleet and support R&D of advanced reactor technologies, including fast reactors, high temperature gas-cooled reactors and salt-cooled reactors.
- Initiate development of international outreach and education program to support emerging countries developing nuclear energy programs.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted[1]	FY 2017 Request	FY 2017 vs FY 2016 $	FY 2017 vs FY 2016 %
Office of Technology Transitions						
Office of Technology Transitions	0	0	0	8,400	+8,400	+100.0%
Total, Office of Technology Transitions	**0**	**0**	**0**	**8,400**	**+8,400**	**+ 100.0%**

[1] During FY 2016, funding for technology transitions is provided within the applied energy programs with appropriated funding for technology transition activities

Appropriation Overview

The mission of the Office of Technology Transitions (OTT) is to expand the commercial impact of the Department of Energy's (DOE) portfolio of Research, Development, Demonstration and Deployment (RDD&D) activities over the short, medium and long term. The OTT's work includes implementing the key responsibilities and duties assigned to the statutorily-created Technology Transfer Coordinator, program management of the Technology Commercialization Fund (TCF), development of the statutory Technology Transfer Execution Plan and Annual Technology Transfer Report, and the implementation of the Clean Energy Investment Center (CEIC). The OTT provides institutional support of technology transition activities throughout the Department including administrative, budgetary, planning and execution responsibilities.

Led by the Department's Technology Transfer Coordinator, a direct report and principal advisor to the Secretary of Energy on all matters related to technology transfer, commercialization, and lab-to-market initiatives, the OTT accomplishes this mission leveraging a small, highly skilled workforce working in concert with the national laboratories and stakeholders to develop strategies which identify high-value technological innovations and discoveries. Once these technologies are identified, the OTT workforce, in partnership with investors, injects the resources to rapidly move these to commercialization and into markets, thus enhancing U.S. competitiveness and energy technological leadership.

Technology transfer is a national priority as evidenced by enacted legislation and policy initiatives. OTT activities accomplish priorities set out in policy documents such as: (1) Climate Action Plan: Deploying Clean Energy, Unlocking Long-Term Investment in Clean Energy Innovation; (2) Cross-Agency Priority Goal on Lab-to-Market: Accelerating and improving the transfer of new technologies from the laboratory to the commercial marketplace; and (3) Presidential Memorandum 2011: Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses. The OTT activities align with the Department's Strategic Goal #1, Objective #3: "Deliver the scientific discoveries and major scientific tools that transform our understanding of nature and strengthen the connection between advances in fundamental science and technology innovation."

Program Highlights

The Department requests $8,400,000 for the OTT Program Direction in FY 2017. For FY 2015 and FY 2016, the technology transition activities are funded through funds executed within DOE's applied energy and science programs. For FY 2017, the Department is seeking funding consistent with the OTT's operational requirements, to fully establish the OTT as an integral and critical function within DOE. The resources requested for FY 2017 are required to maintain adequate staffing to fulfill Congressional and Administration direction to increase Departmental engagement for the transition of new and evolving energy technology to the U.S. markets, a principal component of Mission Innovation.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Office of Indian Energy[1]						
Tribal Energy Program	0	0	0	18,130	+18,130	+100.0%
Program Direction	0	0	0	4,800	+4,800	+100.0%
Total, Office of Indian Energy	**0**	**0**	**0**	**22,930**	**+22,930**	**+100.0%**

[1] Amounts prior to the FY 2017 Request were appropriated in Departmental Administration.

Appropriation Overview

While Indian Lands comprise just 2 percent of all U.S. lands, Indian Lands contain 5 percent of the total renewable energy generation potential of the entire Nation. The National Renewable Energy Laboratory (NREL)[1] estimated that the annual renewable energy generation potential on Indian Lands (27,661 million MWh) is nearly seven times the annual U.S. electricity generation from all sources, which was 4,117 million MWh in 2011.

The Energy Policy Act of 2005 established the Office of Indian Energy Policy and Programs (IE) to promote Indian tribal energy development, efficiency and use; reduce or stabilize energy costs; enhance and strengthen Indian tribal energy and economic infrastructure relating to natural resourced development and electrification; and to bring electrical power and service to Indian land and homes, where 14.2 percent of tribal households lack access to basic electricity, and providing opportunities for the development of significant fossil fuel and renewable energy resources that remain undeveloped in 2016 due to a variety of factors, including lack of access to capital, absence of tribal capacity for energy and economic development, and a complicated legal and regulatory structure governing the use of Indian lands.

To meet the statutory mandate, IE coordinates programmatic activities across DOE related to the development of energy resources on Indian lands and works with other state and federal Government agencies, Indian Tribes, Alaska Native Village and Regional Corporations and organizations to promote Indian innovative energy policies and initiatives. IE performs these functions on a fuel-neutral basis consistent with the federal government's statutory obligations concerning the federal/tribal trust responsibility, Tribal self-determination policy, and government-to-government relationship with Indian Tribes.

Program Highlights

In FY 2017, IE will double its FY2016 budget for Technical Assistance ($6 million) to Indian Tribes, Alaska Native Village and Regional corporations, and Tribal Energy Resource Development Organizations to meet the increased demand that has resulted from its outreach activities. The Office will continue to provide financial assistance ($12 million) in the form of grants for deployment of innovative energy systems and technologies and for efficient delivery of technical assistance through the intertribal technical assistance networks. The funding request provides an additional 6 FTEs within Program Direction that are critically necessary to carry out the programs, especially in the remote communities in Alaska and the Arctic.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Implement IE's Strategic Roadmap including building the IE, DOE and National Laboratory relationships and expanding the IE program team to meet increased demand for technical assistance and human capacity building from Indian tribes including Alaska Native village and regional corporations.
- Deploy the Intertribal Organization Network to help tribal communities build local expertise, skills, knowledge and resources to implement successful strategic energy solutions for tribes in all regions of the Lower 48 and Alaska.

[1] Doris, E., *Geospatial Analysis of Renewable Energy Technical Potential on Tribal Lands*. DOE/IE-0013 (Feb, 2013).

- Develop industry partnerships and promote public/private partnership opportunities to increase investment in Indian Country and improve access to private capital for development of community and commercial scale energy facilities on Tribal Lands.

In FY 2017, the Budget Request proposes to:

- Leverage Intertribal Technical Assistance Networks to support more sustainable and efficient capacity building and delivery of technical assistance.
- Continue the micro-grid and energy-water nexus crosscut activities to address growing needs in both areas throughout Indian Country.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Advanced Research Projects Agency – Energy (Discretionary Funding)						
Advanced Research Projects Agency – Energy Projects	252,000	252,000	261,750	318,000	+56,250	+21.5%
Program Direction	28,000	28,000	29,250	32,000	+2,750	+9.4%
Subtotal, Advanced Research Projects Agency – Energy	**280,000**	**280,000**	**291,000**	**350,000**	**+59,000**	**+20.3%**
Rescission of Prior Year Balances	-18	-18	0	0	0	N/A
Total, Advanced Research Projects Agency – Energy (Discretionary Funding)	**279,982**	**279,982**	**291,000**	**350,000**	**+59,000**	**+20.3%**
Advanced Research Projects Agency – Energy Trust (Mandatory Funding)	**0**	**0**	**0**	**150,000**	**+150,000**	**N/A**
Total, Advanced Research Projects Agency – Energy	**279,982**	**279,982**	**291,000**	**500,000**	**+209,000**	**+71.8%**

Appropriation Overview

As defined by its authorization under the America COMPETES Act of 2007, The Advanced Research Projects Agency-Energy (ARPA-E) catalyzes transformational energy technologies to enhance the economic, environmental, and energy security of the United States. A funding path to an annual budget of $1billion was proposed in the Rising Above the Gathering Storm report that recommended the formation of the agency. ARPA-E funds high-potential, high-impact energy projects that are too early for private sector investment, but could significantly advance the ways we generate, store, and use energy. ARPA-E plays a unique role in DOE's R&D organization, complementing and expanding the impact of DOE's basic science and applied energy programs.

ARPA-E has focused on early-stage energy technologies that can be meaningfully advanced from concept to laboratory scale prototype with a modest investment over a defined period of time. In its first six years, ARPA-E has established a nimble, effective management structure and developed a portfolio of technical programs that is delivering energy innovations with clear pathways to economic impact.

As of December 2015, ARPA-E has funded over 450 projects, with approximately $1.3 billion through 29 focused and open funding solicitations.

Key FY 2015 Accomplishments

- ✓ ARPA-E developed innovative new focused programs in fusion and solar power, distributed generation, grid optimization and storage, sustaining power-generation efficiency under conditions of drought and water scarcity, sustainable biofuels and efficient transportation networks.
- ✓ ARPA-E successfully executed the third OPEN solicitation in its history, selecting 41 cutting-edge projects spanning the entire spectrum of energy technologies to complement the new focused programs.
- ✓ As of February 2015, 141 of ARPA-E project teams had completed their funded work, and 34 ARPA-E projects had attracted more than $850 million in private-sector follow-on funding. Additionally, at least 30 ARPA-E project teams had formed new companies to advance their technologies, 8 had commercial sales of their products, and more than 37 ARPA-E projects had partnered with other government entities for further development.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The ARPA-E FY 2017 Budget Request of $350 million contributes to the Mission Innovation pledge, an increase of $59 million from the FY 2016 Enacted level of $291 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security. The

Budget Request also includes $150 million in mandatory funding as part of the ARPA-E Trust proposal that seeks $1.85 billion in mandatory funding over five years to reliably increase the program's transformational clean energy technology R&D.

Program Highlights

Under the Discretionary funding requested for FY 2017, ARPA-E expects to release funding opportunity announcements (FOA) for 7 – 8 focused technology programs, slightly increase the number of IDEAS proposals supported, and provide additional support for validation and field testing of successful projects that are deemed to have high potential for private sector follow-on. In FY 2017, ARPA-E will continue its stand-alone Small Business Innovation Research / Small Business Technology Transfer (SBIR/STTR) program to provide additional support to small businesses beyond the significant number of awards that go to small businesses via ARPA-E's standard FOA process.

Program Execution

The 2017 Discretionary Request will continue support for ARPA-E's dynamic core programs in early-stage transformational energy technologies that can be advanced with targeted, modest investments over a defined time. The Budget Request will also provide limited funding for qualification and field testing that will increase the likelihood that projects will be able to attract private sector investment for commercial development after ARPA-E's support has ended. Under the proposed mandatory funding, ARPA-E will add a new focus on innovative systems level development that will deliver larger, more rapid impacts from the transformational energy technologies developed under ARPA-E's existing core programs.

Under both the discretionary appropriations request and the mandatory proposal, ARPA-E will continue to manage a dynamic portfolio that is constantly changing to address new opportunities for energy innovation. This requires intense, timely assessment of new programs, using the following criteria:

- A new program must be based on significant transformational technological innovation that opens the opportunity for a large impact in the energy sector. The opportunity must be too early stage or too high-risk for private sector development.
- The technical area must have the potential to have substantial impact in one of ARPA-E's legislated mission areas, which are "reductions of imports of energy from foreign sources, reductions of energy-related emissions, including greenhouse gases; and improvement in the energy efficiency of all economic sectors."
- Investment in the technical opportunity addresses DOE's mission and goals, and may complement but not duplicate investment being carried out in other parts of DOE.
- There must be a pathway for advancing the technology toward hand-off to the private sector for commercial development and corresponding benefits to the economic and energy security of the U.S.

