

Department of Energy

FY 2017 Congressional

Budget Request



**Other Defense Activities
Departmental Administration
Inspector General
Working Capital Fund
Crosscutting Activities
Pensions**

Department of Energy

FY 2017 Congressional Budget Request



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Pensions**

Volume 2
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FUNDING BY APPROPRIATION

	(\$K)					
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request ¹	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%
<i>Use of Prior Year Balances</i>	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.

Other Defense Activities

Other Defense Activities

Other Defense Activities

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**Other Defense Activities
Proposed Appropriation Language**

For Department of Energy expenses, including the purchase, construction, and acquisition of plant and capital equipment and other expenses, necessary for atomic energy defense, other defense activities, and classified activities, in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, [\$774,425,000]\$791,552,000, to remain available until expended: Provided, That [\$253,729,000]\$258,061,000 shall be available until September 30, [2016]2017, for program direction.

Explanation of Changes

No change.

Other Defense Activities (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities	754,000	754,000	776,425	791,552
Rescission of Prior Year Balances	-551	-551	0	0
Total Other Defense Activities	753,449	753,449	776,425	791,552

Overview

The Other Defense Activities appropriation funds elements that relate to and support the defense-oriented activities within the Department. These include Environment, Health, Safety and Security (EHSS), Enterprise Assessments (EA), Specialized Security Activities (SSA), Legacy Management (LM), Hearings and Appeals (HA), and Defense Related Administrative Support (DRAS). Funding from DRAS is used to offset funding within the Departmental Administration (DA) for work supporting defense-oriented activities in the Department. DRAS represents one third of the Departmental Administration gross spending level as NNSA represents a little more than a third of DOE's total budget.

Highlights and Major Changes in the FY 2017 Budget Request

- Specialized Security Activities' funding is increased in FY 2017 to assure coverage of National Security related activities.
- EHSS funding provides for coordination and policy direction for the Insider Threat activities. Also, an increase in funding will maintain Headquarters Security Operations and provide additional support for physical equipment maintenance and replacement.

In FY 2015, the Department was reorganized into three Under Secretariats—Science and Energy, Nuclear Security, and Management and Performance—that recognizes the complex interrelationship among DOE Program Offices. The FY 2017 Budget Request continues crosscutting programs which coordinate across the Department and seek to tap DOE's full capability to effectively and efficiently address the United States' energy, environmental, and national security challenges. These crosscutting initiatives will be discussed further within the Programs in which the crosscuts are funded. The below ODA programs contains the following crosscut:

Cybersecurity: 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).

FY 2017 Crosscuts (\$K)	
	Cybersecurity
Environment, Health, Safety and Security	5,409
Office of Enterprise Assessments	5,502
Office of Legacy Management	1,140
Total, Crosscuts	12,051

Other Defense Activities
Funding by Congressional Control
($\$K$)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Environment, Health, Safety and Security	180,998	182,998	180,998	197,212	+16,214
Office of Enterprise Assessments	73,534	71,534	73,534	76,473	+2,939
Specialized Security Activities	203,152	203,152	230,377	237,912	+7,535
Office of Legacy Management	171,980	171,980	167,180	154,320	-12,860
Defense-Related Administrative Support	118,836	118,836	118,836	119,716	+880
Office of Hearings and Appeals	5,500	5,500	5,500	5,919	+419
Total, Other Defense Activities	754,000	754,000	776,425	791,552	+15,127
Rescission	-551	-551	0	0	0
Total, Other Defense Activities	753,449	753,449	776,425	791,552	+15,127

Environment, Health, Safety and Security

Overview

The Office of Environment, Health, Safety and Security (EHSS) provides corporate leadership and strategic approaches for protecting Department of Energy (DOE) workers, the public, the environment and national security assets. This is accomplished through the maintenance of corporate-level policies and standards and providing implementation guidance; sharing operating experience, lessons learned, and best practices; and providing assistance and supporting services to line management with the goal of mission success as DOE's environment, health, safety and security advocate.

EHSS accomplishes its overall mission in the following focus areas:

Environment, Health and Safety Policy and Support:

- Protecting the health and safety of DOE's Federal and contractor workforce, addressing the health effects legacy of the Nation's nuclear weapons program, and conducting national and international health studies.
- Minimizing DOE's radiological and other environmental footprints and improving DOE's safety performance through analysis, policy development, and sharing lessons learned.
- Promoting the safe design, construction and operation of DOE's facilities, both nuclear and non-nuclear, and providing cross-organizational leadership in resolving related issues.

Security Policy and Support:

- Establishing effective policies, through a collaborative, enterprise approach, by which the national security assets entrusted to the Department are protected and secured.
- Furthering DOE's national security, nonproliferation and open governmental goals through the identification of classified, controlled and unclassified information.
- Providing specialized security services to DOE Headquarters facilities and securing the work environment for Federal and contractor personnel.

As the Department's environment, health, safety and security advocate, EHSS supports the Department by identifying the risks in these areas that could jeopardize DOE's mission. EHSS works closely with DOE line management who is ultimately responsible for ensuring that the Department's work is managed and performed in a manner that protects workers, the public, and the Department's material and information assets. As part of this partnership, EHSS develops and promulgates environment, health, safety and security policy and provides expert advice and implementation assistance to help line management accomplish the Department's mission in a safe and secure manner. EHSS also represents the Department in national and international environment, health, safety, and security matters.

EHSS plays a leadership role in meeting the Department's expectation that all of its organizations embrace a healthy organizational culture where safe and secure performance of work and involvement of workers are deeply, strongly, and consistently held by managers and workers. EHSS contributes to more efficient and cost-effective mission accomplishment by providing quality products and timely expertise aimed at eliminating or mitigating major risks that can lead to adverse impacts to mission. EHSS also informs Secretarial decisions and improves DOE performance by providing expert advice to the Department's senior nuclear safety and nuclear security decision makers.

Working Capital Fund (WCF) estimates for FY 2017 have increased over the FY 2016 estimates to fund the third year of OPM credit monitoring and projected inflation increases in existing WCF programs including corporate business systems, building occupancy, interagency transfers, and telecommunications. EHSS's share of this estimated increase is \$1,946,000 and is included in the Program Direction Budget Request.

	Environment, Health, Safety and Security Funding (\$K)				
	FY 2015 Enacted¹	FY 2015 Current¹	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Environment, Health, Safety and Security					
Environment, Health and Safety					
Worker Safety	4,346	4,346	4,346	5,013	+667
Nuclear Safety	5,696	5,696	5,696	5,768	+72
Environment	2,407	2,407	2,407	2,407	0
Health Programs					
Domestic Health Programs					
Health Research	2,420	2,420	2,270	2,270	0
Former Worker Medical Screening	19,850	19,850	19,850	19,850	0
Employee Compensation Program	6,340	6,340	5,340	5,340	0
International Health Programs					
Russian Health Studies	2,750	2,750	2,750	2,750	0
Japanese Health Studies	14,000	16,000	14,000	14,000	0
Marshall Islands Program	6,300	6,300	6,300	6,300	0
Total, Environment, Health and Safety	64,109	66,109	62,959	63,698	+739
Security					
Insider Threat Program	2,000	2,000	3,000	3,000	0
Security Operational Support	5,762	5,762	5,762	6,462	+700
Classification, Declassification and Controlled Information	8,457	8,457	8,607	9,757	+1,150
Security Investigations	7,445	7,445	7,445	8,705	+1,260
Headquarters Security Operations	30,990	30,990	30,990	39,071	+8,081
Total, Security	54,654	54,654	55,804	66,995	+11,191
Total, Environment, Health, Safety and Security	118,763	120,763	118,763	130,693	+11,930
Program Direction	62,235	62,235	62,235	66,519	+4,284
Total, Environment, Health, Safety and Security	180,998	182,998	180,998	197,212	+16,214
Rescission	-87	-87	0	0	0
Total, Environment, Health, Safety and Security	180,911	182,911	180,998	197,212	+16,214

¹ Reflects a reprogramming of \$2,000,000 between Enterprise Assessments and the Office of Environment, Health, Safety and Security in FY 2015.

Other Defense Activities/

Environment, Health, Safety and Security

Environment, Health, Safety and Security
Explanation of Major Changes (\$K)

FY 2017 vs
 FY 2016
 Enacted

Environment, Health, Safety and Security:

Program Direction: Provides increases for salaries and benefits, working capital fund, and information technology, and an increase of 2 FTEs for the Employee Concerns program.

+4,284

Headquarters Security Operations: The increase includes funding for the Protective Force contract that was awarded in April 2015 to meet the increased labor costs and security measures to meet the current Interagency Security Committee (DHS) standards (\$7,981,000) and an increase of \$100,000 for Headquarters Physical Security Systems to include the cost, maintenance, and replacement of the access control system at both the Forrestal and Germantown facilities, replacement of the current security turnstile system, and the Classified Waste Destruction Facility, located in Germantown.

+8,081

Nuclear Safety: An increase for cost escalation for the Filter Test Facility.

+72

Security Operational Support: An increase for Security Technology Integration to provide for the identification and assessment of effective, safe and reliable physical security technologies to replace systems currently in operation at nuclear facilities, laboratories, the Strategic Petroleum Reserve and the Department's Power Marketing Administrations. The increase is also for Vulnerability Assessments, and this is offset by a decrease to the Human Reliability Program.

+700

Security Investigations: Increase is for costs by OPM to conduct security clearance investigations, and an increase in costs for the issuance of HSPD-12 credentials.

+1,260

Classification/Declassification: Increase is to provide additional support for the timely review of classified documents to prevent the inadvertent release of sensitive information to the public.

+1,150

Worker Safety: Increase is for the Employee Concerns Program being transferred to EHSS, and an increase for Information Technology.

+667

Total, Environment, Health, Safety and Security

+16,214

Environment, Health and Safety

Description

The Environment, Health and Safety subprogram provides technical and analytical expertise to protect and enhance the safety of DOE workers, the public, and the environment. This subprogram maintains policies and guidance for the establishment of safe, environmentally sound work practices to achieve best-in-class performance in occupational, facility, nuclear, and radiation safety; protection of the environment and cultural and natural resources; and quality assurance. Environment, Health and Safety provides assistance to DOE offices and laboratories through site-specific activities, such as nuclear facility safety basis reviews, and corporate-wide services, such as accrediting commercial laboratories used by DOE sites for regulatory compliance and employee monitoring programs; administering the accident investigation program; supporting the Radiation Emergency Assistance Center/Training Site; and testing of high efficient particulate air filters. Corporate databases, such as those pertaining to accidents and illnesses, occurrence reporting, radiation monitoring and dose assessment, safety basis information, and hazardous substances inventories are maintained and used to support analyses of health and safety performance for senior management.

Environment, Health and Safety provides technical support for the implementation of Department-wide safety and environmental programs such as the DOE Federal occupational safety and health program, the voluntary protection program which encourages and rewards safety performance that exceeds industry averages through universally recognized certifications, environmental management systems which support sustainable practices that promote pollution prevention, greenhouse gas reduction, and effective resource utilization, and radiological clearance and control programs for the safe reuse and recycle of DOE equipment and materials and radiological release of lands and buildings. These DOE-wide safety and environmental programs are integrated with mission activities to optimize protection and effective implementation.

The Environment, Health and Safety subprogram also provides support to the Department of Labor for the implementation of the Energy Employees Occupational Illness Compensation Program Act, the former worker medical screening program, and radiation health studies in Japan and Russia. These projects and programs provide for the evaluation and documentation of health effects and outcomes that support the basis for national and international worker protection policies and standards, which, in turn, provide updated levels of protection appropriate for the risk posed to DOE workers and the public.

In FY 2017, Environment, Health and Safety will continue:

- Developing cost-effective solutions for achieving best-in-class safety performance founded on integrated safety management and enhanced through such concepts as safety culture, voluntary protection, and environmental management systems.
- Honoring the national and Departmental commitment to current and former workers through cost-effective implementation of the former worker medical screening program and support to the Department of Labor for the implementation of the Energy Employees Occupational Illness Compensation Program Act.

Worker Safety

Worker safety and health policies establish Department-wide safe work practices to achieve best-in-class safety performance as compared to industrial operations resulting in work conducted with a full understanding of health and safety related risks and controls necessary to mitigate those risks leading to minimization or avoidance of worker compensation liabilities. Funding provides for the maintenance of existing standards and the development of new requirements based on new or evolving working conditions and new developments in health science; technical assistance to DOE programs, laboratories, and sites in implementing health and safety requirements and programs; promotion of improvements in overall safety culture; and implementation of corporate health- and safety-related programs and information technology systems. Funding also provides for collecting, analyzing, and trending operational data to identify strengths and weaknesses of safety programs in support of continuous improvement in safety performance and cost effective implementation. Funding provides for the Employee Concerns Program that 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.

Nuclear Safety

Nuclear Safety activities include establishing and maintaining nuclear safety policies and requirements to ensure adequate

Other Defense Activities/

Environment, Health, Safety and Security

protection of workers, the public, and the environment from hazards associated with the design and operation of DOE nuclear facilities. This includes the establishment of general facility safety requirements in fire protection, response to natural phenomena, maintenance, and quality assurance to ensure that products and services meet or exceed the Department's objectives. Nuclear safety provides assistance to field elements in implementing requirements and resolving issues; and provides oversight of DOE nuclear operations and facilities.

Environment

Environmental activities support DOE's strategic sustainability performance objectives by fostering efficient use of resources and energy, assisting in the responsible management of natural and cultural resources on and around DOE facilities, reducing DOE's carbon footprint, and avoiding future environmental liabilities. Funding provides technical support for the development of policies, requirements, and guidance related to environmental compliance; the encouragement of green purchasing; sustainable environmental stewardship, pollution prevention, and greenhouse gas reduction; and implementation of environmental performance tracking across the DOE complex. Environmental activities also provide technical support to ensure DOE's public and environmental radiation protection program is consistent with the Department's risk management strategies and national and international radiation protection standards associated with the management of DOE radioactive wastes and associated property and is based on sound science and risk management principles. Funding supports programs that provide assurance that environmental monitoring and sampling data meet DOE data quality objectives and ensures computer codes that are used to demonstrate compliance with DOE public and environmental protection requirements are appropriate and employ the best science. Funding also supports the development and maintenance of plans, models, and guidance to respond to radiological- and nuclear-related emergencies and support for interagency and national consensus standard development with a goal to harmonize Federal radiation protection policies and guidance for protection of the public and environment.

Domestic Health Programs:

Health Research

Domestic health research activities provide for the conduct of health studies on DOE workers and communities surrounding DOE sites, technical assistance to DOE Programs in addressing specific health issues, support to national assets used to respond to radiological events throughout the country, and expertise to support national and international efforts in response to disease outbreaks. These activities also support the maintenance of the electronic comprehensive epidemiologic data resource; the beryllium and U.S. transuranium and uranium registries; and the illness and injury surveillance database and access to the data these systems contain.

Former Worker Medical Screening

Former worker medical screening activities provide for the conduct of medical screenings for former DOE and DOE-related beryllium vendor employees to identify adverse health conditions that may have resulted from work conducted at DOE or DOE-related beryllium vendor facilities on behalf of DOE, as mandated by Congress in the FY 1993 Defense Authorization Act (Public Law 102-484). Workers who are found to have illnesses related to work on behalf of DOE are referred to the Department of Labor for potential compensation through the Energy Employees Occupational Illness Compensation Program Act.

Employee Compensation Program

DOE Energy Employees Occupational Illness Compensation Program Act (EEOICPA) activities support the implementation of Parts B and E of the Act by the Department of Labor to provide compensation to DOE and DOE-related vendor employees who have become ill as a result of work for DOE. Part B provides for compensation to workers with beryllium disease, silicosis, or radiation-induced cancer, and Part E provides for compensation and medical benefits to DOE contractor and subcontractor employees whose illnesses were caused by exposure to any toxic substance, such as beryllium or other chemical hazards. DOE's support consists primarily of providing information regarding employment status, exposures to radiation and toxic substances, and operational history of DOE facilities to the Department of Labor, the National Institute for Occupational Safety and Health, and the President's Advisory Board on Radiation and Worker Health in support of claims filed by current and former DOE Federal and contractor employees.

International Health Programs:

Russian Health Studies

Other Defense Activities/

Environment, Health, Safety and Security

The Russian health studies program supports the collaborative radiation health effects research program between U.S. and Russian scientists to determine the risks associated with working at or living near Russian former nuclear weapons production sites. The research is performed under the Cooperation in Research on Radiation Effects for the Purpose of Minimizing the Consequences of Radioactive Contamination on Health and the Environment, an agreement between the United States and Russia that was signed in 1994 and renewed in 2000, 2007, and 2011. The agreement is implemented through the Joint Coordinating Committee for Radiation Effects Research, representing agencies from the United States and the Russian Federation. The goals of the program are to better understand the relationship between health effects and chronic, low-to-medium radiation exposure; determine radiation-induced cancer risks from exposure to gamma, neutron, and alpha radiation; and improve and validate U.S. and international radiation protection standards and practices.