<u>Activities Supported by Discretionary Funding</u>

Definition of the FY 2017 Programs will be completed through detailed assessments in 2016 using the criteria described above. The areas under consideration continue to balance the overall ARPA-E program portfolio broadly across all sectors of energy generation, storage, and usage. The areas identified for assessment have significant opportunities for advances with modest levels of investment, and include:

- Innovative Approaches to Ocean Cultivation and Processing of Macro Algae for the Production of Low-carbon Fuels
- High-Impact Building Efficiency through Novel Sensor Technologies and Data Analytics
- Applications in efficient power conversion based on materials and component level advances in power electronics
- Hybrid Solar Systems combining advances in concentrated solar photo-voltaics and solar thermal storage
- Improved Light Metals Production integrated with Advanced Manufacturing to transform vehicle light-weighting.
- Advanced technologies for efficient, competitive domestic production of fuels and chemicals.
- Expanded investments in Information and Computing Technologies, to address efficiency-enhancing opportunities

<u>Activities Supported by the ARPA-E Trust (mandatory funding)</u>

Under the legislative proposal to create a mandatory funding stream for ARPA-E, ARPA-E would begin to address larger scale, more complex energy challenges than can be supported under its core program, while the dynamic core program activities will continue to be supported under appropriated funding. The ARPA-E Trust will inherently complement the relatively modest, targeted project investments of the ARPA-E core program, by designing transformational technical systems that accelerate delivery of value from

the results of the core program. The program structure will address different types of challenges in creating larger impact, including:

- Technical Challenges in Scale-up: addressing both scale of product and manufacturing scale
- Integration of multiple technical advances to create new functionality
- System-level Challenges: Addressing technical impacts at the scale of the energy sector
- Technological innovation to drive the creation of new business models

ARPA-E Trust programs will support projects with techno-economic goals designed to generate large impacts on the energy system and investable large-scale outcomes. The new activities under the ARPA-E Trust will be implemented in stages that draw from the outcomes of the core program and, in the years after FY 2017, the outcomes of the previous years' Trust investments. In this way, the planned growth in funding requested over the five year period will enable ARPA-E to scale up this new effort to deliver the maximum impact, while maintaining the agency's central focus on accelerating transformational energy technologies from concept to market.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- ARPA-E will add 6-7 new focused programs to its dynamic portfolio of technical innovations with potential for commercial impact in the energy sector. These will address opportunities for significant impact in building efficiency, biofuel crops that sequester carbon in soil, data center efficiency, using renewable electricity to create zero-carbon liquid fuels, new approaches to transportation efficiency and advanced materials to improve batteries for energy storage.
- The number of ARPA-E projects that deliver commercial impacts will continue to increase, with more teams receiving follow-on funding from the private sector, and more products reaching commercial sales.

In FY 2017, the Budget Request proposes to:

- ARPA-E will add 7-8 new focused programs to its dynamic portfolio of technical innovations with potential for commercial impact in the energy sector. These will address opportunities for significant impact in some areas of macro-algae-based biofuels, advanced materials, data analytics approaches to building efficiency, applications incorporating efficient power conversion, hybrid solar systems, light metals in transportation and advanced manufacturing, and grid optimization.
- Under proposed mandatory funding, ARPA-E will implement the first stage of its growth path, and deliver new projects that address larger scale, more complex energy challenges than can be supported under its core program. The new projects will be designed to generate large impacts on the energy system and investable large-scale outcomes.
- The number of ARPA-E projects that deliver commercial impacts will continue to increase, with more teams receiving follow-on funding from the private sector, and more products reaching commercial sales.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Energy Information Administration						
National Energy Information System	117,000	117,000	122,000	131,125	+9,125	+7.5%
Total, Energy Information Administration	**117,000**	**117,000**	**122,000**	**131,125**	**+9,125**	**+7.5%**

Appropriation Overview

The **U.S. Energy Information Administration (EIA)** is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information and analysis to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. As the nation's premier source of energy information, EIA conducts a data collection program covering the full spectrum of energy sources, end uses, and energy flows; generates short- and long-term domestic and international energy projections; and performs timely, informative energy analyses. EIA supports Goal 1 (Science and Energy) of the DOE Strategic Plan.

Program Highlights

The FY 2017 Budget Request maintains EIA's core energy activities funded in the FY 2016 appropriation, while also expanding the data collection and analysis program to serve several emerging stakeholder needs:

Key FY 2015 Accomplishments

- ✓ Began monthly survey-based collection of new crude oil and expanded natural gas production data.
- ✓ Launched monthly reporting on shipments of crude oil by rail.
- ✓ Initiated first-ever collection of hourly electricity demand data from the nation's balancing authorities.
- ✓ Incorporated state-level estimates of distributed solar photovoltaic in EIA's monthly electricity data.
- ✓ Completed independent and impartial policy analysis reports, such as analysis of the impacts of the Clean Power Plan proposal, and the effects of removing restrictions on U.S. crude oil exports.
- ✓ Developed state-of-the-art tools to improve customer access to energy data.

- **Revamp petroleum data and analysis to provide more regional detail:** EIA's petroleum data have historically focused on the five World War II era Petroleum Administration for Defense (PAD) Districts, which is no longer sufficient to address many policymaker questions and market issues. EIA is seeking to add more regional detail, which will require both one-time updates and a permanent increase in processing and review effort to produce more granular information. EIA is planning to provide additional analysis of regional refining and product markets.

- **Enhance commercial building energy efficiency data**: EIA will build upon new methodologies from its residential building data collection to realize efficiencies in its commercial building survey, such as better sampling frames, more efficient collection modes, and development of a new survey instrument for collecting commercial building energy characteristics. Additionally, in response to the Energy Efficiency Improvement Act of 2015, EIA will continue to evolve its energy consumption program by beginning to test methods for tenant-level energy data collections. EIA will pilot a study to evaluate what sampling frames and techniques, survey instruments, collection protocols, and statistical estimation methods would support a "Tenant Star" energy efficiency rating system.

- **Expand international analysis, including Canada-Mexico collaboration and key economies in Asia:** With rapid growth in U.S. oil and natural gas production there is an acute need for better understanding of domestic energy markets within the context of the world energy system, particularly export scenarios for crude oil, petroleum products, and liquefied natural gas. Additionally, EIA will continue to collaborate with counterparts in Canada and Mexico to improve the quality and transparency of North American energy data with the ultimate goal of harmonizing product definitions and classifications. Mapping of North American infrastructure and current energy flows will also be expanded to improve market transparency.

- **Collect transportation energy consumption data**: EIA will explore options and partnerships to collect and analyze data on personal vehicle transportation related to macroeconomic, demographic, and behavioral changes, such as driver licensing rates and access to alternative transportation options, which contributed to recent trends in vehicle miles traveled. These data will help in developing projections of motor fuel demand, and also will be highly useful to policymakers who assess, plan, and fund energy infrastructure needs.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Title 17 – Innovative Technology Loan Guarantee Program						
Administrative Operations	42,000	42,000	42,000	37,000	-5,000	-11.9%
Loan Guarantee, Offsetting Collections	-25,000	-25,000	-25,000	-27,000	-2,000	-8.0%
Total, Title 17 – Innovative Technology Loan Guarantee Program	**17,000**	**17,000**	**17,000**	**10,000**	**-7,000**	**-41.18%**

Appropriation Overview

The **Innovative Technology Loan Guarantee Program (LGP)**, as authorized under Title XVII of the Energy Policy Act of 2005, 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. LGP supports the goals and objectives in the President's Climate Action Plan by supporting the deployment of innovative clean energy technologies. In the Title 17 program, LGP has closed over $24 billion in loan guarantees and issued over $2 billion in conditional commitments, including loan guarantees for a wide-range of renewable energy technologies and the first new commercial nuclear power plant to be licensed and begin construction in the U.S. in three decades.

The FY 2017 LGP Budget Request will allow LPO to monitor the existing portfolio and continue efforts to deploy $24.9 billion in current loan authority and $169.6 million in current section 1703 credit subsidy appropriations for innovative energy projects. LGP's FY 2017 Budget Request includes $4 billion in additional loan authority.

Portfolio Status

- ✓ Total Amount Disbursed: $15,596M
- ✓ Total Amount Repaid: (Principal and Interest) $2,953M
- ✓ Total Amount of Sale/Write-offs: $11.95M

Program Highlights

The FY 2017 Budget Request will help accelerate the domestic commercial deployment of innovative clean energy while supporting the President's Climate Action Plan. Furthermore:

- LGP is accepting and reviewing new applications for the following three technologies;
  - Advanced Fossil Energy Projects Solicitation.
  - Renewable Energy and Efficient Energy Projects Solicitation
  - Advanced Nuclear Energy Projects Solicitation.
- Over the course of FY 2017, LGP expects to accept and review applications under the solicitations and work to issue conditional commitments and close loans in order to use existing loan authority and credit subsidy.

$27 million of administrative expenses are expected to be offset by fees collected from applicants and borrowers.

Key FY 2015 Accomplishments

- ✓ 33 total loan guarantees issued, of which $21.3 billion has been obligated and $17 billion has been disbursed.
- ✓ 20 (of 23 active) projects in partial to full operating phase.
- ✓ Announced issuance of the remaining $1.8 billion in loan guarantees for Vogtle Advanced Nuclear Energy Project.
- ✓ Title XVII projects produced enough clean energy to power more than 1 million average American homes annually.
- ✓ As of September 2015, LPO's portfolio of projects have prevented 13.1 million metric tons of CO_2 emissions, and saved or created 21,000 American jobs.
- ✓ Increased the potential of the Advanced Fossil Energy Projects Solicitation and Renewable Energy and Efficient Energy Projects Solicitation:
  - Made an additional $500 million in loan guarantee authority available for each solicitation.
  - Released clarification that certain Distributed Energy Projects are eligible for loan guarantees for both solicitations.
  - Issued new rounds of application deadlines for both solicitations.

Planned and Proposed Accomplishments

In FY 2016 and FY 2017, the Department plans to:

- LPO remains focused on issuing conditional commitments for loan guarantees on eligible projects to support the deployment of a new round of innovative technologies. LPO also continues to prudently manage its existing $32 billion portfolio of loan guarantees to ensure the health of the portfolio remains strong. LPO is working to utilize existing loan authority to support innovative energy technologies that avoid, reduce, or sequester greenhouse gas emissions. As of September 2015, LPO-financed projects have avoided more than 25 million metric tons of CO2 emissions. Many projects recently completed construction; however, once all projects are operating at capacity, the LPO portfolio is expected to avoid over 19 million metrics tons of CO2 emissions annually.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Advanced Technology Vehicles Manufacturing Loan Program						
Administrative Expenses	4,000	4,000	6,000	5,000	-1,000	-16.7%
Total, Advanced Technology Vehicles Manufacturing Loan Program	**4,000**	**4,000**	**6,000**	**5,000**	**-1,000**	**-16.7%**

Appropriation Overview

The **Advanced Technology Vehicles Manufacturing (ATVM) Loan Guarantee Program** supports the manufacturing of advanced technology vehicles and associated components in the United States. ATVM accelerates the domestic commercial deployment of advanced technology vehicles at a scale sufficient to meaningfully contribute to the achievement of our national clean energy objectives. These include reducing domestic dependence on oil; mitigating greenhouse gas emissions; and enhancing American competitiveness in the 21st century global economy.

Portfolio Status

- ✓ Total Amount Disbursed: $8,646M
- ✓ Total Amount Repaid (Principal and Interest): $2,587M
- ✓ Total Amount of Sale/Write-offs: $186M

The FY 2017 Budget Request for ATVM will allow the Loans Program Office (LPO) to monitor the existing portfolio and conduct underwriting on new projects. The appropriation will cover ATVM's 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. LPO/ATVM has been engaged with industry in discussions on potential new applications from qualified vehicle and component manufacturers and originates new loans using existing loan authority.

Program Highlights

Key FY 2015 Accomplishments

- ✓ 5 total loans issued, of which $8 billion has been obligated and $7.3 billion has been disbursed.
- ✓ Announced a conditional commitment for a $259 million loan to Alcoa, Inc.
- ✓ Funding for ATVM projects have contributed to the production of more than 1 million cars with EcoBoost engines which are expected to be sold for the first time in a single year in 2015.
- ✓ As of September 2015, LPO's portfolio of projects have prevented 11.9 million metric tons of CO_2 emissions – the pollution reduction equivalent to taking 5.28 million cars off the road.

- As of September 2015, ATVM projects have saved 1.35 billion gallons of gasoline.
- ATVM's projects have supported over 35,000 jobs domestically.

In FY 2016 and FY 2017, the Department plans to:

- LPO remains focused on issuing conditional commitments for loans on eligible projects to support the development of advanced technology vehicles and associated components in the U.S. LPO also continues to prudently manage its existing $32 billion portfolio of loan guarantees to ensure the health of the portfolio remains strong. LPO is working to utilize existing loan authority to support advanced technology vehicle manufacturing projects that help achieve rising fuel economy standards, create and preserve American manufacturing jobs, expand domestic manufacturing, and deploy new technology.

The FY 2017 Budget Request provides $6.7 billion to institutionalize an enterprise-wide focus on improving the efficiency and effectiveness of DOE programs and operations.

The Budget Request includes $6.1 billion for Environmental Management, $99 million below the FY 2016 Enacted level for the Department to address its responsibilities for the cleanup of large quantities of liquid radioactive waste, spent nuclear fuel, contaminated soil and groundwater, and deactivating and decommissioning excess facilities used by the nation's nuclear weapons program. This includes $2.4 billion to maintain progress on constructing and operating facilities to address waste stored in underground tanks at sites in Washington, South Carolina, and Idaho. In addition, this request includes a proposal for mandatory funding of $674 million for deactivating, decommissioning, and demolition of the excess gaseous diffusion plants at Oak Ridge, Tennessee; Paducah, Kentucky; and Portsmouth, Ohio.

Strategic Goal

Position the Department of Energy to meet the challenges of the 21st century and its responsibilities by employing effective management and refining operational and support capabilities to pursue departmental missions.

Environmental & Legacy Management	**FY17 ($)**
✓ Environmental Management	6.1B
✓ Legacy Management	154M
Subtotal, Environmental & Legacy Management	*6.3B*
Management & Performance Functions	
✓ Environment, Health, Safety and Security	197M
✓ Chief Information Officer	93M
✓ Management	59M
✓ Chief Human Capital Officer	25M
✓ Project Management and Oversight Assessments	18M
✓ Economic Impact and Diversity	11M
✓ Hearings and Appeals	6M
✓ Cost Estimating and Program Evaluation	5M
✓ Energy Jobs Development	4M
Subtotal, Management &Performance Functions	*418M*

Following the fire and radiation leak that shut down the Waste Isolation Pilot Plant, the Request includes $271 million to maintain critical progress toward returning to normal operations, with a goal of establishing interim operations/waste emplacement underground by the end of 2016. The Request also includes $1.5 billion, $85 million above the FY 2016 Enacted level, to support the Department's proposal to the court to amend the Consent Decree between DOE and the State of Washington for completion of the Waste Treatment and Immobilization Plant and retrieval of waste from 19 Single Shell Tanks. DOE's proposed modification would require DOE to install new infrastructure to allow DOE to begin treating low level waste by the end of 2022, without waiting for completion of facilities affected by the technical issues.

Building on the Department's continued emphasis on management and performance, the FY 2017 Budget Request funds a number of initiatives that identify and institutionalize improvements and efficiencies in Departmental operations, to include evidence-based reviews on project management; human resource delivery and talent management; information technology infrastructure; and aging Departmental infrastructure.

The Department is also aggressively pursuing implementation of a Secretarial initiative to improve project management, for which the Budget includes $18 million for an independent office on project management oversight and assessments. With senior management focus on DOE's total project portfolio, DOE will be able to hold contractors and programs accountable for large and at risk projects, receiving early warning notifications and quarterly updates. The Budget also includes $5 million to establish an independent, statutory office, similar to that at the Department of Defense, to set cost estimating policy and provide timely unbiased program evaluation analysis and cost estimation.

The Request continues support for the Human Resources (HR) Shared Services Centers, which allows for a more efficient and effective HR model across DOE. It also invests in the implementation of the results of a talent management study that help develop a corporate approach to talent acquisition in order to consistently and effectively attract, develop, and retain the best workforce to meet mission needs. In addition, the Request supports several critical information technology improvements, including implementation of Federal Information Technology Acquisition Reform Act (FITARA) requirements, network refresh activities and modernization efforts to address DOE's legacy IT infrastructure.

The Request also supports safe and reliable world class facilities by investing in new infrastructure and establishing a sustainable trajectory for the Department's existing infrastructure by ensuring no increase in the backlog of deferred maintenance at facilities across the complex.

Additionally, the FY 2017 Request reflects the establishment of the Office of Energy Jobs Development in 2016, consolidating ongoing activities across the Department (formerly coordinated via the Jobs Strategy Council), to compile survey data and deliver an annual energy jobs and workforce report that details growth/shifts in the energy and advanced manufacturing industries, fills the data gaps that currently exist in Bureau of Labor Statistics data gathering on renewable energy, energy efficiency, and advanced manufacturing jobs, and identifies jobs skills needed in the energy sector.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016 $	FY 2017 vs FY 2016 %
Environmental Management by Site						
Carlsbad/Waste Isolation Pilot Plant (WIPP)	324,455	324,455	304,838	271,000	-33,838	-11.1%
Idaho	405,103	404,929	401,919	370,088	-31,831	-7.9%
Oak Ridge	431,142	431,142	468,407	391,407	-77,000	-16.4%
Mandatory	*0*	*0*	*0*	*178,188*	*+178,188*	*N/A*
Paducah	269,773	269,773	268,402	272,310	+3,908	+1.5%
Mandatory	*0*	*0*	*0*	*207,916*	*+207,916*	*N/A*
Portsmouth	275,828	273,828	288,970	322,653	+33,683	+11.7%
Mandatory	*0*	*0*	*0*	*257,645*	*+257,645*	*N/A*
Richland/Hanford	1,007,230	1,007,230	990,653	800,000	-190,653	-19.2%
River Protection	1,212,000	1,212,000	1,414,000	1,499,965	+85,965	+6.1%
Savannah River	1,259,542	1,259,542	1,336,566	1,448,000	+111,434	+8.3%
Lawrence Berkeley National Laboratory	0	0	17,000	0	-17,000	-100.0%
Lawrence Livermore National Laboratory	1,366	1,366	1,366	1,396	+30	+2.2%
Nevada	64,851	64,851	62,385	62,176	-209	-0.3%
Sandia National Laboratories	2,801	2,801	2,500	4,130	+1,630	+65.2%
Separations Process Research Unit (SPRU)	0	0	0	3,685	+3,685	+100.0%
West Valley Demonstration Project	60,457	60,457	61,804	63,628	+1,824	+3.0%
Energy Technology Engineering Center	8,959	8,959	10,459	10,459	0	+0.0%
Los Alamos	189,600	189,600	185,000	189,000	+4,000	+2.2%
Moab	35,663	37,867	38,644	34,784	-3,860	-10.0%
Other Sites	13,297	13,297	14,389	9,389	-5,000	-34.7%
Headquarters Operations	38,979	38,517	69,238	74,979	+5,741	+8.3%
Mandatory	*0*	*0*	*0*	*30,000*	*30,000*	*N/A*
Program Direction	280,784	280,784	281,951	290,050	+8,099	+2.9%
Uranium Enrichment Decontamination and Decommissioning Fund Contribution	463,000	463,000	0	155,100	+155,100	+100.0%
Subtotal, Environmental Management by Site	**6,344,830**	**6,344,398**	**6,218,491**	**6,274,199**	**+55,708**	**+0.9%**
Uranium Enrichment Decontamination and Decommissioning Fund Discretionary Payment	-463,000	-463,000	0	-155,100	-155,100	-100.0%
Rescission of Prior Year Balances	-20,813	-20,813	0	0	0	-100.0%
Total, Environmental Management	**5,861,017**	**5,860,585**	**6,218,491**	**6,119,099**	**-99,392**	**-1.6%**
Total Mandatory	**0**	**0**	**0**	**673,749**	**+673,749**	**N/A**

Appropriation Overview

The Office of Environmental Management (EM) supports the Department's Strategic Plan to position the Department of Energy (DOE) to meet the challenges of the 21st century and 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 special nuclear material, 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 five 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 2017 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 and management of the tank farms. In addition, the Request supports continued construction of the Salt Waste Processing Facility, Saltstone Disposal Unit #6, and Saltstone Disposal Unit #7, and operation of the Actinide Removal Process and Modular Caustic Side Extraction Unit. This unit will be needed until the Salt Waste Processing Facility begins operation. The Request also supports the operations of the Saltstone Facility and the Effluent Treatment Facility. The FY 2017 Request also supports the Savannah River Site to operate H Canyon in a safe and secure manner, 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 2016 Enacted level provides additional support leading to startup of Salt Waste Processing Facility in 2018; supports tank closure and bulk waste removal activities to meet FY 2016 enforceable milestones; and provides additional funding for Salt Disposal Unit #7 design activities.

EM Key Cleanup Progress to Date

- ✓ Producing 4,000 canisters of vitrified high-level waste at the Defense Waste Processing Facility at Savannah River, enabling closure of seven high-level storage tanks.
- ✓ Completing cleanup of the bulk of the River Corridor at Hanford, including more than 500 facilities and 1,000 remediation sites.
- ✓ Converting and packing over 23,000 tons of depleted uranium hexafluoride for final disposition at Portsmouth.

- **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. Its mission includes operation, maintenance, engineering, and construction activities in the tank farms, as well as managing a multi-year construction project to build a Waste Treatment and Immobilization Plant (WTP) to process and immobilize the tank waste in a solid glass form that is safe for permanent disposal. The FY 2017 Request reflects continued progress toward important cleanup required by the Consent Decree and Tri-Party Agreement. In summary, the Office of River Protection Budget Request is designed to maintain safe operations for the tank farms; to achieve progress in meeting regulatory commitments; to enable the development of facilities necessary to enable waste treatment operations; to continue construction focus on the Low-Activity Waste Facility, Balance of Facilities, and Analytical Laboratory; to resolve significant technical issues with the Pretreatment and the High-Level Waste Facilities; and to protect workers, the public, and environment. The FY 2017 Request includes funding for two line-item projects: 1) 01- D-416, the Waste Treatment and Immobilization Plant ($690,000,000) and 2) 15-D-409, the Low Activity Waste Pretreatment System ($73,000,000). The mission of the Waste Treatment and Immobilization Plant Project is to construct a treatment facility to blend waste from the tank farms with molten glass and then pour it into stainless steel canisters suitable for long-term storage (in the case of high-level waste) and disposal (in the case of low-level waste). The mission of the Low Activity Waste Pretreatment System is to remove tank waste solids and cesium in order to supply a low activity waste feed stream directly to the Low Activity Waste Facility. DOE's proposal to the Court to amend the Consent Decree has a milestone to complete direct feed low activity waste hot commissioning by December 31, 2022.

- **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 2017 Request represents continued achievement of important cleanup progress required by the Tri-Party Agreement. In summary, the Richland Budget Request is designed to maintain Richland safe operations; Hanford site-wide services; continue groundwater remediation; complete Plutonium Finishing Plant demolition; capping and demobilization, maturing of technology, and approach for 300-296 waste site soil beneath building 324; completion of trenches 618-10 Vertical Piping Units; and support K- West Basin sludge removal progress. Cleanup work is accomplished while

maintaining safe and compliant waste management, decontamination and decommissioning, and groundwater capabilities in the Central Plateau. The decrease from the FY 2016 Enacted level is attributed to completed scope and facility modifications to prepare for installation of sludge removal systems for the K West Basin, as well as, purchase of the engineered containers for sludge repackaging; and completion of remediation in the 300 area, 100K area and 618-10 trenches.

- **Oak Ridge**
  At Oak Ridge, the FY 2017 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 Building K-27 at East Tennessee Technology Park; and continue design for the 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 continues for the Sludge Processing Facility Buildout project. Additionally, the Request supports direct disposition of Consolidated Edison Uranium Solidification Project material from Building 3019, assuming resolution of stakeholder concerns. The decrease from the FY 2016 Enacted level is attributed to the progress in complaint D&D activities.

- **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 and high-level waste from Idaho. Idaho's FY 2017 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 Facility to process transuranic and mixed low level wastes. The Request will continue progress in retrieving targeted waste at the Subsurface Disposal Area under the Accelerated Retrieval Project. It will also continue activities for retrieval and treatment of sodium bearing waste from the four remaining tanks and continue progress towards closure of the tank farm and management of spent nuclear fuel, including retrieval of fuel from wet storage to dry storage. The decrease from the FY 2016 Enacted level is attributed to progress in treatment, packaging, and certification of Idaho Settlement Agreement remote-handled transuranic waste and additional canister storage that may not be needed in FY 2017 due to processing waste at the Integrated Waste Treatment Unit.