Japanese Health Studies

The Japanese health studies activity supports the Radiation Effects Research Foundation, managed through a bi-national agreement between the United States and Japan, to conduct epidemiologic studies and medical surveillance of the survivors of the atomic bombings of Hiroshima and Nagasaki. The foundation engages in innovative science to develop new research methods and approaches for assessing radiation health effects that are used as a basis for the development of radiation standards.

Marshall Islands Program

The Marshall Islands program provides for medical surveillance and treatment of Marshallese citizens affected by the nuclear weapons testing conducted by the United States in the Pacific Ocean between 1946 and 1958. The program also provides for environmental monitoring in support of safe resettlement of four atolls affected by the testing. The work is performed as required by the Compact of Free Association Acts of 1986 and 2003 between the United States and the Republic of the Marshall Islands and the Insular Areas Act of 2011 requiring enhanced monitoring of Runit Island Nuclear Waste Containment Structure beginning in FY 2013.

Activities and Explanation of Changes			Health and Safety
FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016	
Environment, Health, Safety and Security			
\$62,959,000	\$63,698,000		+\$739,000
Worker Safety \$4,346,000	\$5,013,000		+\$667,000
<ul style="list-style-type: none"> • Research, update, and maintain existing DOE regulations, directives and technical standards, and develop new safety and health requirements based on new or evolving working conditions, when warranted; • Provide technical assistance to DOE programs, laboratories, and sites in the implementation of health and safety requirements and programs, such as integrated safety management; • Provide support in development of technical qualification standards and description of required competencies and training for Federal staff involved in management of defense nuclear facilities; • Promote the implementation of the DOE voluntary protection program, which encourages and rewards safety performance that exceeds industry averages; • Provide for the health and safety aspects of the DOE human reliability program, designed to ensure that individuals who occupy positions that afford access to certain national security materials and nuclear explosive devices meet high standards for trustworthiness, dependability, and physical and mental reliability; • Provide technical support for the implementation of the DOE contractor employee assistance program that provides for the collection and analysis of causes of lost time and disabilities and the medical and psychological interventions available to reduce those losses; • Maintain the electronic Radiation Exposure Monitoring System, which serves as the 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities; and • Support the DOE enterprise-wide Employee Concerns Program that provides management and administration of the program to ensure that employee concerns related to environment, health, safety, and security and the management of DOE and NNSA programs and facilities are addressed utilizing well established processes that include prompt identification, reporting, and resolution of employee concerns regarding DOE facilities or operations in a manner that provides the highest degree of safe operations. 	Increase is for the Employee Concerns program transferred from the Office of Economic Impact and Diversity. There is also an increase to information technology due to increased costs of services.	

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>Department's central repository for radiation exposure information at DOE in support of 10 C.F.R. 835, Occupational Radiation Protection, Subpart I, requirements regarding annual monitoring of individual occupational radiation exposure records for DOE employees, contractors, and subcontractors, as well as members of the public who visit DOE sites;</p> <ul style="list-style-type: none"> • Provide technical support for the implementation of the DOE Federal employee occupational safety and health program, as required by Presidential Executive Order 12196, Occupational Safety and Health Programs for Federal Employees; Section 19 of Public Law 91-596, the Occupational Safety and Health Act of 1970; and 29 C.F.R. 1960, Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters; • Conduct and communicate analysis and trending of safety performance information to identify excellent performance and areas needing improvement in order to reduce or prevent adverse events and injuries and minimize mission interruptions; • Provide information to DOE operating entities regarding operating experience, lessons learned, and suspect, defective, and counterfeit items; • Provide overall program administration and assistance, including training, to DOE program offices in support of implementing the Department's accident investigation program, which provides for independent Federal investigations of high-consequence incidents involving worker fatalities or serious injuries, acute exposures to radiation or chemicals, environmental releases, or significant loss of capital assets. Upon request or as directed by DOE leadership, assist DOE program offices in 		

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>conducting specific accident investigations;</p> <ul style="list-style-type: none"> • Maintain the differing professional opinion program and process, including a web page and online submittal form that DOE and contractor employees can use to identify and document differing professional opinions concerning technical issues; • Maintain corporate health- and safety-related information management technology systems, such as the Computerized Accident/Incident Reporting System, the Occurrence Reporting and Processing System, the Radiation Exposure Monitoring System, and the lessons learned system; and • Support continuous improvement in meeting the Department's safety culture and safety conscious work environment (SCWE) across the complex and to ensure consistent leadership and focus on all aspects of DOE's safety culture initiatives. 		
Nuclear Safety \$5,696,000	\$5,768,000	+\$72,000
<ul style="list-style-type: none"> • Assess, update, and maintain DOE regulations, directives, and technical standards and lead the development of nuclear safety and quality assurance requirements based on new or evolving facility hazards and/or operating conditions, when warranted (including fire protection, natural phenomena hazards, nuclear materials packaging, and maintenance); • Maintain a DOE-wide nuclear safety research and development program to provide corporate-level leadership supporting the coordination and integration of nuclear safety science and technology, share nuclear safety research and development information across the Department, and coordinate the conduct of nuclear safety research and development activities; • Provide technical assistance to DOE program and line organizations, national laboratories, and sites 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	Provides for cost escalation for operation of the Filter Test Facility.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>in implementing nuclear safety and quality assurance requirements and programs and resolving issues and recommendations identified by the Defense Nuclear Facilities Safety Board;</p> <ul style="list-style-type: none"> ● Provide technical assistance to national standards development organizations in developing and maintaining nuclear safety and quality assurance consensus standards; ● Support DOE program offices in assessing conduct of operations, maintenance, and/or training evaluations for hazard category 1, 2, and 3 nuclear facilities prior to authorizing startup or restart of these facilities or their operations; ● Facilitate continuous improvement to the DOE facility representative and safety system programs, supporting approximately 280 site office resident nuclear safety subject matter experts funded by and reporting to DOE line management; ● Assist in coordinating information exchanges in various safety concepts relevant to DOE including nuclear safety; safety and organizational culture, high reliability performance and human performance improvement; and probabilistic risk assessment with the Institute of Nuclear Power Operations, a non-profit organization established by the commercial nuclear power industry to promote the highest levels of safety and reliability in the operation of nuclear power plants; ● Maintain web-based systems to provide the status of the safety basis of each hazard category 1, 2, or 3 DOE nuclear facility and provide public information on how to obtain copies of safety basis and related documents for DOE nuclear facilities; ● Implement safety software quality assurance activities that provide for the maintenance of the DOE safety software central registry of approved 		

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>computer codes, including a user-oriented communication forum, and operation of the safety software expert working group for enabling effective and consistent use of high-quality safety software across DOE; and</p> <ul style="list-style-type: none"> • Provide for the testing of 100 percent of all high efficiency particulate air filters used in safety class and safety significant systems, and other ventilation systems for confinement of radioactive materials prior to their use at DOE nuclear facilities. 		
Environment \$2,407,000	\$2,407,000	\$0
<ul style="list-style-type: none"> • Research, update, and maintain existing DOE regulations, directives, and technical standards, and develop new sustainability, environmental protection, and public radiation protection requirements based on new or evolving science, protection strategies, national radiation protection guidance, and techniques based on new or evolving DOE activities and programs, when warranted; • Provide technical assistance to DOE programs, laboratories, and sites in implementing sustainability, environmental protection, and public radiation protection requirements and programs; • Provide technical support to DOE site and program offices and laboratories in evaluating and resolving regulatory compliance issues through the interpretation of regulatory requirements, development of cost-effective implementation strategies, and maintenance of web-based compliance tools; • Coordinate and develop consolidated responses to proposed changes in environmental regulations that may impact Departmental operations, in order to improve implementation and optimize the use of protective resources; 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	No change in work scope.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> • Review data from environmental reports required by Federal and state environmental protection agencies to validate adherence to reporting requirements; evaluate the effectiveness of the Department's toxic chemical release reduction and pollution prevention efforts; produce annual reports on DOE environmental sustainability performance; and develop annual radionuclide emissions summaries submitted to the Environmental Protection Agency under an interagency agreement; • Conduct proficiency and quality assurance audits and reviews of environmental analytical laboratories and commercial waste treatment, storage, and disposal vendors used by DOE operating entities in support of ongoing operations, remediation, and other cleanup projects; compliance programs; and long-term monitoring and surveillance activities to ensure consistency of services while minimizing the number of DOE audits of these commercial service providers; • Support development and maintenance of software toolkits to assist DOE operating elements in meeting data quality objectives related to environmental field sampling and to support user training at DOE field element sites; • Administer the DOE environmental awards program such as the Green Buy Awards and the Migratory Birds Protection awards and support the Department in other sustainability awards programs that recognize DOE entities for outstanding achievement in sustainable environmental stewardship; • Provide assistance to and oversight of DOE site property radiological clearance and control programs to ensure the public and environment are protected from radiological harm associated 		

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>with the use or disposition of DOE property;</p> <ul style="list-style-type: none"> • Continue development and maintenance of residual radioactivity models and codes that support evaluations and safe disposition of lands, structures, equipment, soil, and other material that may contain small amounts of residual radioactive material; • Support development of Federal radiation protection policies and guidelines and consistent, cost effective implementation of radiation protection programs within DOE including the review, evaluation and implementation of the 2014 and 2015 updates to the recommendations of the International Commission on Radiological Protection and associated revisions to Federal guidance reports on radiation protection; • Provide assistance to support development and effective use of national consensus standards for radiation protection, radioactive waste and materials management, environmental protection, and climate change preparedness; • Support the Center for Radiation Protection Knowledge at the Oak Ridge National Laboratory to ensure U.S. leadership in radiation dosimetry and risk assessment; and • Maintain operational guidelines and other radiological criteria that support protective action decisions and Federal policy governing response to and recovery from radiological and nuclear terrorism incidents (radiological dispersal devices and improvised nuclear devices) and major nuclear accidents and support NNSA emergency response and preparedness activities associated with such incidents. 		
Domestic Health Programs \$27,460,000	\$27,460,000	\$0
Health Research \$2,270,000	Health Research \$2,270,000	No change to work scope.
<ul style="list-style-type: none"> • Provide for the operation and maintenance of the electronic comprehensive epidemiologic data 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	
Other Defense Activities/ Environment, Health, Safety and Security	22	FY 2017 Congressional Budget Justification

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>resource, the illness and injury surveillance database, and the U.S. transuranium and uranium registries;</p> <ul style="list-style-type: none"> • Support the Radiation Emergency Assistance Center/Training Site, which provides medical expertise to DOE occupational medicine clinics, supplies chelating pharmaceuticals to treat radiation-exposed workers, and trains physicians to respond to radiological accidents anywhere in the United States; • Provide for the maintenance of the beryllium registry, which collects, analyzes, summarizes, and disseminates health and exposure data to improve chronic beryllium disease prevention programs; and • Provide for the conduct of public health studies and other activities performed by the Department of Health and Human Services through the National Institute for Occupational Safety and Health, the National Center for Environmental Health, and the Agency for Toxic Substances and Disease Registry to provide third-party objectivity regarding the effect of DOE operations on communities surrounding DOE sites. 		
<p><i>Former Worker Medical Screening \$19,850,000</i></p> <ul style="list-style-type: none"> • Conduct site assessments to identify groups of at-risk former DOE Federal and contractor/subcontractor workers and DOE site-specific exposures; • Provide for outreach efforts to inform former workers of the availability and benefits of the program; • Provide for approximately 8,000 medical screenings annually to check for adverse health effects that could be related to occupational exposures to radiation, noise, beryllium, asbestos, silica, lead, cadmium, chromium, and solvents, 	<p><i>Former Worker Medical Screening \$19,850,000</i></p> <ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	<p>No change in work scope.</p>

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>conducted by independent health experts through seven cooperative agreements held by a consortia of universities, labor unions, and commercial organizations throughout the United States with expertise in administration of medical programs;</p> <ul style="list-style-type: none"> • Refer workers who are found to have illnesses related to work on behalf of DOE to the Department of Labor for potential compensation through the Energy Employees Occupational Illness Compensation Program Act; and • Support the DOE central institutional review board, jointly funded with Science and the National Nuclear Security Administration, which reviews all medical screening programs funded by DOE and/or involving the DOE workforce to ensure that the risks to human participants are minimized and reasonable in relation to the anticipated benefits. 		
<p><i>Employee Compensation Program \$5,340,000</i></p> <ul style="list-style-type: none"> • Conduct searches for records related to the employment and hazardous exposures for workers who applied to the Department of Labor for benefits under EEOICPA, declassify relevant records, and provide copies of those records to the Department of Labor and the National Institute for Occupational Safety and Health; • Provide for large-scale records research projects conducted by the Department of Labor, the National Institute for Occupational Safety and Health, and the President's Advisory Board on Radiation and Worker Health; • Provide for the continued transition of hard copy, paper records to electronic records, as well as records indexing projects to improve the efficiency of responses to the Department of Labor and the National Institute for Occupational Safety and Health; and 	<p><i>Employee Compensation Program \$5,340,000</i></p> <ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	<p>No change in work scope.</p>

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> Continue coordination and interface between former worker medical screening activities and EEOICPA activities, including identifying mechanisms for outreach to former workers and enhancing the exchange of medical, site, and exposure information among former worker medical screening service providers, the Department of Labor, and the National Institute for Occupational Safety and Health to assist the agencies tasked with adjudicating claims. 		
International Health Program \$23,050,000	\$23,050,000	\$0
<i>Russian Health Studies \$2,750,000</i>	<i>Russian Health Studies \$2,750,000</i>	
<ul style="list-style-type: none"> Provide for the conduct of radiation exposure historical dose reconstruction studies, epidemiologic studies, and for a tissue repository of Russian nuclear workers and people living in communities surrounding the Russian nuclear facilities; Assess radiation health effects of ionizing radiation; and Publish analyses of radiation health effects assessments. 	<ul style="list-style-type: none"> Continuation of all FY 2016 activities. 	No change in work scope.
<i>Japanese Health Studies \$14,000,000</i>	<i>Japanese Health Studies \$14,000,000</i>	
<ul style="list-style-type: none"> Conduct epidemiologic studies and medical surveillance of the survivors of the atomic bombings of Hiroshima and Nagasaki; Assess radiation health effects of ionizing radiation; and Publish analyses of radiation health effects assessments. 	<ul style="list-style-type: none"> Continuation of all FY 2016 activities. 	No change in work scope.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p><i>Marshall Islands Program</i> \$6,300,000</p> <ul style="list-style-type: none"> • Conduct whole-body counting and plutonium urinalyses to measure individual exposure to radionuclides; • Conduct comprehensive annual screening examinations; • Provide medical care for specified Marshallese; and • Provide environmental monitoring services in support of resettlement activities. 	<p><i>Marshall Islands Program</i> \$6,300,000</p> <ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	No change in work scope.

Security

Description

The Security subprogram provides support to develop and assist in the implementation of safeguards and security programs that provide protection to national security and other vital national assets entrusted to DOE, and to implement the U.S. Government's nuclear weapons-related technology classification and declassification program. Policies and guidance related to physical, personnel, and information security and nuclear materials accountability are designed to promote responsiveness to national security needs and changing threat environments. Assistance is provided to DOE programs and site offices and laboratories via working groups, site-specific support, and corporate program support to implement cost-effective security measures tailored to Departmental mission accomplishment. Corporate security-related information management systems are maintained to identify and reduce the potential for undue risk to individual sites, the Department, and national security. This subprogram also provides for the continuous physical protection and security of DOE facilities and information in the National Capital Area and access authorization security background investigations for DOE Headquarters Federal and contractor personnel. Additionally, DOE implements the information control program for the U.S. Government to mitigate national security threats by preventing the release of information regarding weapons of mass destruction and other data that could lead to damage of the Nation's energy infrastructure. Support is also provided to review over 400 million pages of documents at the National Archives for potential release as required by Executive Order 13526.

In FY 2017, Security activities will include developing comprehensive, reasonable, and cost effective security policies and operational guidelines to assure that the Nation's nuclear and energy assets and DOE's personnel and facilities are secure from insider and external threats.

Insider Threat Program

The DOE Insider Threat Program is intended to deter cleared employees from becoming insider threats; detect insiders who pose a risk to personnel, facilities, or classified or sensitive information; and mitigate the risks through administrative, investigative or other response actions. The Deputy Secretary of Energy designated an EHSS Senior Executive as the Senior Insider Threat Official to provide guidance and oversight for the insider threat program. On a continuing basis this Designated Senior Official advises and reports directly to the Secretary and Deputy Secretary regarding the planning, construct and operation of the Insider Threat Program. In FY 2017, the Insider Threat Program will continue to cut across several components of DOE and the Designated Senior Official will continue to coordinate resource needs with those components. This budget justification shows only the funding needed to implement EHSS's share of program responsibilities. Funding provides the DOE share for the inter-agency Security, Suitability and Credential Line of Business (SSCLoB) budget supporting Executive Branch-wide reforms to the security clearance, employment suitability, and credentialing processes and reform efforts pursuant to addressing the Administration's Insider Threat and Security Clearance Reform Cross-Agency Priority Goal.