- **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. WIPP suspended operations on February 5, 2014, following a fire involving an underground vehicle and an unrelated radioactive release that occurred February 14, 2014. The FY 2017 Budget Request includes activities to resume waste emplacement operations in first quarter FY 2017, including continued implementation of corrective actions and safety management program improvements, corrective actions from contractor management assessments, completion of Operational Readiness Reviews and commencement of waste emplacement operations. Additionally, funding provides for completion of repairs of New Mexico Roads used for the transportation of DOE shipments of transuranic waste to the Waste Isolation Pilot Plant, specifically the North Access Road to the Waste Isolation Pilot Plant, and community and regulatory support. Activities include mine stabilization, mining, mine habitability activities in all underground areas, continued decontamination of contaminated areas, and upgrades, purchases and maintenance and repair to continue infrastructure improvements. The budget supports the Central Characterization Project and maintains shipping capability between the generator sites and WIPP. Additionally, there is limited finding for progress in design of a new permanent ventilation system that is needed to support normal operations (simultaneous mining, emplacement and facility maintenance). The FY 2017 Budget Request reflects the decrease in recovery requirements because of the considerable progress made to date and planned through FY 2016.

- **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, all with close involvement of local community stakeholders. In addition to ongoing environmental cleanup and DUF6 operations, Paducah's FY 2017 Budget Request supports activities to continue the environmental remediation and further stabilize the gaseous diffusion plant. The stabilization activities include uranium deposit removal, facility modifications, surveillance and maintenance, and activities to remove hazardous materials. The Request also supports the design of the Paducah potential On-Site Waste Disposal Facility project, if the project is selected as the appropriate remedy. The increase from the FY 2016 Enacted level is attributed to decontamination and decommissioning activities, construction of the On-Site Waste Disposal Facility project, and additional investments in safeguards and security.

- **Portsmouth**
  The FY 2017 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 2017 Request also includes funding for design and construction of a potential on-site landfill for the disposal of waste, which is expected to be generated from the demolition of the Portsmouth Gaseous Diffusion Plant and associated facilities. In addition, the Request will continue the safe operation of the DUF6 Conversion facility that converts depleted uranium hexafluoride into a more stable depleted uranium oxide form suitable for reuse or disposition. The increase from the FY 2016 Enacted level is attributed to decontamination and decommissioning activities, construction of the On-Site Waste Disposal Facility project, and additional investments in safeguards and security.

Planned and Proposed Accomplishments

In FY 2016, the Department plans to:

- Continue construction of the Low Activity Waste (LAW) facility at the Waste Treatment Plant at Hanford, including design of a low activity waste new pretreatment system; and continue technical issue resolution on Pretreatment and High Level Waste facilities.
- Continue to execute major clean-up projects (e.g., Integrated Waste Treatment Unit, Plutonium Finishing Plant, and Salt Waste Processing Facility.
- Complete the K-31 Building demolition project at the Oak Ridge site and continue the removal of legacy material from Building 3019.
- Commence construction activities at the Portsmouth site for the On-Site Waste Disposal facility.
- Work with regulators to achieve realistic, risk-informed cleanup programs.

In FY 2017, the Budget Request proposes to:

- Safely resume waste emplacement at the Waste Isolation Pilot Plant (WIPP).
- Continue to process, characterize, and package approximately 4,500 cubic meters of contact-handle and remote-handle transuranic waste at the Idaho site to prepare it for disposal at offsite facilities.
- Continue demolition of the K-27 Building at the East Tennessee Technology Park, at the Oak Ridge site.
- Complete deactivation and declaration of criticality incredible and initiate downgrade (from a Category II Nuclear Facility to a radiological facility) of X-326, the first process building, for "demolition ready" in FY 2017, at the Portsmouth site.
- Continue construction and commissioning activities at the Savannah River Site to achieve startup of the Salt Waste Processing Facility in 2018 and support receipt of foreign and domestic research reactor spent nuclear fuel.
- Complete project closeout activities for the Plutonium Finishing Plant at the Richland site.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Office of Legacy Management						
Legacy Management	158,639	158,639	154,080	140,306	-13,774	-8.9%
Program Direction	13,341	13,341	13,100	14,014	+914	+7.0%
Subtotal, Office of Legacy Management	**171,980**	**171,980**	**167,180**	**154,320**	**-12,860**	**-7.7%**
Rescission of Prior Year Balances	-169	-169	0	0	0	N/A
Total, Office of Legacy Management	**171,811**	**171,811**	**167,180**	**154,320**	**-12,860**	**-7.7%**

Appropriation Overview

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

The LM program supports the Strategic Plan goal of Management and Performance: Position the Department of Energy (DOE) to meet the challenges of the 21st century and the Nation's Manhattan Project and Cold War legacy responsibilities by employing effective management and refining operational and support capabilities to pursue departmental missions. LM is also a leader in cutting resource waste, supporting energy efficiency and reducing energy use in Federal buildings, including certification by the U.S. Green Building Council for the LM records storage facility and Fernald Preserve Visitors Center.

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 2017, 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 of the sites LM maintains both the physical and electronic records and responds to over 1,600 requests for information each year. LM is also responsible for maintaining the records and information systems for the Yucca Mountain site, including the Licensing Support Network. 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, is responsible for the Department's uranium leasing program and, where possible, transfers sites to external parties.

Key FY 2015 Accomplishments

- ✓ Implemented Health Reimbursement Arrangements at Rocky Flats and Fernald.
- ✓ Performed long-term surveillance and maintenance of 90 sites.
- ✓ Disposed of 1 property (5.89 acre parcel at Spook, WY site)
- ✓ Responded to 1,801 requests for records, including 92 requests for Yucca Mountain.

Planned and Proposed Accomplishments

In fiscal year 2016, Department plans to:

- Complete the termination of additional legacy contractor pension plans, including the pension plans for workers associated with Pinellas, Florida and Yucca Mountain, Nevada sites.

In fiscal year 2017, the Budget Request proposes to:

- Accept six new sites scheduled to transfer to Legacy Management by the end of FY 2017.
- Reduce the cost of long-term surveillance and maintenance from the baseline by approximately 2 percent per year.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Office of Hearings and Appeals						
Office of Hearings and Appeals	5,500	5,500	5,500	5,919	+419	+7.6%
Subtotal, Office of Hearings and Appeals	**5,500**	**5,500**	**5,500**	**5,919**	**+419**	**+7.6%**
Rescission of Prior Year Balances	-258	-258	0	0	0	N/A
Total, Office of Hearings and Appeals	**5,242**	**5,242**	**5,500**	**5,919**	**+419**	**+7.6%**

Appropriation Overview

Office of Hearings and Appeals (OHA) is responsible for all DOE adjudicative processes except those administered by the Federal Energy Regulatory Commission. OHA's jurisdiction includes Freedom of Information Act and Privacy Act appeals, evidentiary hearings to determine an employee's eligibility for a security clearance, appeals, and agency decisions on contractor employee whistleblower complaints, and requests for exception from DOE regulations and orders, such as exceptions from the appliance efficiency regulations. OHA also offers alternative dispute resolution (ADR) services such as mediation for a variety of matters. Over the last five years, OHA has reduced its case-processing time in all areas of its jurisdiction without reducing the quality of its decisions. Also, OHA utilizes video teleconferencing to conduct hearings at DOE field sites

Program Highlights

The Request supports salaries and benefits for 26 FTEs operating in OHA's Personnel Security and Appeals Division, Employee Protection and Exceptions Division, and Office of Conflict Prevention and Resolution.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Departmental Administration					
Office of the Secretary	5,008	5,008	5,008	5,300	+292
Congressional & Intergovernmental Affairs (CI)	6,300	5,846	6,300	6,200	-100
Public Affairs	3,431	3,231	3,431	3,431	0
General Counsel (GC)	33,000	32,554	33,000	33,000	0
Economic Impact & Diversity	9,000	8,800	10,000	11,319	+1,319
Chief Financial Officer	47,000	47,000	47,024	53,084	+6,060
Chief Human Capital Officer	24,500	24,500	24,500	25,424	+924
Office of Indian Energy Policy & Programs	16,000	16,000	16,000	0	-16,000
Energy Policy and Systems Analysis	31,181	31,181	31,297	31,000	-297
International Affairs (IA)	13,000	24,943	18,000	19,107	+1,107
Office of Small & Disadvantaged Business Utilization	2,253	2,253	3,000	3,300	+300
Management	62,946	62,946	65,000	59,114	-5,886
Project Management Oversight and Assessments	0	0	0	18,000	+18,000
Cost Estimating and Program Evaluation	0	0	0	5,000	+5,000
Office of the Energy Jobs Development	0	0	0	3,700	+3,700
Strategic Partnership Projects (SPP)	42,000	42,000	40,000	40,000	0
Chief Information Officer (CIO)	74,164	74,164	73,218	93,074	+19,856
Subtotal, Departmental Administration (Gross)	**369,783**	**380,426**	**375,778**	**410,053**	**+34,275**
Adjustments/Use of Prior Year Balances	-6,733	-6,733	-8,800	-20,300	-11,500
Defense-Related Administrative Support	-118,836	-118,836	-118,836	-119,716	-880
Subtotal, Departmental Administration	**244,214**	**254,857**	**248,142**	**270,037**	**+21,895**
Subtotal, Miscellaneous Revenues	-119,171	-119,171	-117,171	-125,171	-8,000
Total, Departmental Administration (Net)	**125,043**	**135,686**	**130,971**	**144,866**	**+13,895**

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, domestic and international energy policy, information management, life-cycle asset management, legal services, workforce diversity and equal employment opportunity, ombudsman services, small business advocacy, sustainability and public affairs.

The DA appropriation budgets for Strategic Partnership Projects and receives Miscellaneous Revenues from other sources. Additionally, the DA appropriation receives funding from the Other Defense Activities (ODA) appropriation, Defense-Related Administrative Support (DRAS), which is used to offset funding within the DA appropriation which supports defense-related programs and activities at DOE.

In order to ensure statutory requirements and Secretarial priorities have resources to support mission critical areas of the Department, the FY 2017 Budget requests that the Office of Indian Energy Policy and Programs be established as a stand-alone account under Energy Programs.

Program Highlights

In FY 2017, the DA Budget reflects increases to strengthen enterprise-wide management and mission support functions and invest in initiatives with the potential for innovative and collaborative endeavors in the energy sector, as outlined below:

- **Office of Management (MA)**
  The FY 2017 Request level reflects the transfer of $16 million and 24 FTEs from MA to the newly established Project Management Oversight and Assessment Office (PM); an increase of $1 million for FTEs and support services associated with the Office of the Under Secretary for Management and Performance; and $.2 million to fund one FTE for the Ombudsman office.

- **Chief Information Officer (CIO)**
  The $19.9 million increase supports replacement of legacy network infrastructure, consolidation of data centers and enterprice e-mail as well as the implementation of other Administration priorities.

- **Chief Financial Officer (CFO)**
  The $6 million increase includes $3 million support for Digital Accountability and Transparency Act of 2014 (DATA Act) requirements and the development of corporate budget formulation which will allow budgets to be formulated from the bottom up across the enterprise in a standard framework.

- **Office of Economic Impact and Diversity (ED)**
  A $1.3 million increase will support Minorities in Energy Initiative activities and program direction to build capacity to provide statutory minority business and economic development support and execute external Civil Rights programs in accordance with Title VI, Title IX, and Section 504 of the Rehabilitation Act of 1973 (protection from discrimination based on disabilities).

- **Office of Project Management Oversight and Assessments (PM)**
  Establishing PM as a separate independent office with 37 FTEs will better enable DOE to conduct independent reviews of projects that are $100 million or greater in the Environmental Management (EM) portfolio, and perform other critical Department-wide functions.

Key FY 2015 Accomplishments

- ✓ Completed major system development lifecycle phases on Funds Distribution System 2.0.
- ✓ Establishment of the Advanced Research & Technology in Science (ARTS) Forum for Minority Serving Institutions (MSI) to broaden their knowledge of energy programs and for the Department to gain first-hand knowledge of MSI capabilities. Completed major system development lifecycle phases on Funds Distribution System 2.0.
- ✓ Expanded North American energy cooperation with Canada and Mexico, focusing on energy infrastructure, data and investment opportunities.
- ✓ Implemented new activities and sustained existing activities to protect the Department's networks and information from the ever-growing threat of cyber intrusions and breaches.
- ✓ Initiated first annual DOE Contractor-Union labor relations training program to improve the labor relations performance among represented contractor workforce.
- ✓ Launched DOE's Digital Reform Initiative, which will make information more centrally-available for the public on Energy.gov.

- **Office of Cost Estimating and Program Evaluation (CEPE-DOE)**
  The newly established Department-wide CEPE will establish cost estimating policy and ensure the capacity to independently determine costs of programs, projects and acquisitions.

- **Office of the Energy Jobs Development (EJD)**
  Established as a new office to consolidate ongoing workforce activities across the Department and track energy sector job growth nation-wide.

Planned and Proposed Accomplishments

In FY 2016, Departmental Administration plans to:

- Implement multifactor authentication across the DOE enterprise, enabling additional security and operational enhancements to identity, credential, and access management services.
- Stand up two of five Human Resources (HR) Shared Service Centers – Management and Performance and Science and Energy– to improve the efficiency and effectiveness of HR service delivery at the Department.
- Update and implement the Annual DOE Strategic Sustainability Performance Plan, which serves as a framework on how the Department will implement sustainability across the complex.
- Issue national and state energy jobs and energy jobs skills report.
- Establish an enterprise-wide system for data collection and infrastructure planning, resulting in an annual infrastructure status report.

In FY 2017, the Budget Request proposes to:

- Implement technology improvements, including network refresh activities and modernization efforts to address DOE's legacy IT infrastructure.
- Stand up the remaining three HR Shared Service Centers – Power Marketing Administrations, Bonneville Power Administration, and the National Nuclear Security Administration – to finalize the centralization of HR service delivery.
- Establish the DOE-wide Office of Cost Estimating and Program Estimating (CEPE-DOE) to set cost estimating policy and provide timely, unbiased program evaluation and cost estimation analysis.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Environment, Health, Safety and Security Mission Support						
Environment, Health, Safety and Security Mission Support	118,763	120,763	118,763	130,693	+11,930	+10.0%
Program Direction	62,235	62,235	62,235	66,519	+4,284	+6.9%
Subtotal, Environment, Health, Safety and Security Mission Support	**180,998**	**182,998**	**180,998**	**197,212**	**+16,214**	**+9.0%**
Rescission of Prior Year Balances	-87	-87	0	0	0	N/A
Total, Environment, Health, Safety and Security Mission Support	**180,911**	**182,911**	**180,998**	**197,212**	**+16,214**	**+9.0%**

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; ensures operations do not adversely affect the health and safety of surrounding communities; and protects the national security and other entrusted assets. EHSS is central to 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 provides 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; environment; 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. Health activities support 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 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 2016, the Department plans to:

- Standup the Employee Concerns Program to promptly respond to and manage employee concerns related to environment, health, safety and security.
- Revise Design Basis Threat Policy, which prescribes the performance metrics for the protection of nuclear weapons, nuclear weapons components, special nuclear material, national critical infrastructure, national laboratories, sites and facilities, personnel and other Departmental assets.

In FY 2017, the Budget Request proposes to:

- Provide for the identification and assessment of effective, safe and reliable physical security technologies to replace aging and failing systems currently in operation at nuclear facilities, laboratories, the Strategic Petroleum Reserve and the Department's Power Marketing Administrations.
- Support the timely review of classified documents to prevent the inadvertent release of sensitive information to the public.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Office of Enterprise Assessments						
Enterprise Assessments	24,068	22,068	24,068	24,580	+512	+2.13%
Program Direction	49,466	49,466	49,466	51,893	+2,427	+4.91%
Total, Office of Enterprise Assessments	**73,534**	**71,534**	**73,534**	**76,473**	**2,939**	**+4.00%**

Appropriation Overview

The **Office of Enterprise Assessments (EA)** is responsible for providing assessments for the Department of Energy (DOE or Department) senior leadership that report on whether Departmental operations are conducted in such a way as to provide for the safety of its employees and the public and whether national security material and information assets are appropriately protected. In addition, EA implements Congressionally-authorized enforcement programs, operates the DOE National Training Center (NTC), and maintains collaborative relationships within and outside the Department. Because EA reports directly to the Office of the Secretary, it is organizationally independent of the DOE entities that develop and implement safety and security policy and programs and can therefore provide a "check and balance," objectively 1) observing and reporting on the effectiveness of implementation of DOE policies and programs, 2) assessing compliance with legally enforceable safety and security requirements, and 3) developing and delivering, safety and security training programs that reflect best practices and lessons learned from EA assessments. EA activities complement, but do not replace the responsibility of DOE line management - reporting through the Under Secretaries - to oversee compliance with safety and security requirements. EA directly supports the Department's, 2014-2018 Strategic Plan under Strategic Objective 11, Operate the DOE enterprise safely, securely, and efficiently.

Program Highlights

The Secretary of Energy has challenged EA to expand its analytical capabilities, to identify emerging trends and systemic weaknesses across the Department's safety and security performance as a whole. The Secretary has also directed EA to place a high priority on assessing a number of specific safety and security related areas; and asked EA to identify practical recommendations which can be used to improve safety and security across the DOE enterprise. EA will be:

- Conducting comprehensive independent safeguards and security assessments at DOE Category I Special Nuclear Material sites (those with the highest value national security assets), with follow-up assessments at certain sites.
- Expanding "limited notice" testing of DOE site security response capabilities and increased focus on the threat of insider personnel who may seek to compromise DOE security.
- Expanding comprehensive cybersecurity assessments and unannounced "red teams" to improve DOE systems against external and internal attacks.
- Expanded assessments of high hazard nuclear projects and operations, for example extensive monitoring of activities related to the construction of the Hanford Site Waste Treatment and Immobilization Plant and on-the-ground monitoring of recovery efforts at the Waste Isolation Pilot Plant in Carlsbad, New Mexico.
- Establishing and expanding the DOE Training Reciprocity program that increases operational efficiency and effectiveness while maintaining worker health and safety.
- Expanding EA's analytical functions across all disciplines to identify emerging safety and security trends across the Department, and identifying best practices and lessons learned which can be applied by DOE sites in improving safety and security performance.
- Enhanced engagement and collaboration with DOE line management representatives at all levels throughout the assessment planning, execution and reporting processes, to have a greater positive impact on the Department's goal to achieve its missions safely and securely.
- Staffing up to increase assessment activities related to Worker Safety and Health, and Emergency Management.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Office of the Inspector General						
Office of the Inspector General	40,500	40,500	46,424	44,424	-2,000	-4.3%
Total, Office of the Inspector General	**40,500**	**40,500**	**46,424**	**44,424**	**-2,000**	**-4.3%**

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 track and improve performance, in conformance with the Government Performance and Results Modernization Act of 2010. The OIG routinely conducts reviews of the most significant management challenges facing the Department and continues to provide oversight activities of Recovery Act funds. 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:

- **Mission Support Costs.** OIG assists in identifying potential costs savings in areas such as the estimated $3.5 billion spent each year on National Laboratory support costs.
- **Key Programs and Projects.** OIG evaluates the efficacy of the Department's management of key programs and projects such as the environmental management program, which annually expends approximately $6.4 billion, and the $690 million Hanford Waste Treatment Plant.
- **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.
- **Loan Guarantee Programs.** Most of the program agreements extend well into the future and require the OIG to hire experts to assist with reviews to confirm compliance with loan terms and conditions. New projects, as well as troubled loans made to entities facing operational and financial challenges, will serve to further extend the necessity for in-depth OIG reviews.
- **Cost Accounting Standards (CAS).** OIG provides reviews of Department contractors' incurred costs and compliance with Cost Accounting Standards.
  - **Contract Review.** OIG assesses the Department's award and administration of approximately $25 billion in contracts.
  - **Recovery Act.** The Department awarded $30 billion under the Recovery Act and the OIG continues to expend resources to ensure that the funds were used appropriately.

Key FY 2015 Accomplishments

- ✓ An average positive return of $12.92 for each tax dollar invested in OIG activities.
- ✓ The work of the OIG lead to the recovery of $10.5 million in criminal restitution and civil fines from a subcontractor who artificially and erroneously inflated the amounts charged to Sandia National Laboratories for computers and related equipment.
- ✓ An OIG review of information technology procurement at Bonneville Power Administration found that Bonneville spent ~$5.2 million for a system that did not meet its needs. The OIG identified weaknesses with system planning, acquisition, and contract administration.

The FY 2017 Budget Request includes a decrease of $2 million from FY 2016. In order to perform the review of critical elements of Department-wide programs and activities at current operational levels, the OIG will rely on prior year carryover balances. The OIG does not anticipate prior year carryover balances being available in FY 2018.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Power Marketing Administrations						
Southeastern Power Administration						
Southeastern Power Administration	96,930	96,930	90,500	84,929	-5,571	-6.2%
Less Alternative Financing/Offsetting Collections	-96,930	-96,930	-90,500	-84,929	+5,571	+6.2%
Total, Southeastern Power Administration	**0**	**0**	**0**	**0**	**0**	**N/A**
Southwestern Power Administration						
Southwestern Power Administration	122,666	122,666	136,223	140,898	+4,675	+3.4%
Less Alternative Financing/Offsetting Collections	-111,266	-111,266	-124,823	-129,841	-5,018	-4.0%
Total, Southwestern Power Administration	**11,400**	**11,400**	**11,400**	**11,057**	**-343**	**-3.0%**
Western Area Power Administration						
Western Area Power Administration (CROM)						
Western Area Power Administration (CROM)	837,731	837,731	941,600	947,270	+5,670	+0.6%
Less Alternative Financing/Offsetting Collections (CROM)	-745,991	-745,991	-848,228	-851,689	-3,461	-0.4%
Total, Western Area Power Administration (CROM)	**91,740**	**91,740**	**93,372**	**95,581**	**+2,209**	**+2.4%**
Falcon and Amistad O&M Fund						
Operation and Maintenance	5,529	5,529	4,950	4,393	-557	-11.3%
Less Alternative Financing/Offsetting Collections	-5,301	-5,301	-4,722	-4,161	+561	+11.9%
Total, Falcon and Amistad O&M Fund	**228**	**228**	**228**	**232**	**+4**	**+1.8%**
Colorado River Basins Power Marketing Fund						
Spending Authority from Offsetting Collections	228,209	228,209	215,647	213,530	-2,117	-1.0%
Offsetting Collections	-251,209	-251,209	-238,647	-236,530	+2,117	+0.9%
Total, Colorado River Basins Power Marketing Fund	**-23,000**	**-23,000**	**-23,000**	**-23,000**	**0**	**0**
Total, Western Area Power Administration	**68,968**	**68,968**	**70,600**	**72,813**	**+2,213**	**+3.1%**
Total, Power Marketing Administrations	**80,368**	**80,368**	**82,000**	**83,870**	**+1,870**	**+2.3%**

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.

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, 25 substations/switchyards, and 51 microwave and VHF radio sites.

The FY 2017 Budget Request includes a proposal for a special receipt/disbursement account, hereafter known as the Purchase Power Drought Fund. This fund would allow Southwestern to pre-collect funds through power rates for use in times of below average water and drought conditions. The account would supplement Southwestern's current authorities and would minimize the necessity to invoke the Continuing Fund for Purchase Power and Wheeling expenses and mitigate the rate volatility associated with such activation.

- **Western Area Power Administration**
  Western 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. Western'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, Western has obtained significant stakeholder and customer participation in financing much of the construction program. Through transparency Western demonstrates the value of its efficient operations that preference customers enjoy. Western will continue to make significant efforts to be open, transparent and inclusive of customers and stakeholders in its operational choices and capital planning efforts. Western is strengthening its Asset and Risk Management to further ensure capital investments are sufficient and wisely deployed for our Nation and for our customers.

  In addition, Western continues to finance projects which facilitate the delivery of renewable energy resource through the development assistance and borrowing authority managed by Western's Transmission Infrastructure Program (TIP). Separate from the CROM construction program, TIP offers critical development assistance and debt financing options valued by primarily private partners and other developers seeking to invest in projects which enhance electricity reliability, support the integration of clean energy, and strengthen our Nation's critical infrastructure. TIP is actively supporting numerous projects throughout the West.

- **Bonneville Power Administration**
  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 2017, estimated total requirements of all Bonneville programs of $4,274 million include estimated budget obligations of $4,068 and estimated capital transfers of $206 million. Estimated obligations include operating expenses of $3,049 million, capital investments of $989 million, and $30 million in projects funded in advance. These funds 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.