Security Operational Support

Security operational support provides technical expertise to develop safeguards and security requirements and guidance; provide assistance to DOE operations; conduct security technology research, development, test and evaluations to effectively mitigate current and emerging threats; and maintain and manage corporate-level safeguards and security-related programs and information technology systems. These activities support Departmental objectives by providing an appropriately tailored level of security requirements and cost effective protection options for a wide range of scientific, research, and national security operations based on the significance of the national assets involved. Security policies, requirements, and guidance are developed to be clear and easily implemented, with the goal of securing nuclear material and classified matter and protecting the highly specialized DOE workforce.

Classification, Declassification, and Controlled Information

The classification, declassification, and controlled information activity ensures that the Department meets its statutory responsibility to implement the U.S. Government-wide program to classify and declassify nuclear weapons-related information (i.e., Restricted Data and Formerly Restricted Data) in order to prevent proliferation of nuclear weapons and technology. This activity supports the implementation of Executive Order 13526, Classified National Security Information, to classify other information critical to national security (i.e., National Security Information), such as security-related information concerning U.S. nuclear sites, energy critical infrastructure, and chemical/biological and radiological dispersal devices. Funding provides for declassification review of DOE records and the development of policies, requirements, and

Other Defense Activities/

Environment, Health, Safety and Security

guidance and technical support for the protection of controlled unclassified information.

Security Investigations

Security investigation activities provide for background investigations conducted by the Office of Personnel Management and the Federal Bureau of Investigation of DOE Headquarters Federal and contractor personnel who require access to classified information or certain quantities of special nuclear material, as required by Section 145 of the Atomic Energy Act of 1954 (as amended) and Executive Order 12968, Access to Classified Information. The conduct of investigations and granting of access authorizations are based on 10 C.F.R. 710, Criteria and Procedures for Determining Eligibility for Access to Classified Matter or Special Nuclear Material. DOE program offices provide funding for security investigations for personnel whose access authorizations are managed through offices other than DOE Headquarters.

This activity also provides support to personnel security programs associated with maintaining access authorizations to personnel who meet the criteria noted above. The conduct of investigations and granting of access authorizations is based on 10 C.F.R. 710, Criteria and Procedures for Determining Eligibility for Access to Classified Matter or Special Nuclear Material.

Headquarters Security Operations

Headquarters security operations provide a comprehensive safeguards and security program for the protection of DOE Headquarters facilities and assets in the Washington, DC, area. This is accomplished through the deployment of a protective force; security education programs; the management and operation of countermeasures, alarms, and access control equipment; and the implementation of security-related programs. Funding provides for a secure work environment and assures management, workers, and stakeholders that activities within Headquarters facilities are effectively protected.

Security		
Activities and Explanation of Changes		
FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Security \$55,804,000	Security \$66,995,000	+\$11,191,000
Insider Threat Program \$3,000,000	\$3,000,000	\$0
<ul style="list-style-type: none"> • Develop and maintain a robust program to deter, detect, and centrally analyze and respond to insider threats facing the Department; • Deploy information technology enabled techniques, detectors, and triggers on all DOE and NNSA classified and unclassified computer networks to identify anomalous activity; • Enhance existing information-sharing partnerships with law enforcement, intelligence, and community organizations; • Develop measures of success and program review criteria. • Develop and implement insider threat program training in fundamentals of counterintelligence, security, agency procedures for insider threat response, as well as applicable laws and regulations on gathering, integrating, retaining, safeguarding and use of collected insider threat data; and • Produce an annual report for the Secretary to provide to the President. • Provide for the inter-agency Security, Suitability and Credentialing Line of Business operating budget. 	<ul style="list-style-type: none"> • Develop and maintain a robust program to deter, detect, and centrally analyze and respond to insider threats facing the Department; • Enhance existing information-sharing partnerships with law enforcement, intelligence, and community organizations; • Assist Field Sites in the establishment of Local Insider Threat Working Groups. • Develop measures of success and program review criteria. • Develop and implement insider threat program training in fundamentals of counterintelligence, security, agency procedures for insider threat response, as well as applicable laws and regulations on gathering, integrating, retaining, safeguarding and use of collected insider threat data; and • Produce an annual report for the Secretary to provide to the President. • Provide for the inter-agency Security, Suitability and Credentialing Line of Business operating budget. 	<ul style="list-style-type: none"> Assist Field Sites in the establishment of Local Insider Threat Working Groups.
Security Operational Support \$5,762,000	\$6,462,000	\$+700,000
<ul style="list-style-type: none"> • Research, update, and maintain existing DOE regulations, directives and technical standards, and develop new safeguards and security requirements based on new or evolving threats or working conditions, when warranted; • Provide technical assistance to DOE programs, laboratories, and sites in implementing safeguards and security requirements and programs; 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities; and • Provide for the identification and assessment of effective, safe and reliable physical security technologies to replace systems currently in operation at nuclear facilities, laboratories, the Strategic Petroleum Reserve and the Department's Power Marketing Administrations. Security technology assessments will be conducted on systems having the highest cost- 	<ul style="list-style-type: none"> An increase for Security Technology Integration to provide for the identification and assessment of effective, safe and reliable physical security technologies to replace systems currently in operation at nuclear facilities, laboratories, the Strategic Petroleum Reserve and the Department's Power Marketing Administrations. An additional increase is also for Vulnerability Assessments, and this is offset by a decrease to the Human Reliability

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> • Provide technical support, training, and awareness materials for the security-related aspects of the human reliability program, including deployment of the human reliability program database and standard certification management system to ensure that over 10,000 individuals with access authorizations/clearances who occupy positions requiring access to special nuclear materials, nuclear explosive devices, or related facilities and information meet the highest standards of reliability and physical and mental suitability; • Provide support to the security awareness special interest group for DOE and contractor safeguards and security awareness coordinators to share security awareness methods and products, solve problems, and disseminate security-related information to satisfy Presidential and other regulatory requirements; • Operate, maintain, and perform data analysis of the electronic Safeguards and Security Information Management System, a centralized classified browser-based database that serves as the repository of current and historical DOE safeguards and security information pertaining to inspection deficiencies, corrective action status, facility clearance levels, classified addresses, and asset information; • Provide technical support and assistance for risk communication, risk management, vulnerability assessments, and security system performance evaluations, verifications, and validations, which are used to identify and cost-effectively address and mitigate current and emerging threats to Departmental assets at the site level; • Provide assistance to DOE programs, sites, and laboratories in the use of security technology as a means to mitigate vulnerabilities, reduce 	<p>benefit potential while driving down risk from an enterprise perspective.</p>	<p>Program.</p>

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>recurring costs, and lessen environmental impacts, and maintain the Security Technology Information Archive for the collection, storage, and dissemination of security technology cost, performance, safety, and implementation information; and</p> <ul style="list-style-type: none"> ● Maintain corporate security-related information technology systems, such as the DOE electronic Foreign Ownership, Control, or Influence program mandated by the Federal acquisition regulations system (48 C.F.R. 904.7003, 952.204-2, 970.0404, 904.404, and 952.204-73) and by Executive Order 12829, National Industrial Security Program; the DOE foreign visits and assignments program that enables foreign nationals' participation in unclassified DOE work, as well as classified visits involving foreign nationals; and the Radiological Source Registry and Tracking database, which is used to inventory approximately 18,000 radioactive sealed sources at DOE sites in support of the Department's nonproliferation and antiterrorist programs, U.S. and DOE regulatory compliance, and international treaty obligations. 		
Classification, Declassification and Controlled Information		
\$8,607,000	\$9,757,000	+\$1,150,000
<ul style="list-style-type: none"> ● Provide technical support in developing U.S. Government and DOE-wide policy and technical guidance to ensure that classified nuclear weapons-related information and other information critical to national security and to U.S. Governmental, commercial, or private interests is identified for proper protection; ● Provide specialized technical expertise to foreign governments and to DOE and other U.S. departments and agencies regarding the national security implications of classification and declassification decisions for nuclear 	<ul style="list-style-type: none"> ● Continuation of all FY 2016 activities. 	<p>Increase is to provide additional support for the timely review of classified documents to prevent the inadvertent release of sensitive information to the public.</p>

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>proliferation issues;</p> <ul style="list-style-type: none"> • Provide training and certification of DOE and other agency personnel in classification and information control programs and related areas; • Provide support to the National Declassification Center for review of 400 million pages at the National Archives and follow-on record collections; • Review documents in support of DOE operations and other U.S. Government entities, such as Congress, Presidential Libraries, U.S. Patent Office, the Defense Nuclear Facilities Safety Board, the Government Accountability Office, and the Inspector General; and • Perform the final review of classified DOE documents and documents containing DOE equities from all U.S. Government departments and agencies, including DOE, when they are requested under the Freedom of Information Act and the mandatory provisions of Executive Order 13526, to ensure that DOE classified and controlled information is identified and protected from unauthorized release to the public as required by 10 C.F.R. 1004, Freedom of Information, and 10 C.F.R. 1045, Nuclear Classification and Declassification. 		
Security Investigations \$7,445,000	\$8,705,000	+\$1,260,000
<ul style="list-style-type: none"> • Provide for the Federal Bureau of Investigation to conduct background investigations of DOE Headquarters Federal and contractor employees applying for or occupying sensitive positions, as dictated by the Atomic Energy Act (as amended). Provides for initial background investigations, periodic reinvestigations, and reimbursement for fingerprint and name checks; • Provide for the Office of Personnel Management to conduct most background investigations of DOE Headquarters Federal and contractor 	Continuation of all FY 2016 activities.	Increase funding required due to price increase for background investigations. Also, the FY 2017 reinvestigation caseload is expected to increase.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>employees. Funding provides for initial single-scope background investigations, periodic reinvestigations, and initial and reinvestigation national agency checks;</p> <ul style="list-style-type: none"> • Research, update, and maintain existing DOE regulations, directives, and technical standards, and develop new personnel security requirements based on new or evolving threats or working conditions, when warranted; • Provide technical assistance to DOE programs, laboratories, and sites in implementing personnel security requirements and programs; • Conduct corporate-level access authorization adjudications (i.e., performing case reviews, conducting evaluations, and preparing decision packages), as necessary; • Operate and manage the electronic DOE Integrated Security System, which consists of interrelated databases and associated client applications and web pages that automate the processing and tracking of access authorizations, access and visitor control, personal identity verification, and related personnel security processes; and • Continue deployment of the personnel security case management system, as well as the integration of this system with DOE field site human resources, financial management, and access control systems to reduce overall personnel security program costs by eliminating redundant systems at DOE field sites and reduce processing time by integrating directly with other databases. 		
Headquarters Security Operations \$30,990,000	\$39,071,000	+\$8,081,000
<ul style="list-style-type: none"> • Provide a protective force engaged in the physical protection of classified information, facilities, and the workforce 24 hours a day, 365 days a year at DOE Headquarters facilities and 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities; and • Replace and repair Headquarters physical security systems at both the Forrestal and Germantown facilities. 	Supports the increased fixed costs of the Protective Force contract and the current DHS Interagency Security Committee standards, and replacement and repair of Headquarters physical security systems.
Other Defense Activities/ Environment, Health, Safety and Security	33	FY 2017 Congressional Budget Justification

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>satellite facilities in Washington, DC, and Germantown, MD;</p> <ul style="list-style-type: none"> • Operate and maintain security alarms and access control systems, including security screening equipment, vehicle inspection scanning devices, internet protocol video, turnstiles, unmanned access/egress portals, other access control equipment; and protective force shelters; • Conduct performance testing of information control systems to ensure the protection of sensitive and classified information vital to both national and economic security; • Conduct technical surveillance countermeasures activities, such as surveys, inspections, in-conference monitoring, pre-construction consultation services, and threat analysis, in support of Presidential Decision Directive 61, Energy Department Counterintelligence, to detect and prevent hostile intelligence collection operations intent on penetrating DOE installations to steal technology or sensitive or classified information; • Conduct the telecommunications security activities consisting of emission security, protected transmission systems, and communications security to ensure the protection of DOE's sensitive unclassified and classified telecommunications through various security components; • Provide access authorization adjudication services (i.e., case reviews and analysis, interviews, and use of court reporters and consulting physicians as needed) for DOE Headquarters personnel to assure that access to DOE classified information is permitted only after a determination that such access will not endanger the common defense and national security; 		

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> • Implement Homeland Security Presidential Directive 12 requirements related to the secure and reliable identification of DOE Federal and contractor employees; • Provide technical support for the implementation of the DOE Headquarters security awareness and classified matter protection and control programs; • Administer the DOE Headquarters facility clearance registration and foreign ownership, control, or influence programs for contractors granted access to classified information; and • Conduct safeguards and security surveys, self-assessments, and program reviews to ensure that DOE Headquarters operations comply with Departmental and national-level requirements. 		

Program Direction

Overview

Program Direction provides for Federal staffing and mission support services to provide overall direction and execution of the EHSS mission of conducting the Department's activities in environment, health, safety, and security policy, technical assistance, analysis, and corporate programs.

Technical Support Services: Defense Nuclear Facilities Safety Board (DNFSB) Liaison Activities

Liaison activities facilitate the Department's interaction with the DNFSB.

Other Related Expenses

Other related expenses provide support required for EHSS to accomplish its mission. Support includes working capital fund services; training for Federal employees; funding for information technology equipment and services and DOE common operating environment fees; and executive protection and other security-related equipment.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction Summary					
Program Direction					
Salaries and Benefits	45,573	45,573	46,024	47,405	+1,381
Travel	1,665	1,665	1,665	2,193	+528
Mission Support	300	300	300	285	-15
Other Related Expenses	14,697	14,697	14,246	16,636	+2,390
Total, Program Direction	62,235	62,235	62,235	66,519	+4,284
Federal FTEs	260	260	260	262	+2
Support Services and Other Related Expenses					
Support Services					
Technical Support					
Defense Nuclear Facilities Safety Board Liaison Activities	300	300	300	285	-15
Total, Technical Support	300	300	300	285	-15
Total, Support Services	300	300	300	285	-15
Other Related Expenses					
Working Capital Fund	10,055	10,055	9,604	11,485	+1,881
Tuition/Training of Federal Staff	223	223	223	260	+37
Other Services Procured	4,419	4,419	4,419	4,891	+472
Total, Other Related Expenses	14,697	14,697	14,246	16,636	+2,390

Program Direction		
Activities and Explanation of Changes		
FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$62,235,000	\$66,519,000	+\$4,284,000
Salaries and Benefits \$46,024,000	\$47,405,000	+\$1,381,000
<ul style="list-style-type: none"> • Provide: corporate-level leadership and strategic vision to coordinate and integrate environment, health, safety, and security policy development and technical assistance; analysis; corporate safety and security programs including insider threat activities; quality assurance programs; executive protection; and effective cross-organizational coordination to resolve Defense Nuclear Facilities Safety Board-related technical and management issues necessary to ensure worker and public health and safety; • Manage the conduct of domestic and international health programs; • Implement physical and personnel security programs for DOE Headquarters facilities; and • Manage the U.S. Government-wide program to classify and declassify nuclear weapons-related technology and other national security information. 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	The increase reflects an expected rise in cost of living adjustments in Federal employee salaries and benefits, and an increase of 2 FTEs for the Employee Concerns Program.
Travel \$1,665,000	\$2,193,000	+\$528,000
<ul style="list-style-type: none"> • Supports the management and conduct of environment, health, safety, and security programs for the Department; and • Supports executive protection activities for the Secretary, Deputy Secretary, and other dignitaries as assigned. 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	Increase is to provide for increased travel costs, including additional travel support for Executive Protection.
Technical Mission Support \$300,000	\$285,000	-\$15,000
<i>Defense Nuclear Facilities Safety Board (Board) Liaison Activities</i>	<i>Defense Nuclear Facilities Safety Board (Board) Liaison Activities</i>	No change in work scope.
<ul style="list-style-type: none"> • Promote resolution of recommendations and agreed-upon safety issues; • Provide requested reports on nuclear safety issues; • Provide ready access to such facilities, personnel, and information as are necessary for the Board to carry out its responsibilities; 	<ul style="list-style-type: none"> • Continuation of all FY 2016 activities. 	
Other Defense Activities/ Environment, Health, Safety and Security	38	FY 2017 Congressional Budget Justification

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> Provide technical evaluation and analysis of safety and management issues identified by the Board; Provide advice and support to DOE line managers on addressing and resolving such issues; and Monitor Department-wide performance in addressing issues raised by the Board. 		
Other Related Expenses \$14,246,000	\$16,636,000	+\$2,390,000
<ul style="list-style-type: none"> Working capital fund fees, based on guideline estimates issued by the working capital fund manager, for the cost of common administrative services such as building occupancy and alterations, computer and telephone infrastructure and usage, mail service, copying, printing and graphics, procurement closeouts, supplies, online learning, computer network support, and payroll processing; Federal employee training to obtain and/or maintain the technical competence of Federal employees, assuring that Federal personnel are fully capable of performing current and future missions of the Department; The DOE common operating environment initiative that provides a single point of contact for all common information technology systems and services and brings security, service, efficiency, and scale to these projects; Information technology investments that support Headquarters Federal and contractor staff with hardware, software, hotline, and other desktop computer maintenance support on per-user count and level of service; Information technology systems exclusive to EHSS such as the classified local area network that includes a Secret/Restricted Data network that supports Headquarters users and the Secret Internet Protocol Router Network that provides access to the Department of Defense classified network to effect coordination between the two departments; 	<ul style="list-style-type: none"> Continuation of all FY 2016 activities. 	<p>The increase provides for cost recovery for the Working Capital Fund increases and covers expected increases for IT desktop services support.</p>

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<ul style="list-style-type: none"> • Executive protection services to the Secretary of Energy and others designated by the Secretary; and the conduct of inquiries and investigations into significant matters of security concern; and • Specialized security equipment and services. 		