($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016 $	FY 2017 vs. FY 2016 %
Federal Energy Regulatory Commission (FERC)						
Just and Reasonable Rates, Terms, and Conditions	142,574	142,574	148,921	159,650	+10,729	+7.2%
Safe, Reliable, Secure, and Efficient Infrastructure	106,004	106,004	112,507	123,576	+11,069	+9.8%
Mission Support through Organizational Excellence	55,811	55,811	58,372	63,574	+5,202	+8.9%
FERC Revenues	−304,389	−304,389	−319,800	−346,800	−27,000	+8.4%
Subtotal, Federal Energy Regulatory Commission	**0**	**0**	**0**	**0**	**0**	**N/A**
Fees and Recoveries in Excess of Annual Appropriations	−28,485	−17,325	−23,587	−9,426	+14,161	-60.0%
Total, Federal Energy Regulatory Commission	**−28,485**	**−17,325**	**−23,587**	**−9,426**	**+14,161**	**-60.0%**

Appropriation Overview

The **Federal Energy Regulatory Commission (FERC or the Commission)** is an independent agency within the department 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**

  To ensure just and reasonable rates, terms and conditions of service, the Commission will rely on competition and appropriate regulatory policies. Competition will benefit energy consumers by encouraging new entry among supply-side and demand-side resources, spurring innovation and deployment of new technologies, improving operating performance, and exerting downward pressure on costs. The Commission will continue to pursue market reforms to allow all types of resources to compete on a level playing field in jurisdictional markets. The Commission will also continue to support an open and transparent electric transmission planning process. Such coordination between transmission providers will support the development of an efficient transmission system and enhance competition in wholesale electric markets. 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. FERC also prevents the accumulation and exercise of market power by reviewing merger and other transactions in the electric industry to ensure that these proposals will not harm the public interest. The Commission accepts tariff provisions, as appropriate, to allow natural gas and oil pipelines, and public utilities to modify their services to meet their customers' needs.

  Oversight 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 takes proactive steps to detect problems in energy markets and to reduce the probability that violations will occur. FERC

uses a balanced approach to oversight and enforcement efforts: conducting surveillance and analysis of market trends and data; promoting internal compliance programs; employing robust audit and investigation programs; and, when appropriate, exercising the Commission's civil penalty authority to deter violations. When violations of sufficient seriousness are discovered, the Commission attempts to resolve the investigation through settlement with appropriate sanctions and future compliance improvements before initiating further enforcement proceedings.

- **Promote Safe, Reliable, Secure, and Efficient Infrastructure**
  The Commission has an important role in the development of safe, reliable, secure, and efficient energy infrastructure. The Commission's infrastructure siting authority rests in licensing non-Federal hydropower projects, certificating interstate natural gas pipelines and storage projects, authorizing LNG facilities, and, in certain circumstances, permitting electric transmission lines. Post-authorization, the Commission relies heavily on physical inspections of hydropower and LNG facilities to ensure safety.

  The Commission also has an important role in protecting the reliability of the Nation's electric transmission grid. FERC will oversee the development and enforcement of mandatory electric reliability standards and critical infrastructure protection standards. In addition, the Commission will provide leadership, expertise, and assistance in identifying, communicating and seeking comprehensive solutions to potential risks to Commission-jurisdictional facilities from cyber attacks, and certain physical threats.

- **Mission Support Through Organizational Excellence**
  The Commission strives to achieve organizational excellence by using resources effectively, adequately equipping employees for success, and executing responsive and transparent processes that strengthen public trust. Trust and understanding increase acceptance of FERC decisions and reduces the potential for contentiousness toward FERC rules and regulations. The Commission advances this objective by promoting transparency and open communication with respect to conduct of the Commission's business, thereby increasing awareness and understanding of the Commission's activities.

  The Commission is making new investments in its human capital, information technology resources, and physical infrastructure. The Commission allocates the majority of its budget to directly cover employee compensation costs and, therefore, places extremely high value on its employees, and is focused on ensuring their success. Also, 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 by FY 2018. At the same time, the headquarters building is currently undergoing a complex multi-year renovation effort to realize mandated space savings with a target of completion during FY 2020. In FY 2016, the Commission is expecting to fund $10.4 million of the project using prior year unobligated balances. The FY 2017 Request includes increases of approximately $16.3 million to continue the modernization effort.

Mission Innovation is an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. It is a widely-shared view that innovation is essential for economic growth by providing affordable and reliable energy for everyone, is critical for energy security, enhances U.S. competitiveness, and is the key to a transition to a low carbon energy future. Each of the 20 participating countries, which together represent over 80 percent of global governmental clean energy research and development, will seek to double its governmental investment in clean energy research and development over five years. While each country will determine its own doubling plan and portfolio, the collection of countries will provide new opportunities for synergies and collaboration.

The need for a substantial investment in clean energy research and development is clear. Many studies have examined the contribution of technological innovation to U.S. economic growth.[1] In 2010, the American Energy Innovation Council, comprised of Chief Executive Officers from multiple industries, called for the tripling of energy research and development, citing the need for a dramatic expansion of the energy innovation pipeline to meet critical national priorities.[2] Another report that same year from the President's Council of Advisors on Science and Technology also recommended accelerating the pace of technology innovation to meet economic competitiveness, environmental and energy security needs.[3] The need for greater regional innovation efforts was highlighted in a 2012 National Research Council report calling for the establishment of regional innovation cluster initiatives that build upon existing knowledge clusters and comparative strengths of a geographic region.[4]

The President's FY 2017 Budget takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next 5 years by providing $7.7 billion across 12 federal agencies, with DOE responsible for approximately 76 percent of that government-wide total. The DOE FY 2017 Request provides a total of $5,856 million in discretionary funding for clean energy research and development research. This funding represents an increase of over 21 percent above the FY 2016 baseline of $4,822 million of appropriated funds.

The DOE program components supporting Mission Innovation include elements of use-inspired basic research sponsored by the Office of Science, ARPA-E and portions of the applied energy programs that support clean energy research, development, and demonstration activities. Overall programs supporting Mission Innovation comprise slightly more than half of the total President's FY 2017 Budget Requests for science and energy, including ARPA-E. The accompanying table shows the total budgets for the various DOE programs, as well as the portion that supports Mission Innovation:

	FY 2016 Enacted		FY 2017 Budget	
Mission Innovation by Program	**Total Budget**	**Mission Innovation**	**Total Budget**	**Mission Innovation**
Discretionary Mission Innovation				
Energy Efficiency and Renewable Energy	2,073	1,406	2,898	2,108
Electricity Delivery and Reliability	206	153	262	177
Fossil Energy Research and Development	632	533	600	564
Nuclear Energy	986	862	994	804
ARPA-E	291	291	350	350
Science	5,350	1,577	5,572	1,853
Total, Discretionary Mission Innovation	**9,538**	**4,822**	**10,676**	**5,856**

The increased investments proposed in the FY 2017 Budget support a broad-based strategy for accelerating the innovation process. The strategy emphasizes investments strategically targeted to support innovative platforms for early stage research and technology development, as well as development and demonstration activities that target cost-reduction and

[1] See, for example, a brief summary in Congressional Budget Office, *Federal Policies and Innovation*, November 2014.
[2] American Energy Innovation Council, *Restoring American Energy Innovation Leadership*, 2010
[3] President's Council of Advisors on Science and Technology, *Report to the President on Accelerating the Pace of Change in Energy Technologies through an Integrated Federal Energy Policy*, November 2010
[4] National Research Council, *Rising to the Challenge*, 2012

advance transformational concepts that can achieve meaningful scale. For example, the President's FY 2017 Budget supports an expansion of promising existing programs, such as Energy Frontier Research Centers, ARPA-E and Clean Energy Manufacturing Institutes. The FY 2017 Budget also supports new initiatives to establish regional innovation partnerships and to expand collaborations between innovators and small businesses and the DOE National Laboratories. The individual programs and projects supporting Mission Innovation are described in more detail within the individual program office budget descriptions.

The President's FY 2017 Budget also includes mandatory funding for clean energy R&D that complements activities supported by discretionary funding. As part of the Administration's 21st Century Clean Transportation Plan, the President's FY 2017 Budget Request includes $500 million in mandatory funding at DOE in FY 2017 to scale-up clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, in particular for intermodal freight and fleets; and establish a smart mobility research center to investigate systems level energy implications of vehicle connectivity and automation. The FY 2017 Budget Request also includes $150 million in mandatory funding for DOE's ARPA-E as part of the ARPA-E Trust proposal that seeks $1.85 billion in mandatory funding over five years to reliably increase the program's transformational clean energy technology R&D.

Highlights of DOE Program Initiatives in Support of Mission Innovation

- ✓ $110 million for new Regional Energy Innovation Partnerships that will support regionally-focused clean energy research and development initiatives and complementary energy innovation ecosystem development activities to address regionally-relevant clean energy challenges;
- ✓ $261 million for advanced clean energy manufacturing research and development projects and facilities, including two new National Network for Manufacturing Innovation Institutes;
- ✓ $880 million in cutting-edge sustainable transportation technologies to increase the affordability and convenience of advanced vehicles and domestic renewable fuels;
- ✓ $500 million to increase the use and reduce the costs of clean renewable power from solar, wind, water, and geothermal energy;
- ✓ $1.8 billion in basic clean energy research to support fundamental research on energy production, conversion, storage, and use, as well as advancing our understanding of the earth and its climate;
- ✓ $804 million for programs and infrastructure that support the advancement of nuclear energy technologies, including research and development in advanced nuclear reactor technologies, life extension for existing power plants, and advanced nuclear fuels;
- ✓ $177 million to support grid modernization, resiliency, and integration of clean energy into the grid; and
- ✓ $564 million in research focused predominantly on development and deployment of carbon capture and storage technologies as well as other approaches to improve the emissions performance of energy generated from fossil fuels.

Mission Innovation investments will be leveraged by private capital that drives innovation and clean energy deployment. The initiative is complemented by a separate private sector-led effort, the Breakthrough Energy Coalition (Coalition), as increased government investment, while necessary, is insufficient by itself. This parallel initiative includes over 28 investors from 10 countries and will supplement the large and growing private sector investment in commercialization of clean energy technologies by targeting new investments at an earlier stage of the innovation cycle and managing these investments through the completion of the innovation process, including the formation of new companies and the commercial introduction of new products and processes. The Coalition will be investing in technologies and projects originating in the Mission Innovation participating countries.

FY 2017 Crosscut Summary ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Energy-Water Nexus	15,575	12,318	28,250	96,100	+67,850
Exascale Computing Initiative	149,000	149,000	252,624	285,000	+32,376
Grid Modernization	190,144	185,852	295,447	378,530	+83,083
Subsurface Science, Technology and Engineering RD&D	168,000	164,699	207,180	258,315	+51,135
Supercritical CO2	30,300	29,466	32,300	36,300	+4,000
Advanced Materials for Energy Innovation	43,790	42,751	48,000	113,450	+65,450
Cybersecurity	311,098	310,006	323,941	333,479	+9,538
Double Counting Offset*	−45,999	−44,756	−62,000	−45,500	+16,500
Total, Crosscut Summary	**861,908**	**849,336**	**1,125,742**	**1,455,674**	**+329,932**

*Cybersecurity for Energy Delivery Systems in Electricity Delivery and Energy Reliability is counted in the totals for both the Cybersecurity and Grid Modernization crosscuts. This line prevents double counting in the total for all crosscut initiatives.

Energy-Water Nexus: Supports the Nation's transition to more resilient energy-water systems.

Water and energy systems are interdependent. Water is used in all phases of electricity generation and energy production, accounting for over 40% of total water withdrawals and over 5% of total water consumption. Conversely, energy is required to extract, convey, and deliver water of appropriate quality for diverse human uses, and then again to treat wastewaters before return to the environment; this accounts for 3% of total electricity consumption. Current trends are increasing the urgency to address the energy-water nexus in an integrated way. Precipitation and temperature patterns, U.S. population growth and regional migration trends, and the introduction of new technologies could shift water and energy demands.

The Energy-Water Nexus crosscutting initiative, which draws on ideas presented in DOE's report, *The Water-Energy Nexus: Challenges and Opportunities* (June 2014), is an integrated set of cross-program initiatives that 1) builds and deploys a DOE mission critical data, modeling and analysis platform to improve understanding and inform decision-making for a broad range of users; 2) strategically targets crosscutting technology RDD&D opportunities within the system of water and energy flows; and 3) is informed and supported by focused policy analysis and outreach and stakeholder engagement. Taken as an integrated whole, these investments position DOE to contribute strongly to the Nation's transition to more resilient energy-water systems. The FY 2017 Request continues to strategically expand activities in the four focus areas listed below. Features of the Request include an investment in a low-carbon, low-energy, low-cost desalination innovation hub; regional-scale data, modeling, and analysis test beds; and research into the beneficial use of non-traditional water.

Energy-Water Nexus
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Departmental Administration					
Energy Policy and Systems Analysis	2,550	2,550	2,550	2,600	+50
International Affairs	0	0	300	400	+100
Total, Departmental Administration	**2,550**	**2,550**	**2,850**	**3,000**	**+150**
Energy Efficiency and Renewable Energy					
Advanced Manufacturing	0	0	4,300	25,000	+20,700
Bioenergy Technologies	0	0	0	4,000	+4,000
Geothermal Technologies	1,225	1,185	2,000	2,000	0
Solar Energy	0	0	0	15,000	+15,000
Water Power	0	0	600	6,000	+5,400
Total, Energy Efficiency and Renewable Energy	**1,225**	**1,185**	**6,900**	**52,000**	**+45,100**

Energy-Water Nexus
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Fossil Energy Research and Development					
Crosscutting Research and Analysis	7,000	6,783	6,000	15,800	+9,800
Fuel Supply Impact Mitigation	3,000	0	0	0	0
Total, Fossil Energy Research and Development	**10,000**	**6,783**	**6,000**	**15,800**	**+9,800**
Office of Indian Energy Policy and Programs					
Tribal Energy Program	0	0	700	1,000	+300
Science					
Biological and Environmental Research	1,800	1,800	11,800	24,300	+12,500
Total, Energy-Water Nexus	**15,575**	**12,318**	**28,250**	**96,100**	**+67,850**

Exascale Computing: Enables U.S. leadership in the next generation of high performance computing

Since the beginning of the digital era, the U.S. Federal government has made pivotal investments in the computer industry at critical times when market progress was stagnating. We are once again at a critical turning point in high performance computing (HPC) technology, with industry innovations in hardware and software architectures driving advances in computing performance, but where the performance of application codes is suffering because the technology advances are not optimized for memory intensive, floating point HPC use. Yet the importance of HPC simulations is increasing as the U.S. faces serious and urgent economic, environmental, and national security challenges based on dynamic changes in the energy and climate systems, as well as growing security threats. Providing tools for solving these and future problems requires exascale capabilities. Committed U.S. leadership toward exascale computing is a critical contributor to our competitiveness in science, national defense, and energy innovation as well as the commercial computing market. Equally important, a robust domestic industry contributes to our nation's security by helping avoid unacceptable cybersecurity and computer supply chain risks.

Addressing this national challenge requires a significant investment by the Federal government involving strong leadership from the Department and close coordination with national laboratories, industry, and academia. The Exascale Computing crosscutting initiative is organized around four pillars: application development, software technology, hardware technology, and exascale systems. In FY 2017, DOE proposes to expand its efforts in the first three technical focus areas, and begin efforts in the fourth focus area in FY 2018.

Exascale Computing Initiative
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Science					
Advanced Scientific Computing Research	91,000	91,000	157,894	154,000	−3,894
Basic Energy Sciences	8,000	8,000	12,000	26,000	+14,000
Biological and Environmental Research	0	0	18,730	10,000	−8,730
Total, Science	**99,000**	**99,000**	**188,624**	**190,000**	**+1,376**
Weapons Activities					
Advanced Simulation and Computing	50,000	50,000	64,000	95,000	+31,000
Total, Exascale Computing Initiative	**149,000**	**149,000**	**252,624**	**285,000**	**+32,376**

Grid Modernization: Provides tools to set the Nation on a cost-effective path to the grid of the future

The reliability and functioning of the Nation's electricity grid is often taken for granted. Whereas rolling blackouts are the norm in many developing countries, U.S. customers have historically benefitted from highly reliable and affordable power transported through long-lived transmission and distribution infrastructure. Our extensive and resilient power grid has fueled

the Nation's growth engine and long been an exemplar for other countries. Access to electricity is such a fundamental enabler for the economy that the National Academy of Engineering named Electrification the greatest engineering achievement of the 20th century.

The Grid Modernization crosscutting initiative supports strategic investments by DOE in foundational technology development, enhanced security and resilience capabilities, and greater institutional support and stakeholder engagement, which will provide tools necessary for the evolution to the grid of the future. Investment is critical now as industry is considering approaches to address aging infrastructure. The FY 2017 Budget Request includes a new emphasis on co-optimization demonstration projects in the areas of (1) clean, resilient distribution feeders; (2) balancing areas with lean reserve margin grid operations; and (3) improved planning tools.

Grid Modernization
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Departmental Administration					
Energy Policy and Systems Analysis	0	0	1,000	1,000	0
Electricity Delivery and Energy Reliability					
Clean Energy Transmission and Reliability: Transmission Reliability	17,424	16,849	17,000	12,300	−4,700
Clean Energy Transmission and Reliability: Advanced Model Grid Research	10,648	10,297	15,000	12,000	−3,000
Clean Energy Transmission and Reliability: Energy Systems Risk and Predictive Capability	6,190	6,190	7,000	6,000	−1,000
Smart Grid Research and Development	15,439	14,930	35,000	30,000	−5,000
Cybersecurity for Energy Delivery Systems	45,999	44,756	62,000	45,500	−16,500
Energy Storage	12,000	11,604	20,500	44,500	+24,000
Transformer Resilience and Advanced Components	0	0	5,000	15,000	+10,000
National Electricity Delivery	6,000	6,000	7,500	6,500	−1,000
State Cooperative Agreements for Distribution-level Reform	0	0	0	15,000	+15,000
Total, Electricity Delivery and Energy Reliability	**113,700**	**110,626**	**169,000**	**186,800**	**+17,800**
Energy Efficiency and Renewable Energy					
Building Technologies: Emerging Technologies	6,200	5,995	18,000	25,000	+7,000
Facilities and Infrastructure (NREL O&M): Facilities Management	30,000	30,000	36,000	36,000	0
Hydrogen And Fuel Cell Technologies: Hydrogen Fuel R&D	0	0	3,000	5,000	+2,000
Hydrogen And Fuel Cell Technologies: Technology Validation	1,500	1,500	2,000	0	−2,000
Solar Energy: Balance of Systems Soft Cost Reduction	0	0	0	10,000	+10,000
Solar Energy: Systems Integration	27,894	27,086	52,447	83,000	+30,553
Vehicle Technologies: Vehicle Systems	6,200	5,995	10,000	18,000	+8,000
Wind Energy: Mitigate Market Barriers	4,650	4,650	3,500	12,730	+9,230
Total, Energy Efficiency and Renewable Energy	**76,444**	**75,226**	**124,947**	**189,730**	**+64,783**
Office of Indian Energy Policy and Programs					
Tribal Energy Program: Tribal Energy Grant Program	0	0	500	1,000	+500
Total, Grid Modernization	**190,144**	**185,852**	**295,447**	**378,530**	**+83,083**

Subsurface Science, Technology and Engineering RD&D (Subsurface): Advances a new era of capabilities across a range of energy applications

Over 80 percent of our total energy supply comes from the subsurface, and this importance is magnified by the ability to also use the subsurface to store and sequester fluids and waste products. The Subsurface crosscut will address identified challenges in the subsurface through highly focused and coordinated research in Wellbore Integrity, Subsurface Stress State and Induced Seismicity, Permeability Manipulation, and New Subsurface Signals to enhance renewable energy supply, ensure material impact on climate change via CO_2 storage, and significantly mitigate environmental impacts from energy-related subsurface activities and operations.

Subsurface resources constitute the Nation's primary source of energy, which provides safe storage capacity for CO_2 and presents an opportunity for environmentally responsible management and disposal of hazardous materials and other energy waste streams. In addition to these four core pillars, the FY 2017 Request funds R&D on an identified grand challenge on advanced imaging of geophysical and geochemical signals in the subsurface.

Subsurface Science, Technology and Engineering RD&D
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Defense Environmental Cleanup					
Headquarters Operations: Technology Development and Deployment: Mission Support	2,000	2,000	2,000	2,000	0
Idaho: Idaho Cleanup and Waste Disposition	0	3,000	3,000	3,000	0
Richland: Central Plateau Remediation	0	3,000	3,000	3,000	0
Total, Defense Environmental Cleanup	**2,000**	**8,000**	**8,000**	**8,000**	**0**
Energy Efficiency and Renewable Energy					
Geothermal Technologies: Enhanced Geothermal Systems	32,500	31,428	39,650	40,600	+950
Geothermal Technologies: Hydrothermal	12,500	12,088	10,280	40,040	+29,760
Total, Energy Efficiency and Renewable Energy	**45,000**	**43,516**	**49,930**	**80,640**	**+30,710**
Fossil Energy Research and Development					
Carbon Storage	83,000	80,307	96,000	90,875	−5,125
Crosscutting Research and Analysis: Computational Sciences	0	0	4,750	0	−4,750
Fuel Supply Impact Mitigation: Environmentally Prudent Development	9,000	3,876	4,000	7,000	+3,000
Total, Fossil Energy Research and Development	**92,000**	**84,183**	**104,750**	**97,875**	**−6,875**
Nuclear Energy					
Fuel Cycle R&D: Used Nuclear Fuel Disposition	24,000	24,000	39,500	30,500	−9,000
Science					
Basic Energy Sciences: Chemical Sciences, Geosciences, and Biosciences	5,000	5,000	5,000	41,300	+36,300
Total, Subsurface Science, Technology and Engineering RD&D	**168,000**	**164,699**	**207,180**	**258,315**	**+51,135**

Supercritical CO_2 Technology: Synchronizes R&D activities around a collective technology demonstration opportunity

The supercritical carbon dioxide (sCO_2) based power generation initiative is a technology-focused crosscut that will facilitate industry's transition to realize power cycles based on sCO_2 as the working fluid. Demonstrating and developing this power cycle has the potential to revolutionize electric power generation for fossil, concentrating solar, geothermal, nuclear and waste heat recovery applications in a way that is cleaner and more efficient, and which reduces cost. The FY 2017 Request builds on industry outreach and focused R&D efforts in FY 2015, and the development of more detailed conceptual plans,

technical approach, and cost and schedule estimates relevant to a 10 MWe pilot test facility in FY 2016. These inputs will inform the development of the Supercritical Transformational Electric Power Generation (STEP) solicitation, to be issued and awarded in FY 2016, for the design, construction and operation of a 10 MWe pilot test facility. Initiation of design and construction of the STEP facility would begin in early FY 2017. Recognizing that the near-term deployment and potential market applications for commercial sCO_2 power cycles are primarily in the fossil energy area, the STEP project is being managed by the Office of Fossil Energy.

Supercritical CO_2
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Energy Efficiency and Renewable Energy					
Solar Energy: Concentrating Solar Power	10,000	9,704	0	0	0
Fossil Energy Research and Development					
Advanced Energy Systems: Advanced Turbines	0	0	0	6,000	+6,000
Advanced Energy Systems: STEP (Supercritical CO_2)	10,000	9,690	15,000	24,300	+9,300
Crosscutting Research and Analysis: Extreme Environment Materials	2,000	1,937	9,000	0	−9,000
Total, Fossil Energy Research and Development	**12,000**	**11,627**	**24,000**	**30,300**	**+6,300**
Nuclear Energy					
Reactor Concepts RD&D: Advanced Reactor Technologies	3,300	3,300	3,300	6,000	+2,700
STEP R&D	5,000	4,835	5,000	0	−5,000
Total, Nuclear Energy	**8,300**	**8,135**	**8,300**	**6,000**	**−2,300**
Total, Supercritical CO_2	**30,300**	**29,466**	**32,300**	**36,300**	**+4,000**

Advanced Materials: Accelerating advanced materials development from discovery through deployment

Affordable, reliable, high performance materials are key enablers to most transformational changes in technology, including critical clean energy applications. New materials discoveries have the potential to revolutionize whole industries, but only a small fraction of these materials make it to widespread market deployment. As a result, many new materials concepts that are hailed as scientific breakthroughs in the laboratory either never realize commercial application, or spend decades in the development cycle at significant cost. The reality is that no matter how well a material performs in the laboratory, the uncertainties and risks associated with scale-up and production, as well as the real or perceived liabilities associated with material failures in service, significantly slow the development and deployment cycles. In order to relieve this uncertainty and reduce risk, most sectors require that a new material be "qualified" before commercialization, requiring arduous and resource-intensive testing loops that can take years or even decades to complete. Accelerating advanced materials development from discovery through deployment is critical for U.S. manufacturing competitiveness in the 21st century.