**Environment, Health, Safety and Security
Safeguards and Security Crosscut
(\$K)**

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY2016 \$ Chg.	FY 2017 vs. FY 2016 % Chg.
<u>Environment, Health, Safety and Security (EHSS)</u>					
Protective Forces	23,410	23,410	31,391	+7,981	+34.1%
Physical Security Systems	5,488	5,488	5,588	+100	+1.8%
Information Security	8,457	8,607	9,757	+1,150	+13.4%
<u>Cyber Security</u>					
Protecting Networks and Information	3,291	4,315	4,315	0	0.0%
Detect, Analyze, and Mitigate intrusions	806	806	806	0	0.0%
Continuous Monitoring	248	248	248	0	0.0%
Shaping the Cyber Security environment	40	40	40	0	0.0%
Total, Cyber Security	4,385	5,409	5,409	0	0.0%
Personnel Security	5,342	5,342	5,392	+50	+0.9%
Material Control and Accountability	0	0	0	0	na
Program Management	5,762	5,762	6,462	+700	+12.1%
Security Investigations	4,195	4,195	5,105	+910	+21.7%
Transportation Security	0	0	0	0	na
Specialized Security Activities	0	0	0	0	na
Total, EHSS	57,039	58,213	69,104	+10,891	+18.7%

**Environment, Health, Safety and Security Funding by Appropriation by Site
(\$K)**

	FY 2015 ¹ Current	FY 2016 Enacted	FY 2017 Request
Environment, Health, Safety and Security			
Argonne National Laboratory	945	945	945
Brookhaven National Laboratory	250	250	250
Chicago Operations Office	50	50	50
Consolidated Business Center	259	259	259
Idaho National Laboratory	150	150	150
Idaho Operations Office	400	400	400
Kansas City Plant	10	10	10
Lawrence Berkeley National Laboratory	1,500	0	0
Lawrence Livermore National Laboratory	3,050	3,050	3,050
Lexington Project Office	200	200	200
Los Alamos National Laboratory	95	95	95
Nevada Site Office	15	15	15
NNSA Service Center	1,000	1,000	1,000
Oak Ridge Institute for Science and Education	1,305	1,305	1,305
Oak Ridge National Laboratory	1,035	1,035	1,035
Oak Ridge Operations Office	2,795	2,795	2,795
Office of Scientific and Technical Information	300	300	300
Ohio Field Office	5	5	5
Pacific Northwest National Laboratory	1,905	1,905	1,095
Pantex Plant	10	10	10
Richland Operations Office	1,000	1,000	1,000
Sandia National Laboratory	1,210	1,210	1,210
Savannah River Operations Office	500	500	500
Savannah River Site	10	10	10
Washington, D.C., Headquarters	162,892 ¹	164,479	180,693
Y-12 National Security Complex	20	20	20
Total, Environment, Health, Safety and Security	182,998	180,998	197,212
Rescission	-87	0	0
Total, Environment, Health, Safety and Security	182,911	180,998	197,212

¹ Reflects a reprogramming of \$2,000,000 between Enterprise Assessments and the Office of Environment, Health, Safety and Security in FY 2015.

Other Defense Activities/

Environment, Health, Safety and Security

Office of Enterprise Assessments

Overview

The Office of Enterprise Assessments (EA)¹ 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.

Since its establishment in 2014, EA has focused on several key initiatives, all of which will remain as priorities in FY 2017:

- 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.
- Standing up two new offices to increase assessment activities related to Worker Safety and Health, and Emergency Management.

Highlights of the FY 2017 Request

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 areas such as cybersecurity, worker protection, emergency management, and insider threats; and asked EA to identify practical recommendations, based on lessons learned during EA assessments, which can be used to improve safety and security across the DOE enterprise. These priorities are reflected in the FY 2017 Budget Request.

Working Capital Fund (WCF) estimates for FY 2017 have increased over the FY 2016 estimates to fund the third year of OPM credit monitoring and projected inflation increases in existing WCF programs including corporate business systems, building occupancy, interagency transfers, and telecommunications. EA’s share of this estimate is included in the Program Direction section of this request.

¹ Formerly the Office of Independent Enterprise Assessments.

Office of Enterprise Assessments

Nuclear Safety Assessments
Enforcement
Safety and Security Training (HS)
Outreach and Analysis

Total, Office of Enterprise Assessments**Program Direction****Total, Office of Enterprise Assessments**

Rescission

Total, Office of Enterprise Assessments**Office of Enterprise Assessments****Funding (\$K)**

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Nuclear Safety Assessments	6,621	4,621 ¹	6,621	6,621	0
Enforcement	1,947	1,947	1,947	1,947	0
Safety and Security Training (HS)	15,000	15,000	15,000	15,512	+512
Outreach and Analysis	500	500	500	500	0
Total, Office of Enterprise Assessments	24,068	22,068	24,068	24,580	+512
Program Direction	49,466	49,466	49,466	51,893	+2,427
Total, Office of Enterprise Assessments	73,534	71,534	73,534	76,473	+2,939
Rescission	0 ²	0	0	0	0
Total, Office of Enterprise Assessments	73,534	71,534	73,534	76,473	+2,939

Office of Enterprise Assessments**Explanation of Major Changes (\$K)**

FY 2017 vs FY 2016
+512

Enterprise Assessments: Provides increased support for the training reciprocity and collaboration program and incorporation of best practices and lessons learned from EA assessments into safety and security training programs.

Program Direction: Increase funds the EA FTE allocation; provides for an anticipated increase in Federal staff travel, training and IT costs associated with the standing up of Worker Safety and Health, and Emergency Management offices.

Total, Enterprise Assessments**+2,427****+2,939**

¹ Reflects a reprogramming of \$2,000,000 between Office of Enterprise Assessments and the Office of Environment, Health, Safety and Security in FY 2015.

² Correction to the EA portion of the ODA rescission previously stated as -\$54,000 in FY 2016 Congressional Budget.

Enterprise Assessments

Description

The EA Program provides for the assessment of DOE performance in nuclear safety, the implementation of the enforcement programs for health and safety, nuclear safety, and classified information security; the development and administration of safety and security training that reflects the most current Departmental policy and lessons learned through safety and security assessments; and the establishment and maintenance of collaborative relationships with internal and external organizations.

Nuclear Safety Assessments

Provides for the planning and execution of independent assessments of DOE high hazard nuclear facility construction projects, nuclear facilities and operations to determine compliance with nuclear safety requirements contained in Title 10 Code of Federal Regulations (C.F.R.) Part 830, Nuclear Safety Management, and DOE directives. EA has placed greater emphasis on nuclear safety assessments, for example increasing its activities related to the Hanford Site Waste Treatment and Immobilization Plant and monitoring recovery efforts at the Waste Isolation Pilot Plant following two major incidents in 2014.

Enforcement

Provides the Department with the capability to implement regulatory enforcement programs specified in Title 10 C.F.R. Part 851, Worker Safety and Health Program; Title 10 C.F.R. Part 820, Procedural Rules for DOE Nuclear Activities; and Title 10 C.F.R. Part 824, Procedural Rules for the Assessment of Civil Penalties for Classified Information Security Violations. These activities provide a consistent and transparent method of contractor accountability for health and safety, nuclear safety and classified information security performance that complements the Department's contract management mechanisms. The goal of the enforcement program is to ensure that DOE contractors adhere to worker safety and health, nuclear safety, and classified information security requirements, and to promote proactive improvement through timely self-identification, reporting, and correction of noncompliant conditions to enable contractors to achieve excellence in mission accomplishment without the need for enforcement actions.

Safety and Security Training

Safety and security training activities assist the Department in developing and maintaining the proficiency and competency of DOE safety and security personnel. Training activities also improve senior executives' capabilities to fulfill safety and security leadership responsibilities through standardized training for the protection of the environment, the safety and health of the public and the workforce, and the security of critical Departmental and national security assets. The DOE National Training Center (NTC), located in Albuquerque, New Mexico, serves as the primary resource for DOE safety and security training. The NTC has led the development of the DOE Training Reciprocity Program to certify safety and security training programs which meet certain standards, and thus may be utilized across DOE sites. The reciprocity program is helping to reduce redundancy and inefficiency in training programs offered at DOE sites. The NTC is also expanding its efforts to incorporate lessons learned and best practices identified during EA assessments into more effective training programs.

Outreach and Analysis

Establishes and maintains collaborative relationships with line management, external stakeholders, and other U.S. Government entities in order to inform the Secretary of their input and positions, and foster improvements in health, safety, environmental and security performance at DOE sites. This helps determine complex-wide crosscutting issues and trends and provides analytic materials to help EA leadership determine areas of critical need and vulnerability and address Departmental issues.

Office of Enterprise Assessments

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Office of Enterprise Assessments \$24,068,000	\$24,580,000	+\$512,000
Nuclear Safety Assessments \$6,621,000	\$6,621,000	\$0
<ul style="list-style-type: none"> • Conduct independent assessments of high hazard nuclear facility construction projects to ensure compliance with nuclear safety requirements; and • Provide independent assessments of DOE nuclear facilities and operations to ensure compliance with nuclear safety requirements. 	<ul style="list-style-type: none"> • Conduct independent assessments of high hazard nuclear facility construction projects to ensure compliance with nuclear safety requirements; and • Provide independent assessments of DOE nuclear facilities and operations to ensure compliance with nuclear safety requirements. 	No change in work scope.
Enforcement \$1,947,000	\$1,947,000	\$0
<ul style="list-style-type: none"> • Review and analyze operational data from the DOE data management system designed for noncompliance reporting, as well as reports from independent assessment activities, the DOE Occurrence Reporting and Processing System, the DOE Computerized Accident/Incident Reporting System, the DOE Safeguards and Security Information Management System, Federal accident investigations, and DOE site and program office assessments and evaluations to determine whether enforcement investigations are warranted and to identify trends in noncompliance events; • Conduct regulatory reviews; • Conduct enforcement investigations; • Develop and issue enforcement actions and other regulatory outcomes, such as notices of violation, enforcement letters, consent orders, and compliance orders, and assess civil penalties or other sanctions for regulatory violations; and • Conduct periodic outreach and training activities to communicate the Department's approach to safety and security enforcement, convey noncompliance reporting expectations, and provide information about DOE regulatory 	<ul style="list-style-type: none"> • Review and analyze operational data from the DOE data management system designed for noncompliance reporting, as well as reports from independent assessment activities, the DOE Occurrence Reporting and Processing System, the DOE Computerized Accident/Incident Reporting System, the DOE Safeguards and Security Information Management System, Federal accident investigations, and DOE site and program office assessments and evaluations to determine whether enforcement investigations are warranted and to identify trends in noncompliance events; • Conduct enforcement investigations; • Develop and issue enforcement case outcomes, such as notices of violation, enforcement letters, and consent orders, and assess civil penalties or other sanctions for regulatory violations; and • Conduct periodic outreach and training activities to communicate the Department's approach to safety and security enforcement, convey noncompliance reporting expectations, and provide information about DOE regulatory 	No change in work scope.

**Other Defense Activities/
Office of Enterprise Assessments**

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
noncompliance reporting expectations, and provide information about DOE regulatory performance.	performance.	
Safety and Security Training (HS) \$15,000,000	\$15,512,000	+\$512,000
<ul style="list-style-type: none"> Develop and provide security-and safety-related training and professional development programs at the DOE National Training Center (NTC), at DOE sites through mobile training teams, and through Webinars, video conferencing, and synchronous distance learning; Maintain and upgrade equipment and technologies to support a greater web presence and “just-in-time” online training products, such as webcasts and topical area seminars; and Expand the reciprocity program whereby certified safety training programs are recognized by other DOE contractors and sites and; Operate and maintain the NTC, including classrooms, administrative offices, weapons live-fire ranges, and the Integrated Safety and Security Training and Evaluation Complex, a simulated DOE research and operational facility designed to allow for the use and evaluation of training methodologies and evolving safety and security technologies through hands-on, performance-based instruction. 	<ul style="list-style-type: none"> Develop and provide security-and safety-related training and professional development programs at the NTC and at DOE sites through mobile training teams, Webinars, video conferencing, and synchronous distance learning; Maintain and upgrade equipment and technologies to support a greater web presence and “just-in-time” online training products, such as webcasts and topical area seminars; Expand the use of the training reciprocity and collaboration program whereby certified safety training programs are recognized by other DOE contractors and sites and provide mechanisms for DOE contractors to work together to share training content and develop DOE-wide courses; Expand the incorporation of best practices and lessons learned from EA assessments into NTC training programs; and Operate and maintain the NTC, including classrooms, administrative offices, weapons live-fire ranges, and the Integrated Safety and Security Training and Evaluation Complex, a simulated DOE research and operational facility designed to allow for the use and evaluation of training methodologies and evolving safety and security technologies through hands-on, performance-based instruction. 	Provides increased support for the training reciprocity and collaboration program and incorporation of best practices and lessons learned from EA assessments into NTC training programs.
Outreach and Analysis \$500,000	\$500,000	\$0
<ul style="list-style-type: none"> Establish and maintain collaborative relationships with organizations both internal and external to DOE; and Leverage and provide analytic materials to help 	<ul style="list-style-type: none"> Establish and maintain collaborative relationships with organizations both internal and external to DOE; Establish outreach mechanisms to industry, 	Expanded activities 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
Other Defense Activities/ Office of Enterprise Assessments	47	FY 2017 Congressional Budget Justification

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>EA leadership determine areas of critical need and vulnerability.</p> <ul style="list-style-type: none"> • government, and academic organizations to leverage expertise for addressing and resolving departmental issues; • Analyze site wide issues and trends and determine complex-wide crosscutting issues and trends; and • Leverage and provide analytic materials techniques and means to help EA leadership understand areas of critical need and vulnerability. 		<p>security performance.</p>

Program Direction

Overview

Program Direction provides for Federal staffing and mission support services to provide overall direction and execution of the EA mission to conduct expert evaluations of management performance in safety, security and other areas; implement health and safety, nuclear safety, and classified information security enforcement programs; develop and administer safety and security training that reflects the most current Departmental policy on safety and security issues; and establish and maintain collaborative relationships with organizations both internal and external to DOE.

Critical to achieving its vision and goals is the ability of EA to maintain a highly qualified workforce with the expertise and skills necessary to support, manage, and conduct its mission. The EA workforce is composed of health, safety, and security professionals grounded in science, engineering, and technology that are led by effective program and project managers with exceptional communication and leadership skills and supported by innovative resource management experts. The judicious use of contractor support continues to be a practical and cost-effective means of providing a surge pool of technical experts.

Support Services - Independent Assessments

Independent assessment activities provide high value to the Department by identifying gaps and vulnerabilities in safety (worker and nuclear safety, and emergency management), physical security and cybersecurity programs, and related performance. Independent assessment activities are selected based on careful consideration and analysis of risk to Departmental operations and performance trends, and are tailored to the unique missions and needs of each DOE program and site office. Safeguards and security, information security, and cybersecurity-related independent assessment activities are designed to determine whether special nuclear materials, classified matter (parts and information), controlled unclassified and sensitive information are adequately protected from unauthorized or inadvertent disclosure or diversion, including from the actions of malicious insiders. Assessment activities are also designed to evaluate whether the Department's overarching management and governance structure is effective in promoting robust protection strategies and informed risk management decisions. Safety-related independent assessment activities help to ensure that workers and the public are protected from the hazards associated with the Department's operations, and to preclude events that could negatively impact the Department's ability to perform its mission and achieve its goals. Independent assessment activities provide accurate and timely information and analysis to the Department's senior leadership regarding the effectiveness of the Department's safety and security programs and other functions of interest. Information is made available to Department management, congressional committees, and stakeholders, such as unions and local public interest groups, to provide confidence that the Department's operations are performed in a safe and secure manner.

Independent assessment activities complement but do not replace DOE line management's responsibility for security, safety, and contract performance management as required by Departmental policies. EA provides a check-and-balance function that is vital for a self-regulating agency to provide assurance of its safety and security posture to its leadership, its workers, the public and Congress, and to maintain confidence in the Department's ability to be an effective self-regulator. As required by DOE Order 227.1, Independent Oversight Program, independent assessment activities are performed by personnel who are organizationally independent of the DOE program and site offices that implement policies and programs, and who can therefore objectively observe and report on those policies and programs as they relate to Departmental operations. Independent assessment processes are governed by documented, formal protocols that are continuously evaluated, revised, and refined based on Departmental and national events and activities that have an impact on DOE security and safety in order to provide more useful performance data and related information to line managers.

Other Related Expenses

Support includes working capital fund services; training for Federal employees; information technology equipment and services, and the Energy Information Technology System.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction					
Salaries and Benefits	16,126	16,126	16,336	18,389	+2,053
Travel	1,235	1,235	1,235	1,667	+432
Support Services	28,013	28,013	27,765	27,544	-221
Other Related Expenses	4,092	4,092	4,130	4,293	+163
Total, Program Direction	49,466	49,466	49,466	51,893	+2,427
Federal FTEs	92	92	92	92	0
Support Services					
Technical Support					
Independent Assessments	28,013	28,013	27,765	27,544	-221
Total, Technical Support	28,013	28,013	27,765	27,544	-221
Total, Support Services	28,013	28,013	27,765	27,544	-221
Other Related Expenses					
Working Capital Fund	2,718	2,718	2,756	2,719	-37
Training	78	78	78	113	+35
Other Services Procured	1,296	1,296	1,296	1,461	+165
Total, Other Related Expenses	4,092	4,092	4,130	4,293	+163

Program Direction		
Activities and Explanation of Changes		Explanation of Changes FY 2017 vs FY 2016
FY 2016 Enacted	FY 2017 Request	
Program Direction \$49,466,000	\$51,893,000	+\$2,427,000
Salaries and Benefits \$16,336,000	\$18,389,000	+\$2,053,000
<ul style="list-style-type: none"> Federal staffing and mission support services to provide overall direction and execution of the EA mission to conduct expert evaluations of management performance in safety, security and other areas; implement health and safety, nuclear safety, and classified information security enforcement programs; develop and administer safety and security training that reflects the most current Departmental policy on safety and security issues; and establish and maintain collaborative relationships with organizations both internal and external to DOE in order to foster improvements in health, safety, environmental and security performance at DOE sites. 	<ul style="list-style-type: none"> Federal staffing and mission support services to provide overall direction and execution of the EA mission to conduct expert evaluations of management performance in safety, security and other areas; implement health and safety, nuclear safety, and classified information security enforcement programs; develop and administer safety and security training that reflects the most current Departmental policy on safety and security issues; and establish and maintain collaborative relationships with organizations both internal and external to DOE in order to foster improvements in health, safety, environmental and security performance at DOE sites. 	Increase funds the EA FTE allocation.
Travel \$1,235,000	\$1,667,000	+\$432,000
<ul style="list-style-type: none"> Provides for Federal employee travel in support of EA enforcement, independent assessment, training outreach and other mission-related activities as directed by the Secretary. 	<ul style="list-style-type: none"> Provides for Federal employee travel in support of EA enforcement, independent assessment, training outreach and other mission-related activities as directed by the Secretary. 	Provides for increased Federal staff travel associated with the standing up of Worker Safety and Health, and Emergency Management offices.
Support Services \$27,765,000	\$27,544,000	-\$221,000
<i>Independent Assessments</i>	<i>Independent Assessments</i>	<i>Independent Assessments</i>
<ul style="list-style-type: none"> Observe operations and conduct technical assessments and performance tests that examine the effectiveness of safety and security programs and policies, giving priority to the highest security interests, such as strategic quantities of special nuclear material, and activities that present the most significant safety risks to workers and the public, such as nuclear facilities and operations; Conduct performance tests for critical 	<ul style="list-style-type: none"> Observe operations and conduct technical assessments and performance tests that examine the effectiveness of safety and security programs and policies, giving priority to the highest security interests, such as strategic quantities of special nuclear material, and activities that present the most significant safety risks to workers and the public, such as nuclear facilities and operations; Conduct performance tests for critical 	Decrease is realized via efficiency of operations with no impact to overall mission.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>safeguards and security interests, including protective force tests (e.g., force-on-force exercises) using weapons simulation systems and a specially trained composite adversary team to assess overall security effectiveness;</p> <ul style="list-style-type: none"> • Conduct limited-notice performance testing of site protective forces to maximize response realism and broaden the spectrum of tested threat scenarios; • Conduct assessments of the implementation of the Department's insider threat program to deter, detect, and mitigate potential insider threats posed by Federal and DOE contractor employees; • Conduct announced and unannounced internal and external network penetration testing to provide a full understanding of a site's cybersecurity protection posture; • Conduct the annual independent evaluation of classified information systems security programs for DOE as required by the Federal Information Security Management Act; • Conduct an annual evaluation of classified information systems security programs for systems that process intelligence information on behalf of the DOE Office of Intelligence and Counterintelligence; • Provide input to the DOE Office of Inspector General for the annual evaluation of the DOE unclassified information systems security program; • Conduct annual "red team" cybersecurity assessments of the computer networks within the National Nuclear Security Administration weapons laboratories; • Conduct targeted reviews of selected nuclear 	<p>safeguards and security interests, including protective force tests (e.g., force-on-force exercises) using weapons simulation systems and a specially trained composite adversary team to assess overall security effectiveness;</p> <ul style="list-style-type: none"> • Conduct limited-notice performance testing of site protective forces to maximize response realism and broaden the spectrum of tested threat scenarios; • Conduct assessments of the implementation of the Department's insider threat program to deter, detect, and mitigate potential insider threats posed by Federal and DOE contractor employees; • Conduct announced and unannounced internal and external network penetration testing to provide a full understanding of a site's cybersecurity protection posture; • Conduct the annual independent evaluation of classified information systems security programs for DOE as required by the Federal Information Security Management Act; • Conduct an annual evaluation of classified information systems security programs for systems that process intelligence information on behalf of the DOE Office of Intelligence and Counterintelligence; • Provide input to the DOE Office of Inspector General for the annual evaluation of the DOE unclassified information systems security program; • Conduct annual "red team" cybersecurity assessments of the computer networks within the National Nuclear Security Administration weapons laboratories; • Conduct targeted reviews of selected nuclear 	

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>safety functional areas across the DOE complex based on such factors as performance trends, changes to applicable requirements, and/or performance information gaps;</p> <ul style="list-style-type: none"> • Maintain the nuclear safety site lead program to monitor the status of DOE nuclear facilities and activities and facilitate the selection and execution of risk-informed assessment activities; • Conduct risk-informed reviews of worker safety and health programs. • Conduct reviews to assess emergency planning, preparedness, and response and recovery capabilities. • Conduct special reviews and studies of safety and security policies, programs, and implementation to identify needed program corrections; • Develop reports identifying findings and opportunities for improvement; • Develop and broadly disseminate abstracts of key results to promote performance improvements; • Continuously analyze results, and develop periodic summary reports that identify cross-cutting issues and performance trends; • Conduct follow-up reviews to evaluate corrective action effectiveness; and • Provide lessons learned and trending of inspection results to the National Training Center to be used to develop or amend safety and security curricula. 	<p>safety functional areas across the DOE complex based on such factors as performance trends, changes to applicable requirements, and/or performance information gaps;</p> <ul style="list-style-type: none"> • Maintain the nuclear safety site lead program to monitor the status of DOE nuclear facilities and activities and facilitate the selection and execution of risk-informed assessment activities; • Conduct risk-informed reviews of worker safety and health programs. • Conduct reviews to assess emergency planning, preparedness, and response and recovery capabilities. • Conduct special reviews and studies of safety and security policies, programs, and implementation to identify needed program corrections; • Develop reports identifying findings and opportunities for improvement; • Develop and broadly disseminate abstracts of key results to promote performance improvements; • Continuously analyze results, and develop periodic summary reports that identify cross-cutting issues and performance trends; • Conduct follow-up reviews to evaluate corrective action effectiveness; and • Provide lessons learned and trending of inspection results to the NTC to be used to develop or amend safety and security curricula. 	
Other Related Expenses \$4,130,000	\$4,293,000	+\$163,000
<ul style="list-style-type: none"> • Working capital fund fees, based on guideline estimates issued by the working capital fund manager, for the cost of common administrative services such as building occupancy and 	<ul style="list-style-type: none"> • Working capital fund fees, based on guideline estimates issued by the working capital fund manager, for the cost of common administrative services such as building occupancy and 	The net increase provides for increased training for Federal staff and expected increase in IT-costs, offset by a reduction of working capital fund fees.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<p>alterations, computer and telephone infrastructure and usage, mail service, copying, printing and graphics, procurement closeouts, supplies, online learning, computer network support, and payroll processing;</p> <ul style="list-style-type: none"> • Federal employee training to obtain and/or maintain the technical competence of EA Federal employees, assuring that Federal personnel are fully capable of performing missions of the Department; and • The DOE common operating environment initiative that provides a single point of contact for all common information technology systems and services and brings security, service, efficiency, and scale to these projects. 	<p>alterations, computer and telephone infrastructure and usage, mail service, copying, printing and graphics, procurement closeouts, supplies, online learning, computer network support, and payroll processing;</p> <ul style="list-style-type: none"> • Federal employee training to obtain and/or maintain the technical competence of EA Federal employees, assuring that Federal personnel are fully capable of performing missions of the Department; and • The Energy Information Technology System that provides a single point of contact for all common information technology systems and services and brings security, service, efficiency. 	

**Other Defense Activities
Facilities Maintenance and Repair**

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. The Facilities Maintenance and Repair activities funded by this budget and displayed below are intended to halt asset condition degradation.

Costs for Direct-Funded Maintenance and Repair (including Deferred Maintenance Reduction) (\$K)

	FY 2015 Actual Cost	FY 2015 Planned Cost	FY 2016 Planned Cost	FY 2017 Planned Cost
National Training Center	409	409	411	504
Total, Direct-Funded Maintenance and Repair	409	409	411	504

Report on FY 2015 Expenditures for Maintenance and Repair

This report responds to legislative language set forth in Conference Report (H.R. 108-10) accompanying the Consolidated Appropriations Resolution, 2003 (Public Law 108-7) (pages 886-887), which requests the Department of Energy provide an annual year-end report on maintenance expenditures to the Committees on Appropriations. This report compares the actual maintenance expenditures in FY 2015 to the amount planned for FY 2015, including Congressionally directed changes.

**Other Defense Activities
Total Costs for Maintenance and Repair (\$K)**

	FY 2015 Actual Cost	FY 2015 Planned Cost
National Training Center	409	409
Total, Maintenance and Repair	409	409

**Enterprise Assessments
Safeguards and Security (\$K)**

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Protective Forces	0	0	0	0	0
Physical Security Systems	0	0	0	0	0
Information Security	0	0	0	0	0
Cybersecurity	4,044	4,044	4,039	5,502	+1,463
Personnel Security	0	0	0	0	0
Material Control and Accountability	0	0	0	0	0
Program Management	0	0	0	0	0
Transportation Security	0	0	0	0	0
Construction	0	0	0	0	0
Total, Safeguards and Security	4,044	4,044	4,039	5,502	+1,463

Crosscutting Initiatives

The Department is organized into three Under Secretariats—Science and Energy, Nuclear Security, and Management and Performance—which recognize the complex interrelationship among DOE Program Offices. The Budget Request continues crosscutting programs which coordinate across the Department and seek to tap DOE's full capability to effectively and efficiently address the United States' energy, environmental, and national security challenges. These crosscutting initiatives will be discussed further within the Programs in which the crosscuts are funded. The Enterprise Assessments (EA) program contains the following crosscut.

Cybersecurity: 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).

The Department maintains strong independent oversight of both classified and unclassified information technology systems through EA cybersecurity assessment activities. These activities include announced internal and external network penetration testing as well as unannounced "red-team" cybersecurity assessments to provide a full understanding of the Department's cybersecurity protection posture against external and insider threats.

FY 2017 Crosscuts (\$K)							
	Grid Modernization	sCO2	Exascale Computing	Subsurface Engineering	Energy-Water Nexus	Cyber security	Total
Enterprise Assessments	0	0	0	0	0	4,668	4,668
Total, Crosscuts	0	0	0	0	0	4,668	4,668

Department of Energy
FY 2017
Funding by Appropriation by Site
($\$K$)

	FY 2015 ¹	FY 2016	FY 2017
Enterprise Assessments			
National Training Center	150	150	250
Pacific Northwest National Laboratory	125	125	160
Washington Headquarters	71,259	73,259	76,063
Total, Enterprise Assessments	71,534	73,534	76,473

¹ Reflects a reprogramming of \$2,000,000 between Office of Enterprise Assessments and the Office of Environment, Health, Safety and Security in FY 2015.

Legacy Management

FY 2015 Enacted	FY 2015 Current¹	FY 2016 Enacted	FY 2017 Request
\$171,811	\$171,811	\$167,180	\$154,320

Overview

The Office of Legacy Management (LM) assists the Department in achieving the strategic goal of providing a long-term solution to the environmental legacy of the Cold War and ensures that DOE fulfills its long-term commitments to: protect human health and the environment; and, provide post-retirement benefits to former contractor workers. By funding the long-term activities at over 90 closed sites in the LM subprogram, other DOE programs are able to concentrate on risk reduction and site closure at the remaining operating sites.

The majority of LM's activities are long-term, aimed at maintaining the Department's regulatory and contractual commitments. Short-term activities assist with the targeted outcome of the Department's 2014-2018 Strategic Plan to complete environmental remediation of our legacy and active sites. The mission of LM achieves the Strategic Plan goal of Management and Performance: 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.

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

Highlights and Major Changes in the FY 2017 Budget Request

LM will continue its core activities at \$13 million below the FY 2016 funding level. A \$19 million decrease in pension and benefit continuity was partially offset by increases in the cost of LTS&M and expanded work scope associated with defense related uranium mines. The funding levels of the program request will allow LM to perform LTS&M at over 90 sites, provide funding for payment of post-retirement benefits to over 10,000 former contractor employees, support termination of pension plans for remaining closure sites, manage records and information, pursue beneficial reuse of properties, and support an interagency agreement to address abandoned uranium mines.

¹ There was a rescission of -\$169,000 of Prior Year Funds in which resulted in funding level decrease for FY 2015.

Legacy Management
Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Legacy Management					
Legacy Management					
Long-Term Surveillance and Maintenance	46,051	46,051	45,252	49,923	+4,671
Environmental Justice	1,303	1,303	1,303	1,303	0
Archives and Information Management	13,967	13,967	13,967	14,400	+433
Pension and Benefit Continuity	88,200	88,200	84,000	64,880	-19,120
Asset Management	9,118	9,118	9,558	9,800	+242
Total, Legacy Management	158,639	158,639	154,080	140,306	-13,774
Program Direction	13,341	13,341	13,100	14,014	+914
Rescission of Prior Year Balances ²	-169	-169	0	0	0
Total, Legacy Management	171,811	171,811	167,180	154,320	-12,860
Federal FTEs	63	63	64	67	+3

² Reflects a rescission of prior year funds of \$169,000 in FY 2015.

Legacy Management
Explanation of Major Changes (\$K)

FY 2017 vs FY 2016

<ul style="list-style-type: none"> • Legacy Management: Funding requirements decreased due to recent actions taken by the responsible contractors related to health insurance payments in accordance with DOE Order 350.1, Contractor Human Resource Management Programs, Chapter V, Benefits. • Program Direction: No significant change. LM will add three FTEs during FY 2017 to address uranium mining issues and additional site responsibility. • Legacy Management: Funding requirements for records/ IT management at increased site locations. • Legacy Management: Funding requirements for LTS&M at additional sites and expanded work on defense related uranium mines. • Legacy Management: Funding requirements for a major maintenance project at the Grand Junction airport for calibration pads. 	-19,120 +914 +433 +4,671 +242
Total, Legacy Management	-12,860

Legacy Management

Overview

Long-Term Surveillance and Maintenance (LTS&M), Environmental Justice (EJ), Archives and Information Management (AIM), Pension and Benefit Continuity, and Asset Management.

Long-Term Surveillance and Maintenance

This activity is required for remediated sites that have been closed. Before transferring to LM, cleanup is performed to a level that protects human health and the environment. DOE maintains the sites to ensure the cleanup remains protective of human health and the environment. Site conditions must meet the regulatory requirements established by state and federal agencies in cooperation with local governments, Tribal Nations, and public stakeholders.