The Advanced Materials Crosscut serves as the principal forum for coordinating advanced materials related activities across the Department. This newly-formed crosscut focuses on a subset of materials R&D that will involve close coordination among the participating offices to form a cohesive network with the following capabilities: (1) predictive tools, (2) functional (applied) design validation, (3) process scale-up, (4) qualification, and (5) digital data and informatics. This crosscut is anchored by a shared vision of the optimal approach to designing, scaling, and qualifying materials that harnesses a suite of innovative capabilities, tools, and methodologies that represent a radical improvement over resource and time-intensive testing loops necessary under current conditions.

Advanced Materials for Energy Innovation
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Energy Efficiency and Renewable Energy					
Advanced Manufacturing: Advanced Manufacturing R&D Facilities	14,000	13,538	14,000	14,000	0
Advanced Manufacturing: Advanced Manufacturing R&D Projects	8,500	8,220	9,500	10,000	+500
Vehicle Technologies: Materials Technology	4,290	4,148	11,000	39,300	+28,300
Total, Energy Efficiency and Renewable Energy	**26,790**	**25,906**	**34,500**	**63,300**	**+28,800**
Fossil Energy Research and Development					
Crosscutting Research and Analysis: Extreme Environment Materials	5,000	4,845	1,000	23,150	+22,150
Nuclear Energy					
Nuclear Energy Enabling Technologies: Crosscutting Technology Development	0	0	0	2,000	+2,000
Reactor Concepts RD&D: Advanced Reactor Technologies	2,500	2,500	3,000	0	−3,000
Reactor Concepts RD&D: Light Water Reactor Sustainability	400	400	400	400	0
Total, Nuclear Energy	**2,900**	**2,900**	**3,400**	**2,400**	**−1,000**
Science					
Basic Energy Sciences	2,100	2,100	2,100	17,600	+15,500
Weapons Activities					
Advanced Manufacturing Development: Component Manufacturing Development	3,000	3,000	3,000	3,000	0
Engineering: Enhanced Surveillance	4,000	4,000	4,000	4,000	0
Total, Weapons Activities	**7,000**	**7,000**	**7,000**	**7,000**	**0**
Total, Advanced Materials for Energy Innovation	**43,790**	**42,751**	**48,000**	**113,450**	**+65,450**

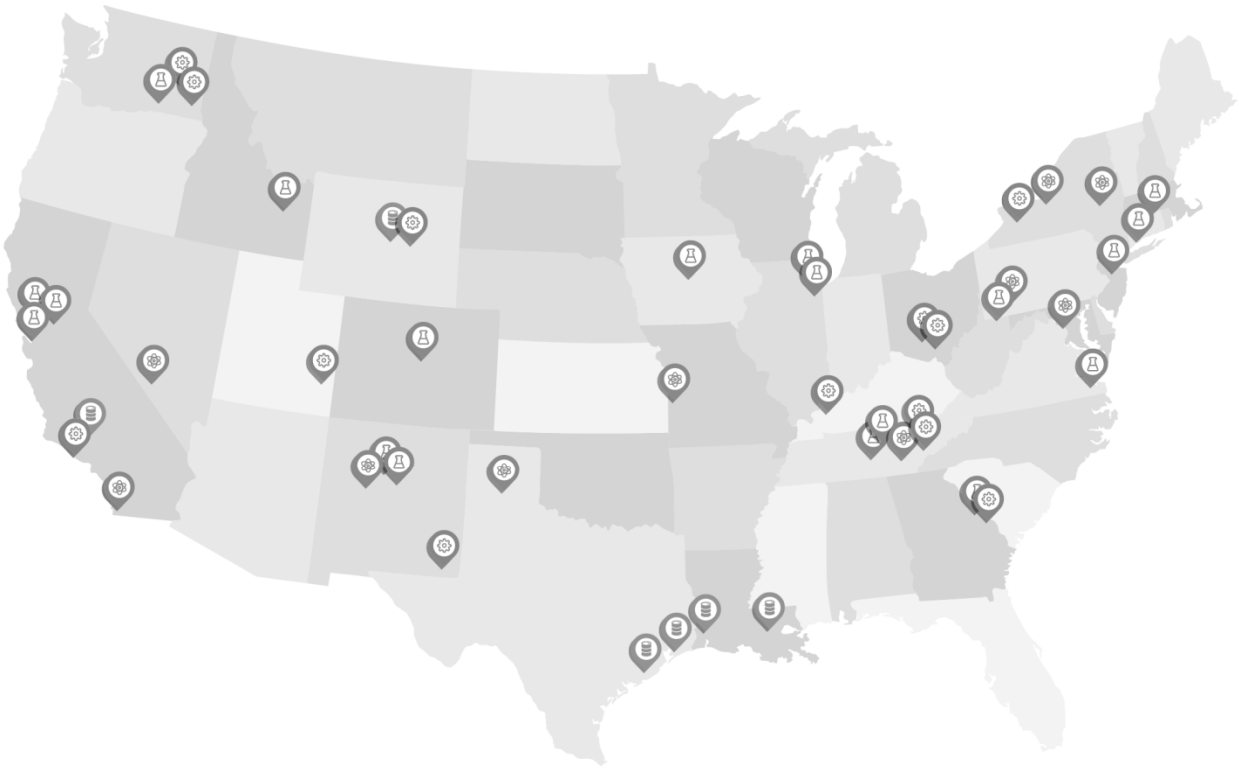
Cybersecurity: Protecting the DOE enterprise and improving cybersecurity in the energy sector

The Department of Energy (DOE) is engaged in two categories of cyber-related activities: protecting the DOE enterprise from a range of cyber threats that can adversely impact mission capabilities and improving cybersecurity in the electric power subsector and the oil and natural gas subsector. The cybersecurity crosscut supports central coordination of the strategic and operational aspects of cybersecurity and facilitates cooperative efforts such as the Joint Cybersecurity Coordination Center (JC3) for incident response and the implementation of Department-wide Identity, Credentials, and Access Management (ICAM).

Under the Presidential Policy Directive on Critical Infrastructure Security and Resilience (PPD-21), DOE is the Sector Specific Agency for the energy sector and has a number of responsibilities, including the following: 1) collaborating with infrastructure owners and operators to strengthen the security and resilience of critical infrastructure; 2) serving as the day-to-day Federal interface for the prioritization and coordination of sector-specific activities; 3) carrying out incident management responsibilities consistent with statutory authority and other appropriate policies; and 4) providing technical assistance to the energy sector to identify vulnerabilities and help mitigate incidents, as appropriate.

Cybersecurity
Funding by Appropriation and Program ($K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Defense Environmental Cleanup					
Safeguards and Security	5,079	5,079	17,370	19,900	+2,530
Departmental Administration					
Chief Information Officer	21,364	21,364	21,006	20,026	−980
Electricity Delivery and Energy Reliability					
Cybersecurity for Energy Delivery Systems	45,999	44,756	62,000	45,500	−16,500
Energy Efficiency and Renewable Energy					
Facilities and Infrastructure (NREL O&M)	2,190	2,190	2,190	2,190	0
Energy Information Administration	837	837	851	865	+14
Fossil Energy Research and Development					
NETL Infrastructure	1,335	1,335	1,750	4,872	+3,122
Nuclear Energy					
Idaho Sitewide Safeguards and Security	11,268	11,419	14,466	16,258	+1,792
Nuclear Energy Enabling Technologies	0	0	0	3,000	+3,000
Total, Nuclear Energy	**11,268**	**11,419**	**14,466**	**19,258**	**+4,792**
Other Defense Activities					
Enterprise Assessments	0	0	4,039	5,502	+1,463
Environment, Health, Safety and Security	4,385	4,385	5,409	5,409	0
Independent Enterprise Assessments	4,044	4,044	0	0	0
Legacy Management	904	904	922	1,140	+218
Total, Other Defense Activities	**9,333**	**9,333**	**10,370**	**12,051**	**+1,681**
Science					
Safeguards and Security	17,430	17,430	27,070	27,197	+127
Strategic Petroleum Reserve					
Facilities Development and Operations	1,464	1,464	1,299	2,047	+748
Weapons Activities					
Information Technology and Cyber Security	154,805	154,805	132,588	146,592	+14,004
Working Capital Fund	39,994	39,994	32,981	32,981	0
Total, Cybersecurity	**311,098**	**310,006**	**323,941**	**333,479**	**+9,538**



National Laboratories and Technology Centers

NNSA Sites

Cleanup Sites

Petroleum Reserves

Site	State	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
National Laboratories and Technology Centers				
Ames Laboratory	IA	52,638	49,836	46,832
Argonne National Laboratory	IL	587,203	599,856	585,279
Brookhaven National Laboratory	NY	484,814	482,292	476,992
Fermi National Accelerator Laboratory	IL	373,928	372,104	394,639
Idaho National Laboratory	ID	1,105,586	1,199,335	1,099,903
Lawrence Berkeley National Laboratory	CA	651,466	690,884	643,876
Lawrence Livermore National Laboratory	CA	1,251,466	1,255,933	1,239,440
Los Alamos National Laboratory	NM	1,953,616	2,201,726	2,104,443
National Energy Technology Lab	WV, PA	699,784	850,002	988,457
National Renewable Energy Laboratory	CO	306,551	292,274	325,743
New Brunswick Laboratory	IL	10,824	5,294	7,015
Oak Ridge Institute for Science & Education	TN	42,619	29,031	19,082

Site	State	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Oak Ridge National Laboratory	TN	1,074,535	1,087,990	1,058,672
Pacific Northwest National Laboratory	WA	591,736	591,720	517,782
Princeton Plasma Physics Laboratory	NJ	93,090	74,969	76,882
Sandia National Laboratories	NM	1,875,289	1,898,607	1,913,937
Savannah River National Laboratory	SC	14,146	12,021	8,036
SLAC National Accelerator Laboratory	CA	459,604	546,264	543,072
Thomas Jefferson National Accelerator Facility	VA	129,635	120,937	125,574
NNSA Sites				
Bettis Atomic Power Laboratory	PA	465,370	485,696	513,287
General Atomics Site	CA	22,973	24,000	24,420
Knolls Atomic Power Laboratory	NY	515,380	596,959	605,118
Naval Research Laboratory	DC	23,820	25,400	26,510
NNSA Albuquerque Complex	NM	466,495	675,702	617,224
Pantex Plant	TX	551,230	661,417	707,744
University of Rochester	NY	67,963	64,264	61,830
Y-12 National Security Complex	TN	271,678	397,335	406,516
Cleanup Sites				
East Tennessee Technology Park (K25)	TN	208,092	229,357	193,188
Energy Technology Engineering Center	CA	8,959	10,459	10,559
Hanford Site	WA	987,529	970,952	780,299
Miamisburg Site	OH	8,408	9,500	——
Moab Site	UT	37,867	38,644	34,784
Oak Ridge Reservation	TN	131,930	74,597	54,557
Office of River Protection	WA	1,220,009	1,368,022	1,458,939
Paducah Gaseous Diffusion Plant	KY	284,643	283,477	290,251
Portsmouth Gaseous Diffusion Plant	OH	279,928	295,070	326,820
Savannah River Site	SC	1,373,612	1,497,418	1,655,451
Waste Isolation Pilot Plant	NM	322,061	300,029	266,196
West Valley Demonstration Project	NY	60,457	61,804	63,628
Petroleum Reserves				
Naval Petroleum Reserves	CA, WY	19,570	16,430	13,880
Strategic Petroleum Reserves	LA, TX	188,612	200,406	242,477