The funding requested for FY 2017 will allow LM to monitor and conduct LTS&M at its sites in accordance with legal, contractual and regulatory agreements. Routine functions include soil, water, and air monitoring, long-term treatment of contaminants, maintenance of disposal cells, and security. Funding for this activity is required to meet legal and regulatory requirements for LM sites. LM is planning to manage 94 sites by the close of FY 2016 and 100 sites by the close of FY 2017.

LM led the effort to produce the defense related uranium mines (DRUM) report as required by Congress and delivered in August 2014. Following eighteen months of intergovernmental coordination, the report concluded there are still numerous data gaps associated with abandoned uranium mines. The funding requested for FY 2017 will support LM's continued involvement in a multi-agency effort to fill existing data gaps and to validate and verify existing information. This additional effort will result in a better understanding of the magnitude and extent of the issues associated with DRUM.

A related cost, directly supporting this activity and embedded within the total activity cost, is safeguards and security for LM properties. The costs include protective forces and physical security systems, as follows (in whole dollars): FY 2015 - \$160,000; FY 2016 - \$200,000; and FY 2017 - \$184,000. The cost is derived from protective forces and physical security systems in Weldon Spring and Fernald.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice (EJ) in Minority and Low-Income Populations, directed each Federal agency to make achieving EJ part of its mission. LM provides leadership and coordination of Departmental EJ activities and represents the Department in interagency planning and activities. The FY 2017 funding continues actions under a Memorandum of Understanding that includes participation from 17 Federal agencies to work collaboratively with communities to increase their ability to sustain a healthy quality of life.

Archives and Information Management

LM is the custodian of legacy physical and electronic records for LM sites, including the major closure sites of Fernald, Mound, and Rocky Flats. LM is responsible for approximately 114,000 cubic feet of physical records and approximately 54 terabytes of electronic records. LM's responsibility in this area includes management of the records and information systems (e.g., the Licensing Support Network) associated with the Yucca Mountain project.

Within this activity, LM provides records management services for its active program elements and maintains legacy archives of inherited collections, including paper and electronic records and records in other media. Elements include records management policy and procedure development, planning, and development of oversight processes and actions that guide and govern physical and electronic records management operations, including preservation efforts for fragile or deteriorating records. Functions within this activity encompass operational records retention, records maintenance and use, and records disposition processes and activities to ensure proper documentation of LM's environmental protection, and hazardous waste disposition-related policies and activities.

The activity includes responding to requests associated with the Freedom of Information Act (FOIA), Privacy Act, and other information requests (e.g., DOE stakeholders processing claims associated with the Energy Employees Occupational Illness Compensation Program Act). LM currently receives ~1,600 information requests each year.

This activity also provides LM's information management and technology needs. This work involves the coordination of information collection, storage, dissemination, and destruction as well as managing the policies, guidelines, and standards

regarding information management. LM maintains its information technology (IT) infrastructure – including maintaining functional equipment, operating systems, and software capable of accessing electronic records – and provides planning, design, and maintenance of an IT infrastructure to effectively support automated needs (e.g., platforms, networks, servers, printers, etc.) and provides IT security for LM’s unclassified computing networks.

IT security involves all processes and activities pertaining to the securing of Federal data and systems through the creation and definition of security policies, procedures and controls covering such services as identification, authentication, and non-repudiation in accordance with Federal Information Processing Standards (FIPS) and the Federal Information Security Management Act (FISMA). The cost of the embedded cyber security and information security functions are as follows (in whole dollars): FY 2015 - \$904,000 (includes security testing and evaluation); FY 2016 - \$922,000; and FY 2017 - \$1,190,000. The primary reason for the increase in FY 2017 is a planned certification and accreditation effort associated with the move of the Yucca Mountain Licensing Support Network to the LM managed data center in Morgantown, WV.

Pension and Benefit Continuity

This activity fulfills the Department’s commitment to its former contractor employees from closure sites and certain employees from other sites. For sites that have been closed following the end of active programs and completion of site remediation, LM is responsible for ensuring that former contractor employees receive the pensions and post-retirement benefits (PRB) that are part of the contractual agreements for the respective sites. Dependent upon the contract provisions for the respective sites, LM funds the contractor cost of providing retirement benefits to former contractor employees. These retirement benefits include pension plans, health insurance, Medicare Part B reimbursement, and life insurance. Several DOE contractors responsible for closure site pension plans are in the process of terminating pension plans through a combination of lump sum buyouts and the purchase of insurance company annuities.

In FY 2017, LM will support the administration of pensions and/or PRB for the following sites: Fernald (OH), Grand Junction (CO), Mound (OH), Paducah (KY), Pinellas (FL), Portsmouth (OH), and Rocky Flats (CO). The number of participants in the pension and/or other benefit plans (including spouses covered under the retiree medical plans) is over 10,000. The total number of participants is expected to decrease over time due to a closed participant population and normal mortality.

Asset Management

LM manages tens of thousands of acres of land and other assets. This activity focuses on management of those assets – including administration of leases for property used in program functions, infrastructure and facility management – and on reuse or transfer of the real and personal property to other agencies or private interests. Transferring land to a private interest allows the land to be reused productively, reduces the Department’s “footprint” of the Cold War legacy, and enables resumption of local property taxes. Transfer of excess assets to non-DOE ownership is a priority. LM has disposed of more than ten properties since being created in FY 2004, and continues to evaluate assets for future property disposition. Asset Management also includes LM’s Environmental Management Systems (EMS) Program for maintaining environmental compliance and meeting sustainability goals for federal agencies. LM sustainability efforts include: continuing to reduce greenhouse gas emissions, water use intensity, and energy use; increasing the portion of energy needs met by renewable or alternative sources; and assessing the potential impacts of climate change on LM sites.

This activity also includes management of lease tracts for uranium mining on selected Federal lands in Colorado. By managing lands for domestic production of uranium, LM enables prudent development of our natural resources. Uranium lease management will continue to strengthen LM’s capacity for long-term management of uranium-mine related issues.

A related cost directly supporting this activity and embedded within the total activity cost is safeguards and security for LM properties. The costs include protective forces, physical security systems, personnel security, information security, and program management, as follows (in whole dollars): FY 2015 - \$552,000; FY 2016 - \$850,000; and FY 2017 - \$1,003,000.

Legacy Management
Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Long-Term Surveillance and Maintenance- \$45,252,000	\$49,923,000	+\$4,671,000
<ul style="list-style-type: none"> Conduct surveillance and maintenance at 90 sites. Accept responsibility for four additional sites by the end of FY 2016. Conduct needed actions to prepare for transfer of future sites. 	<ul style="list-style-type: none"> Conduct surveillance and maintenance at 94 sites. Accept responsibility for six additional sites by the end of FY 2017. Conduct needed actions to prepare for transfer of future sites. Supports an interagency effort to address defense-related uranium mines. 	<ul style="list-style-type: none"> The increase supports the transfer of new sites to LM and DOE's contribution to an interagency effort to address the legacy of defense-related uranium mines.
Environmental Justice (EJ)- \$1,303,000	\$1,303,000	\$0
<ul style="list-style-type: none"> Continue EJ functions as the Departmental focus for that program element. Promote EJ functions in the communities affected by DOE closure actions. 	<ul style="list-style-type: none"> Continue EJ functions as the Departmental focus for that program element. Promote EJ functions in the communities affected by DOE closure actions. 	<ul style="list-style-type: none"> No change.
Archives and Information Management- \$13,967,000	\$14,400.000	\$433,000
<ul style="list-style-type: none"> Continue records/IT management functions for all sites and activities. Accept responsibility for records/IT for sites transferred to LM during the fiscal year. 	<ul style="list-style-type: none"> Continue records/IT management functions for all sites and activities. Accept responsibility for records/IT for sites transferred to LM during the fiscal year. 	<ul style="list-style-type: none"> No significant change.
Pension and Benefit Continuity- \$84,000,000	\$64,880,000	-\$19,120,000
<ul style="list-style-type: none"> Continue to pay pensions and/or PRB for eight sites. 	<ul style="list-style-type: none"> Continue to pay pensions and/or PRB for seven sites. Support termination of pension plans for the retirees at three sites, as needed. 	<ul style="list-style-type: none"> PRB costs reduced through the use of health reimbursement arrangements. Pension and PRBs for the Yucca Mountain site retirees terminated.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Asset Management- \$9,558,000 <ul style="list-style-type: none"> Continue asset management support for 90 sites. Add four sites by the end of FY 2016. Manage infrastructure and facilities at LM sites. Continue management of the Uranium Leasing program. Continue to increase and manage beneficial reuse initiatives at sites available for reuse. Disposition of one property during FY 2016. 	\$9,800,000 <ul style="list-style-type: none"> Continue asset management support for 94 existing sites. Add six sites by the end of FY 2017. Manage infrastructure and facilities at LM sites. Continue management of the Uranium Leasing Program. Continue to increase and manage beneficial reuse initiatives at sites available for reuse. Perform a major maintenance project at the Grand Junction airport for calibration pads. 	+\$242,000 <ul style="list-style-type: none"> The increase supports a major maintenance project at the Grand Junction airport for calibration pads.

Legacy Management Performance Measures

In accordance with the GPRA Modernization Act of 2010, the Department sets targets for, and tracks progress toward, achieving performance goals for each program. For more information, refer to the Department's FY 2015 Annual Performance Report.

	FY 2015	FY 2016	FY 2017
Performance Goal (Measure)	Conduct surveillance and maintenance actions at all sites within LM's responsibility to ensure the effectiveness of cleanup remedies in accordance with legal agreements or identify sites subject to additional remedial action		
Target	90 sites inspected	94 sites inspected	100 sites inspected
Result	90 sites inspected	Not Applicable	Not Applicable
Endpoint Target	Inspections will continue indefinitely. Inspection of 100 percent of the sites will continue to be the goal.		
Performance Goal (Measure)	Reduce the cost of performing long-term surveillance and maintenance activities while meeting all regulatory requirements to protect human health and the environment. Reduction is measured in percent from the life-cycle baseline. Goal is a 2 percent reduction each year based on an independently-reviewed baseline.		
Target	2 percent reduction below the baseline	2 percent reduction below the baseline	2 percent reduction below the baseline
Result	Target met	Not Applicable	Not Applicable
Endpoint Target	Two percent reduction below the life-cycle baseline each year.		

Program Direction

Overview

The LM mission is carried out by a workforce composed mainly of contractors paid mostly from program funds. Oversight, policy, and inherently governmental functions (e.g., contract administration and budget formulation and execution) are provided by a federal workforce funded from program direction. Within the program direction subprogram, most costs are associated with Federal personnel salaries and benefits.

Highlights of the FY 2017 Budget Request

The FY 2017 Request includes three additional FTEs (and additional travel and training costs) to address growing site management responsibilities.

	Program Direction Funding (\$K)	Program Direction Summary				
		FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters						
Salaries and Benefits		10,100	10,100	10,246	10,720	+474
Travel		508	508	522	598	+76
Support Services		581	581	346	524	+178
Other Related Expenses		2,152	2,152	1,986	2,172	+186
Total, Program Direction		13,341	13,341	13,100	14,014	+914
Federal FTEs		63	63	64	67	+3
Support Services and Other Related Expenses						
Support Services						
Technical Support		110	110	50	50	0
System Definition						
Total, Technical Support		110	110	50	50	0
Management Support						
Manpower Systems Analysis		125	125	94	51	-43
Training and Education		70	70	71	72	+1
Analysis of DOE Management Processes		110	110	50	50	0
Reports and Analyses Management and General Administrative Support		166	16	81	301	+220
Total Management Support		471	471	296	474	+178
Total, Support Services		581	581	346	524	+178
Other Related Expenses						
Other Services and Supplies		250	250	203	224	+21
Energy IT Services		132	132	134	166	+32
Working Capital Fund		1,770	1,770	1,649	1,782	+133
Total, Other Related Expenses		2,152	2,152	1,986	2,172	+186

Program Direction		
Activities and Explanation of Changes		Explanation of Changes FY 2017 vs FY 2016
FY 2016Enacted	FY 2017 Request	
Program Direction- \$13,100	\$14,014	+\$914
Salaries and Benefits- \$10,246	\$10,720	+\$474
<ul style="list-style-type: none"> Federal staff will perform functions to ensure the objectives under each LM program goal are met. Often the functions include oversight, audit, and policy development for contractors' activities. 	<ul style="list-style-type: none"> Continue functions to manage LM's activities in order to achieve LM's program goals. Increase the number of federal employees to meet the additional site management responsibility and address defense related uranium mine issues. 	<ul style="list-style-type: none"> The increase will allow 3 additional FTEs.
Travel- \$522	\$598	+\$76
<ul style="list-style-type: none"> Travel enables staff to conduct necessary surveillance and maintenance functions, business and site operations, oversight, and related activities. 	<ul style="list-style-type: none"> Continue to conduct necessary functions at a growing number of closed sites. 	Additional travel funds are needed to meet expanding site requirements.
Support Services- \$346	\$524	+\$178
<ul style="list-style-type: none"> Support services assist in the preparation of both routine and ad hoc reports. In addition, contractual support assists with staff training. 	<ul style="list-style-type: none"> Continue in an effort to prepare more analyses and reports with Federal staff. Some training will be done by Federal staff. 	<ul style="list-style-type: none"> The increase reflects training for additional staff.
Other Related Expenses- \$1,986	\$2,172	+\$186
<ul style="list-style-type: none"> Other services include LM's contribution to the DOE Working Capital Fund (WCF) as well as expenses not encompassed by the fund, supplies, computer software and hardware, and the Department's IT support. 	<ul style="list-style-type: none"> Continue with procuring services and supplies at relatively the same level with the exception of WCF. 	<ul style="list-style-type: none"> The increase is due to higher WCF expenses, including \$114K for credit monitoring expenses, and CIO labor increases on EITS contracts.

Legacy Management
Facilities Maintenance and Repair

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by this budget are displayed below.

Costs for Direct-Funded Maintenance and Repair (including Deferred Maintenance Reduction) (\$K)

	FY 2015 Actual Cost	FY 2015 Planned Cost	FY 2016 Planned Cost	FY 2017 Planned Cost
Office of Legacy Management				
Comprehensive Environmental Response Compensation and Liabilities Act (CERCLA) Sites	2,771	2,771	1,380	2,327
Non-CERCLA Sites	1,465	1,465	1,859	1,192
Total, Direct-Funded Maintenance and Repair	4,236	4,236	3,239	3,519

Report on FY 2014 Expenditures for Maintenance and Repair

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

Legacy Management
Safeguards and Security Crosscut (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Protective Forces	532	532	549	539	-10
Physical Security Systems	113	113	139	136	-3
Information Security ³	6	6	6	56	+50
Cyber Security ⁴	904	904	922	1,140	+218
Personnel Security	33	33	33	33	0
Material Control and Accountability	0	0	0	0	0
Program Management	28	28	323	473	+150
Security Investigations	0	0	0	0	0
Transportation Security	0	0	0	0	0
Construction	0	0	0	0	0
Total, Safeguards and Security	1,616	1,616	1,972	2,377	+405

³ FY 2017 Request includes \$50,000 to purchase new encryption software.

⁴ FY 2017 increase supports a planned certification and accreditation effort associated with the Licensing Support Network. Additionally, cyber demands continue to increase.

Other Defense Activities/ Legacy Management/

Program Direction

**Office of Hearings and Appeals
Program Direction**

Overview

The Office of Hearings and Appeals (OHA) provides adjudicatory and conflict resolution services for DOE's programs so that disputes may be resolved at the agency level in a fair, impartial and efficient manner. OHA supports all DOE strategic goals, including management and operational excellence. The bulk of OHA work is defense-related and consists of the adjudication of security clearance cases that determine the eligibility of employees to have access to special nuclear material or classified information.

Within the Other Defense Activities Appropriation, OHA operates with three staffs: the Personnel Security and Appeals Division, the Employee Protection and Exceptions Division, and the Office of Conflict Prevention and Resolution.

OHA offers fair, timely, impartial, and customer-friendly processes for adjudicating matters pursuant to regulatory authority or special delegation from the Secretary. Such cases include: (i) eligibility for a security clearance, (ii) whistleblower protection for employees of DOE contractors, (iii) Freedom of Information and Privacy Act Appeals, (iv) relief from DOE product efficiency regulations to prevent special hardship, and (v) and other matters that the Secretary may delegate. With respect to alternative dispute resolution (ADR), OHA offers mediation and other services for a variety of matters.

Highlights of the FY 2017 Budget Request

The FY 2017 Budget Request supports increased workload and succession planning. OHA's level of 26 FTEs (an increase of 4 FTEs from the FY 2016 requested level of 22 FTEs) accommodates the hiring and training of junior staff to replace the more experienced staff that are likely to retire.

Program Direction
Funding (\$K)

FY 2015 Enacted	FY 2015 Current	FY 2016 Request	FY 2017 Request	FY 2017 vs FY 2016
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Program Direction

Salaries and Benefits	4,181	4,181	4,106	4,333	+227
Travel	40	40	40	40	0
Support Services	0	0	44	60	+16
Other Related Expenses	1,279	1,279	1,310	1,486	+176
Subtotal, Program Direction	5,500	5,500	5,500	5,919	+419
Rescission of Balances	-258	-258	0	0	0
Total, Program Direction	5,242	5,242	5,500	5,919	+419
Federal FTEs	22	22	22	26	+4

Support Services

Legal Research Support	0	0	44	60	+16
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Other Related Expenses

Energy IT Services	165	165	175	195	+20
Working Capital Fund	1,114	1,114	1,135	1,291	+156
Total, Other Related Expenses	1,279	1,279	1,310	1,486	+176

Program Direction

Activities and Explanation of Changes

FY 2016 Request	FY 2017 Request	Explanation of Changes FY 2017 vs. FY 2016
Program Direction \$5,500,000	\$5,919,000	+\$419,000
Salaries and Benefits \$4,106,000	\$4,333,000	+\$227,000
• Supports current staffing level of 22 FTEs.	• Supports staffing level of 26 FTEs.	• Increase reflects addition of 4 FTEs at lower grades in anticipation of several retirements of higher-graded staff. There will need to be some overlap between outgoing and incoming staff for the purpose of transitioning duties and allowing for on-the-job training.
Travel \$40,000	\$40,000	\$0
• Supports travel to conduct security hearings at DOE field locations.	• Continuation of FY16 activities.	• No change in work scope.
Support Services \$44,000	\$60,000	+\$16,000
• Supports computer legal research services for FY 2016.	• Supports computer research services for FY 2017.	• Increase allows OHA to fund legal research services.
Other Related Expenses \$1,310,000	\$1,486,000	+\$176,000
• Funding supports the Working Capital Fund (WCF), which provides for shared service costs and Departmental overhead expenses; Energy IT Services; and other services.	• Continuation of FY 2016 activities.	• Increase reflects WCF estimated costs.

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities			
Argonne National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	945	945	945
Total, Argonne National Laboratory	945	945	945
Brookhaven National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	250	250	250
Total, Brookhaven National Laboratory	250	250	250
Chicago Operations Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	50	50	50
Total, Chicago Operations Office	50	50	50
Consolidated Business Center			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	259	259	259
Total, Consolidated Business Center	259	259	259
Fernald Site			
Office of Legacy Management			
Legacy Management	16,202	15,785	13,369
Total, Fernald Site	16,202	15,785	13,369
Grand Junction Office			
Office of Legacy Management			
Legacy Management	33,641	34,150	34,205
Total, Grand Junction Office	33,641	34,150	34,205
Idaho National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	150	150	150
Total, Idaho National Laboratory	150	150	150
Idaho Operations Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	400	400	400
Total, Idaho Operations Office	400	400	400
Kansas City National Security Complex (KCNSC)			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	10	10	10
Total, Kansas City National Security Complex (KCNSC)	10	10	10

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities			
Lawrence Berkeley National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,500	0	0
Total, Lawrence Berkeley National Laboratory	1,500	0	0
Lawrence Livermore National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	3,050	3,050	3,050
Total, Lawrence Livermore National Laboratory	3,050	3,050	3,050
Lexington Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	200	200	200
Total, Lexington Office	200	200	200
Los Alamos National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	95	95	95
Total, Los Alamos National Laboratory	95	95	95
Morgantown Office			
Office of Legacy Management			
Legacy Management	11,432	11,462	11,925
Total, Morgantown Office	11,432	11,462	11,925
Mound Site			
Office of Legacy Management			
Legacy Management	17,235	15,611	12,583
Total, Mound Site	17,235	15,611	12,583
Nevada Field Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	15	15	15
Total, Nevada Field Office	15	15	15
NNSA Albuquerque Complex			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,000	1,000	1,000
Enterprise Assessments			
Enterprise Assessments	150	150	250
Total, NNSA Albuquerque Complex	1,150	1,150	1,250

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities			
Oak Ridge Institute for Science & Education			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,305	1,305	1,305
Total, Oak Ridge Institute for Science & Education	1,305	1,305	1,305
Oak Ridge National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,035	1,035	1,035
Total, Oak Ridge National Laboratory	1,035	1,035	1,035
Oak Ridge Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	2,795	2,795	2,795
Total, Oak Ridge Office	2,795	2,795	2,795
Office of Scientific & Technical Information			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	300	300	300
Total, Office of Scientific & Technical Information	300	300	300
Ohio Field Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	5	5	5
Total, Ohio Field Office	5	5	5
Pacific Northwest National Laboratory			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,905	1,905	1,905
Enterprise Assessments			
Enterprise Assessments	125	125	160
Total, Pacific Northwest National Laboratory	2,030	2,030	2,065
Paducah Gaseous Diffusion Plant			
Office of Legacy Management			
Legacy Management	3,000	3,000	2,933
Total, Paducah Gaseous Diffusion Plant	3,000	3,000	2,933
Pantex Plant			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	10	10	10
Total, Pantex Plant	10	10	10

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities			
Pinellas Site			
Office of Legacy Management			
Legacy Management	7,218	7,643	6,130
Total, Pinellas Site	7,218	7,643	6,130
Portsmouth Gaseous Diffusion Plant			
Office of Legacy Management			
Legacy Management	6,100	6,100	4,867
Total, Portsmouth Gaseous Diffusion Plant	6,100	6,100	4,867
Richland Operations Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,000	1,000	1,000
Total, Richland Operations Office	1,000	1,000	1,000
Rocky Flats Site			
Office of Legacy Management			
Legacy Management	54,853	53,460	42,605
Total, Rocky Flats Site	54,853	53,460	42,605
Sandia National Laboratories			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	1,210	1,210	1,210
Total, Sandia National Laboratories	1,210	1,210	1,210
Savannah River Operations Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	500	500	500
Total, Savannah River Operations Office	500	500	500
Savannah River Site Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	10	10	10
Total, Savannah River Site Office	10	10	10

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Other Defense Activities			
Washington Headquarters			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	102,744	102,244	114,174
Program Direction	62,235	62,235	66,519
Total, Environment, Health, Safety and Security	164,979	164,479	180,693
Hearings and Appeals			
Program Direction	5,500	5,500	5,919
Office of Legacy Management			
Legacy Management	14,644	14,403	15,317
Enterprise Assessments			
Enterprise Assessments	21,793	23,793	24,170
Program Direction	49,466	49,466	51,893
Total, Enterprise Assessments	71,259	73,259	76,063
Specialized Security Activities			
Specialized Security Activities	203,152	230,377	237,912
Total, Washington Headquarters	459,534	488,018	515,904
Weldon Spring Site Office			
Office of Legacy Management			
Legacy Management	5,020	3,061	7,911
Total, Weldon Spring Site Office	5,020	3,061	7,911
Y-12 Site Office			
Environment, Health, Safety and Security			
Environment, Health, Safety and Security	20	20	20
Total, Y-12 Site Office	20	20	20
Yucca Mountain Site Office			
Office of Legacy Management			
Legacy Management	2,635	2,505	2,475
Total, Yucca Mountain Site Office	2,635	2,505	2,475
Total, Other Defense Activities	635,164	657,589	671,836

Departmental Administration

Departmental Administration

Departmental Administration

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**Departmental Administration
Proposed Appropriation Language**

For salaries and expenses of the Department of Energy necessary for departmental administration in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), [\$248,142,000]\$270,037,000, to remain available until September 30, [2017]2018, including the hire of passenger motor vehicles and official reception and representation expenses not to exceed \$30,000, plus such additional amounts as necessary to cover increases in the estimated amount of cost of work for others notwithstanding the provisions of the Anti-Deficiency Act (31 U.S.C. 1511 et seq.): *Provided*, That such increases in cost of work are offset by revenue increases of the same or greater amount: *Provided further*, That moneys received by the Department for miscellaneous revenues estimated to total [\$117,171,000]\$125,171,000 in fiscal year [2016]2017 may be retained and used for operating expenses within this account, as authorized by section 201 of Public Law 95–238, notwithstanding the provisions of 31 U.S.C. 3302: *Provided further*, That the sum herein appropriated shall be reduced as collections are received during the fiscal year so as to result in a final fiscal year [2016]2017 appropriation from the general fund estimated at not more than [\$153,511,000]\$144,866,000. *\$3,000,000 is to support the Department's activities related to implementation of the Digital Accountability and Transparency Act (DATA Act; Public Law 113–101; 31 U.S.C. 6101 note), to include changes in business processes, workforce, or information technology to support high quality, transparent Federal spending information.*

Explanation of Change

No change.

Departmental Administration

(\$K)

FY 2015 Enacted	FY 2015 Current¹	FY 2016 Enacted	FY 2017 Request
125,043	135,686	130,971	144,866

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 also 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-oriented 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.

Highlights of the FY 2017 Budget Request

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 \$16,000,000 and 24 FTEs from MA to the newly established Project Management Oversight and Assessment Office (PM); an increase of \$1,000,000 for FTEs and support services associated with the Office of the Under Secretary for Management and Performance; and \$200,000 to fund one FTE for the Ombudsman office.
- Chief Information Officer (CIO): The \$19,856,000 increase supports replacement of legacy network infrastructure, consolidation of data centers and enterprise e-mail as well as the implementation of other Administration priorities.
- Chief Financial Officer (CFO): The \$6,060,000 increase includes \$3,000,000 support for Digital Accountability and Transparency Act of 2014 (DATA Act) requirements requirements and \$1,650,000 to support 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): \$1,319,000 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 \$100,000,000 or greater in the Environmental Management (EM) portfolio, and perform other critical Department-wide functions.
- 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.

¹ Funding reflects transfers totaling \$10,643,000 from USAID to International Affairs.

The Department is organized into three Under Secretariats — Science and Energy, Nuclear Security, and Management and Performance — which recognizes the complex interrelationship among DOE Program Offices. The FY 2017 Budget continues crosscutting programs which coordinate across the Department and seek to tap DOE's full capability to effectively and efficiently address the U.S.'s energy, environmental, and national security challenges. These crosscutting initiatives will be discussed further within the programs in which the crosscuts are funded.

The FY 2017 DA appropriation contains funding for the following crosscuts:

Grid Modernization (Grid): U.S. prosperity and energy innovation in a global clean energy economy depends on the modernization of the National Electric Grid. To support this transformation, the Department of Energy's Grid Modernization Initiative will create tools and technologies that measure, analyze, predict, and control the grid of the future; focus on key policy questions related to regulatory practices, market designs, and business models building on analysis and findings of the QER; ensure the development of a secure and resilient grid; and collaborate with stakeholders to test and demonstrate combinations of promising new technologies.

Energy-Water Nexus (EWN): There is increasing urgency to address the energy-water nexus in an integrated way due to changing precipitation and temperature patterns, accelerated drawdown of critical water supplies, population growth and regional migration trends, and the introduction of new technologies that could shift water and energy demands. The energy-water nexus crosscut is an integrated set of cross-program collaborations designed to accelerate the Nation's transition to more resilient energy and coupled energy-water systems. The crosscut supports: (1) an advanced, integrated data, modeling, and analysis platform to improve understanding and inform decision-making for a broad range of users and at multiple scales; (2) investments in targeted technology research opportunities within the system of water-energy flows that offer the greatest potential for positive impact; and (3) policy analysis and stakeholder engagement designed to build from and strengthen the two preceding areas while motivating more rapid community involvement and response.

Cybersecurity: DOE is engaged in three categories of cyber-related activities: protecting the DOE enterprise from a range of cyber threats that can adversely impact mission capabilities; bolstering the U.S. Government's capabilities to address cyber threats; 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 Control and Access Management (ICAM). The crosscut also enables the Cyber Sciences Laboratory (CSL) to be funded and supported by multiple programs to focus on longer-term, higher-risk, game-changing technologies targeted towards solving fundamental cybersecurity problems in the DOE mission space.

FY 2017 Crosscuts (\$K)

	Grid	EWN	Cybersecurity	Total
Energy Systems and Policy Analysis	1,000	2,600	0	3,600
International Affairs	0	400	0	400
Chief Information Officer	0	0	20,026	20,026
Total, Crosscuts	1,000	3,000	20,026	24,026

Departmental Administration
Funding by Congressional Control (\$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	-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
Miscellaneous Revenues					
Revenues Associated with SPP	-42,000	-42,000	-40,000	-40,000	0
Other Revenues	-77,171	-77,171	-77,171	-85,171	-8,000
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
Federal FTEs	1,124	1,124	1,160	1,165	+5

Defense-Related Administrative Support

Overview

Beginning in FY 1999, funding has been provided within the Other Defense Activities appropriation to offset amounts within the DA appropriation that support defense-related activities. This offset addresses the significant level of administrative support performed within DA in support of the Department's defense-related programs. DRAS represents one third of the Departmental Administration gross spending level as NNSA represents a little more than a third of DOE's total budget. The services provided by the offices within DA are performed without distinction between defense and non-defense related activities and provide benefit for all headquarters organizations proportionally.

Defense-Related Administrative Support Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Defense-Related Administrative Support	118,836	118,836	118,836	119,716	+880

Strategic Partnership Projects

Overview

The Strategic Partnership Projects (SPP) program provides funding to DOE's multi-purpose field offices and National Laboratories to finance the cost of products and services requested by non-DOE users, both foreign and domestic. The products and services provided by the Department under this program generally are not available from alternate sources and are either (1) a revenue program which results from a budgeted mission of the Department or (2) reimbursable work for non-federal entities where the sponsor is precluded by law from providing advance funding. The costs of the SPP program are offset by revenues received from the sale of products and services to customers.

The SPP program includes a portion of the Department's Foreign Research Reactor Spent Fuel Program. This program, which involves the receipt and storage of foreign research reactor spent fuel, is provided for in the SPP program only to the extent of revenues provided.

The benefits for this program are: continued access to the Department's Laboratory complex and the availability of by-products for sale to non-federal customers. The SPP program satisfies the needs of our non-federal customers. For this reason, performance evaluation for this work is the responsibility of our customers. The success of this program is indicated by the steady influx of business from the targeted groups.

Strategic Partnership Projects
Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Chicago Operations Office	400	400	200	13,200	+13,000
Idaho Operations Office	1,000	1,000	1,000	1,000	0
Lawrence Berkeley Laboratory	1,392	1,392	4,634	1,415	-3,219
National Energy Technology Laboratory	150	150	150	100	-50
National Renewable Energy Laboratory	360	360	510	200	-310
NNSA Albuquerque Complex	9,330	9,330	6,630	7,221	+591
Oak Ridge National Laboratory	14,768	14,768	8,968	7,567	-1,401
Pacific Northwest Laboratory	9,000	9,000	10,000	10,000	0
Richland Operations Office	100	100	100	100	0
Savannah River Ops Office	5,500	5,500	6,700	6,700	0
Washington, DC (Reserve)	0	0	1,108	0	-1,108
Prior Year Balance Use	0	0	0	-7,503	-7,503
Subtotal, Strategic Partnership Projects	42,000	42,000	40,000	40,000	0
Revenues Associated with Strategic Partnership Projects	-42,000	-42,000	-40,000	-40,000	0

Revenues Associated with Strategic Partnership Projects
Funding (\$K)

<u>Description of FY 2017 Activities</u>	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Chicago Operations Office	400	400	200	13,200	+13,000
• Brookhaven National Laboratory support to University of Washington for nanoparticle loading and standard metal loaded scintillator for optical measurements (\$13,200,000).					
Idaho Operations Office	1,000	1,000	1,000	1,000	0
• Support to state and local governments (\$1,000,000).					
Lawrence Berkeley National Laboratory	1,392	1,392	4,634	1,415	-3,219
• Additional university support for Composite for Basic Science research in Life Sciences (\$400,000);					
• University of Washington for comprehensive Identification of Worm and Fly Transcription Factors (\$400,000);					
• Additional university support for Composite for Basic Science Research in Genome (\$250,000);					
• Lake County Seismic monitoring (\$215,000); and					
• National Laboratory High Energy Physics for Particle Data Group (\$150,000).					
National Energy Technology Laboratory	150	150	150	100	-50
• Support to state/local governments (\$100,000).					
National Renewable Energy Laboratory	360	360	510	200	-310
• University of Michigan for Chemistry at Harvard Macromolecular Mechanics (CHARMM) Modernization, Performance, and Continued Development (\$88,000);					
• Georgia Institute of Technology for Foundational Program to Advance Cell Efficiency II (FPACE-II) project, which aims at breaking the cell efficiency record of a silicon solar cell (\$200,000); and					
• Support to state/local governments (\$222,000).					

<u>Description of FY 2017 Activities</u>	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
NNSA Complex (formally NNSA Albuquerque Complex) <ul style="list-style-type: none"> • Y-12 National Security Complex support to long-term supply contracts with foreign governments to provide uranium fuel (\$3,930,000); • Lawrence Livermore National Laboratory support to State of California Ambient Groundwater Monitoring & Assessment (GAMA) program (\$1,000,000); • Y-12's Global Threat Reduction Initiative support to arrange for the return of enriched uranium from foreign countries (\$750,000); • NNSA to address multiple smaller projects for state/local governments, universities and institutes, including work for the State of Washington Department of Health, Maryland Transit Authority, and New Mexico Office of the State Engineer (\$500,000); • Sandia National Laboratory support to state & local governments (\$300,000); and • State of Washington aerial radiological survey of the City of Seattle performed by the Nevada Field Office Remote Sensing Laboratory (\$150,000). 	9,330	9,330	6,630	7,221	4,389
Oak Ridge Operations Office <ul style="list-style-type: none"> • Oak Ridge National Laboratory support to Inter-comparison Studies Program– Bioassay Samples; New York State Department of Transportation - Research and Analytical Support; Beam Dump Research & Development and Conceptual Design; New York State Department of Transportation - Research and Analytical Support; etc. (\$6,907,000); • Stanford Linear Accelerator Center (SLAC) support to U.S./Japan Cooperative Program in High Energy Physics (\$500,000); • Oak Ridge Institute for Science and Education (ORISE) support to Radiation Emergency Assistance Center/Training courses (\$100,000); and • Thomas Jefferson National Laboratory support for research and development on Superconducting Radio Frequency (SRF) cavity fabrication, processing and instrumented testing at cryogenic temperatures for high performance SRF cavities (\$60,000). 	14,768	14,768	8,968	7,567	-1,401
Pacific Northwest National Laboratory <ul style="list-style-type: none"> • Maritime Radiological/Nuclear training, logistics management, and technical assistance (\$10,000,000). 	9,000	9,000	10,000	10,000	0
Richland Operations Office <ul style="list-style-type: none"> • Training in support of disaster recovery, emergency response, fire protection, transportation, law enforcement, military readiness, technology deployment (\$100,000). 	100	100	100	100	0

<u>Description of FY 2017 Activities</u>	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Savannah River Operations	5,500	5,500	6,700	6,700	0
• Savannah River Forest Service Timber Management program (\$5,840,000);					
• Savannah River National Laboratory support to the University of Washington (\$500,000); and					
• South Carolina Institute of Archaeology and Anthropology cooperative agreement to comply with archaeological regulatory requirements needed to support the U.S. Forest Service Savannah River timber program (\$360,000).					
Washington, DC (in Reserve)					
• Reserve funds set aside for use at Headquarters.	0	0	1,108	0	-1,108
Prior Year Balance Use	0	0	0	-7,503	-7,503
Total, Revenues Associated with Strategic Partnership Projects	42,000	42,000	40,000	40,000	0

Miscellaneous Revenues

Overview

The Departmental Administration account receives Miscellaneous Revenues from the following:

- Revenues associated with Strategic Partnership Projects (SPP) represents the full-cost recovery offset to the SSP account. SPP is the program associated with providing products and services to our customers.
- Other Revenues received from the sale of by-products that have no cost associated with the Departmental Administration appropriation. These items are by-products of activities funded by other on-going Departmental programs and are collected as Miscellaneous Revenues. Included in this estimate are revenues collected from the Reimbursable Work program for Federal Administrative Charges.

Miscellaneous Revenues

Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Revenues Associated with Strategic Partnership Projects	-42,000	-42,000	-40,000	-40,000	0
Other Revenues	-77,171	-77,171	-77,171	-77,171	0
Total, Miscellaneous Revenues	-119,171	-119,171	-117,171	-117,171	0

Other Revenues
Explanation of Major Changes (\$K)

	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Federal Administrative Charges – Revenues collected from other federal agencies as well as non-federal entities for reimbursable activity conducted by the Department in accordance with full-cost recovery policy.	-30,000	-37,071	-7,071
Y-12 Site Office – Revenues generated from shipment of surplus Highly Enriched Uranium and Low Enriched Uranium for use in foreign research and test reactors.	-14,000	-14,000	0
Pittsburgh Naval Reactors Office - The Department of Navy reimburses the Pittsburgh Naval Reactors Office for the nuclear material burn-up while the core is in operation and when residual nuclear material is removed during core refuelings and defuelings. While nuclear material burn-up is relatively consistent across years, major fluctuations in this line item are attributable to the refueling and defueling schedules, which are based on ship availability and quantity of nuclear material left in the cores.	-27,700	-21,600	+6,100
Other Revenues, including Timber Sales - Estimate based on current rate of collections for various miscellaneous revenues collected at all Departmental sites, including timber sales at Savannah River Site.	-5,471	-4,500	+971
Total, Other Revenues	-77,171	-77,171	0

**Office of the Secretary
Program Direction**

Overview

The Office of the Secretary (OSE) provides leadership and policy direction to the Department of Energy (DOE) in fulfilling its responsibilities for advancing the energy, environmental, and nuclear security of the United States; promoting scientific and technological innovation in support of that mission; sponsoring basic research in the physical sciences; and ensuring the environmental cleanup of the nation's nuclear weapons complex. These responsibilities will be fulfilled through:

Science and Energy – DOE leads the nation in the transformational research, development, demonstration, and deployment of an extensive range of clean energy and efficiency technologies, supporting the President's Climate Action Plan and an "all of the above" energy strategy. DOE identifies and promotes advances in fundamental and applied sciences; translates cutting-edge inventions into technological innovations; and accelerates transformational technological advances in energy areas that industry by itself is not likely to undertake because of technical or financial risk. DOE also leads national efforts to develop technologies to modernize the electricity grid, enhance the security and resilience of energy infrastructure, and expedite recovery from energy supply disruptions. DOE conducts robust, integrated policy analysis and engagement to support the nation's energy agenda. DOE is the largest federal sponsor of basic research in the physical sciences. DOE world-leading research in the physical, chemical, biological, environmental, and computational sciences contributes fundamental scientific discoveries and technological solutions that support the nation's primacy in science and innovation.

Nuclear Security – DOE enhances the security and safety of the nation through its national security endeavors: maintaining a safe, secure, and effective nuclear weapons stockpile in the absence of nuclear testing and managing the research, development, and production activities and associated infrastructure needed to meet national security requirements; accelerating and expanding efforts to reduce the global threat posed by nuclear weapons, nuclear proliferation and unsecured or excess nuclear materials; and providing safe and effective nuclear propulsion for the U.S. Navy. As a result of the expertise developed to support these nuclear security missions, the DOE laboratories also serve as strategic assets in support of broader national security missions.

Management and Performance – DOE leads the largest cleanup effort in the world to remediate the environmental legacy of over six decades of nuclear weapons research, development, and production through investments in science and technology research. As DOE carries out its mission, it employs effective and cost-efficient management, supports an engaged workforce, and provides a modern, secure physical and information technology infrastructure. DOE remains committed to maintaining a safe and secure work environment for all personnel and to ensuring that its operations preserve the health, safety, and security of the surrounding communities.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	4,473	4,473	4,473	4,765	+292
Travel	529	529	529	529	0
Support Services	0	0	0	0	0
Other Related Expenses	6	6	6	6	0
Total, Program Direction	5,008	5,008	5,008	5,300	+292
Federal FTEs	32	32	32	32	0
Other Related Expenses					
Training	6	6	6	6	0
Total, Other Related Expenses	6	6	6	6	0

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$5,008,000	\$5,300,000	+\$292,000
Salaries and Benefits \$4,473,000	\$4,765,000	+\$292,000
Funding supports 32 FTEs in the Office of the Secretary, Deputy Secretary, Under Secretary for Management and Performance, and Under Secretary for Science and Energy.	Funding to fully support 32 FTEs.	The increase will support payroll costs for 32 FTEs.
Additional requirements will be supported through the use of prior year balances.		
Travel \$529,000	\$529,000	\$0
Funding for the Office of the Secretary, Deputy Secretary, Under Secretary for Management and Performance, Under Secretary for Science and Energy, and Special Assistants to travel both internationally and domestically in support of the Department's mission.	Continuation of FY 2016 activities.	No changes.
Additional requirements will be supported through the use of prior year balances.		
Other Related Expenses \$6,000	\$6,000	\$0
Training and course registration cost for OSE employees for essential training activities.	Continuation of FY 2016 activities.	No changes.

**Chief Financial Officer
Program Direction**

Overview

The Office of the Chief Financial Officer (CFO) is responsible for the effective management and financial integrity of Department of Energy (DOE) programs, activities and resources by developing, implementing, and monitoring DOE-wide policies and systems in budget formulation and execution, finance and accounting, internal controls and financial policy, corporate financial systems, and strategic planning.

Highlights of the FY 2017 Budget Request

The FY 2017 request is \$53,084,000, an increase of \$6,060,000 above the FY 2016 Enacted. The increased funds support the development of corporate budget formulation which will allow budgets to be formulated from the bottom up across the enterprise in a standard framework. The FY 2017 Request also includes \$3,000,000 to fund implementation of the Digital Accountability and Transparency Act of 2014 (DATA Act) which requires modifications to DOE business systems and processes.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	29,155	29,155	29,420	30,240	+820
Travel	200	200	200	200	0
Support Services	9,189	9,189	9,030	14,044	+5,014
Other Related Expenses	8,456	8,456	8,374	8,600	+226
Total, Program Direction	47,000	47,000	47,024	53,084	+6,060
Total FTEs	212	212	212	212	0
Support Services					
Management Support					
Corporate Business Systems	5,450	5,450	5,450	7,100	+1,650
DATA Act	0	0	0	3,000	+3,000
System Support/Other Support Services	3,739	3,739	3,580	3,944	+364
Total, Support Services	9,189	9,189	9,030	14,044	+5,014
Other Related Expenses					
IT Services	1,600	1,600	1,600	1,600	0
Training	140	140	140	140	0
Interagency Agreements/Data Licenses/Other	600	600	600	600	0
Working Capital Fund	6,116	6,116	6,034	6,260	+226
Total, Other Related Expenses	8,456	8,456	8,374	8,600	+226

Program Direction

Activities and Explanation of Changes		Explanation of Changes FY 2017 vs FY 2016
FY 2016 Enacted	FY 2017 Request	
Program Direction \$47,024,000	\$53,084,000	+\$6,060,000
Salaries and Benefits \$29,420,000	\$30,240,000	+\$820,000
Funds 212 full-time equivalent employees (FTEs).	Funds 212 FTEs.	Increase (+\$820,000) covers employee pay increases.
Travel \$200,000	\$200,000	\$0
Supports travel requirements for 212 FTEs.	Continuation of FY 2016 activities.	No change from FY 2016.
Support Services \$9,030,000	\$14,044,000	+\$5,014,000
The FY 2016 Corporate Business Systems (CBS) budget funds the continued operation of the DOE financial, procurement, and human capital systems, including the Data Warehouse, which supports over 2,000 users and maintains structured data from multiple data sources; the integration of funds distribution; and operation and maintenance of the Foreign Travel Management System.	The FY 2017 CBS budget funds the operation of the CBS systems and development of corporate budget formulation to replace Excel spreadsheets and allowing budgets to be formulated from the bottom up across the enterprise in a standard framework. Funding also supports DATA Act implementation, strengthening database and application security controls, and enabling database activity monitoring services.	Increase funds development of corporate budget formulation to replace Excel spreadsheets and allowing budgets to be formulated from the bottom up across the enterprise in a standard framework (+\$1,650,000), supports DATA Act implementation (+\$3,000,000), and IT support contracts (+364,000).
Other Related Expenses \$8,374,000	\$8,600,000	+\$226,000
Funding supports Working Capital Fund (WCF), interagency agreements, employee training, data licenses, and IT support requirements for 212 FTEs.	Continuation of FY 2016 activities.	Increase (+\$226,000) for WCF funds OPM credit monitoring and inflation increases in existing WCF programs.

Management Program Direction

Overview

The Office of Management (MA) provides the Department of Energy (DOE) with centralized direction and oversight for the full range of management, procurement, and administrative services. MA's activities include policy development and oversight, and delivery of procurement services to DOE Headquarters (HQ) organizations. Administrative activities include the management of HQ facilities and the delivery of other services critical to the operation of the Department. MA also fulfills the statutory responsibilities of the Chief Acquisition Officer and the Director, Office of Acquisition Management, serves as DOE's Senior Procurement Executive.

In FY 2017, MA will accomplish its mission through its program office components and associated Departmental budget lines:

- Aviation Management – Manage all DOE-owned aircraft and contract aviation services world-wide by developing and implementing policies and procedures; provide technical and management assistance to program leaders and field elements with aviation responsibilities; and conduct independent oversight over all DOE elements that own or use aviation as a part of their mission.
- Executive Secretariat – Facilitate quality document management of executive correspondence, departmental actions and decision documents; ensure the timely delivery of Congressional reporting requirements, executive commitments and information; serve as the Department's Federal Historic Preservation Officer; serve as the Department's Advisory Committee Management Officer and manage the Department's Advisory Committee Management Program.
- Information Resources – Implement the Department's Freedom of Information Act (FOIA); oversee the Directives Management and Delegation of Authority System; and manage the Department's Conference Management Program.
- Acquisition Management – Provide corporate oversight, managerial leadership and assist in the development and implementation of DOE-wide policies, procedures, programs, and management systems pertaining to procurement and financial assistance, contract management, professional development, and related activities to provide procurement services to Headquarters elements.
- Asset Management – Develop and maintain Department-wide policies, regulations, standards, and procedures while tracking performance pertaining to real estate, facilities and infrastructure management, and personal property. The Director serves as the Senior Real Property Officer, as designated by the Secretary and also serves as the Head of the Contracting Activity for Real Estate, as appointed by the Department's Senior Procurement Executive.
- Administration – Manage HQ facilities and support services, including operations management, building automation, lease and office space management, supply management, transportation/courier services, concession services, exchange visitor program, and mail/printing services.
- Scheduling and Advance – Manage scheduling, logistical, and advance preparations for the Office of the Secretary.
- Sustainability and Performance Office (SPO) – Coordinate data collection, reporting, and analysis of DOE's sustainability data, including energy, water, and resource use; manage and implement DOE's Strategic Sustainability Performance Plan; and provide oversight of energy, water, and resource assessments at DOE sites and National Laboratories.
- Secretary of Energy Advisory Board (SEAB) – Administer and coordinate the activities of the Board and its subcommittees for the Secretary to obtain timely, balanced, and independent external advice on issues of national importance related to the missions of the Department.
- Ombudsman – The Office of the Ombudsman is an independent, neutral, confidential and informal resource available to all DOE federal employees. The Ombudsman staff increases organizational focus on mission critical activities by helping senior leaders, managers, supervisors, and staff to: minimize unwarranted distractions in the workplace; increase employee engagement; and expeditiously address individual and organization matters. In addition, the Office elevates systemic issues and shares conflict prevention strategies with senior leaders when appropriate.

Highlights of the FY 2017 Budget Request

The Department requests \$59,114,000 in FY 2017 for MA, which is \$5,886,000 below the FY 2016 Enacted level of \$65,000,000. This net change supports a Secretarial driven initiative which results in a transfer of 24 FTEs from MA to the newly established independent Project Management Oversight and Assessment Office (PM) within the Departmental Administration account. In addition, the FY 2017 Request includes: (1) \$1,000,000 increase for Operations Staff support for the Office of the Under Secretary for Management and Performance; (2) \$3,712,000 to cover the cost of staff and function for Sustainability and Performance Office (SPO) program; (3) \$1,210,000 Internal Evaluations; and (4) \$200,000 to fund one additional FTE for the Ombudsman's office.

Program Direction
Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	35,383	35,383	36,140	33,233	-2,907
Travel	940	940	940	858	-82
Support Services	12,619	12,619	13,436	10,246	-3,190
Other Related Expenses	14,004	14,004	14,484	14,777	+293
Total, Program Direction	62,946	62,946	65,000	59,114	-5,886
Federal FTEs—MA	226	226	226	210	-16
Federal FTEs—WCF	40	40	40	40	0
Support Services					
Management Support					
External Independent Reviews (EIRs)	2,203	2,203	2,203	0	-2,203
Cross Agency Priority Goals	0	0	422	422	0
Earned Value Management System (EVMS)	429	429	429	0	-429
Sustainability and Performance	0	0	0	2,912	+2,912
Project Assessment and Reporting System (PARS II)	2,000	2,000	2,000	0	-2,000
Acquisition Career Management Program (ACMP)	500	500	500	500	0
National Laboratory Operations Board (NLOB)	0	0	95	95	0
Contract Management Improvement	500	500	0	0	0
Cost Estimating/Cost Analysis Improvement	1,948	1,948	2,748	0	-2,748
Internal Evaluation	2,400	2,400	2,400	3,610	+1,210
Other Support Services	2,639	2,639	2,639	2,707	+68
Total, Support Services	12,619	12,619	13,436	10,246	-3,190
Other Related Expenses					
Training	143	143	143	153	+10
Energy IT Services	1,207	1,207	1,207	1,157	-50
Working Capital Fund (WCF)	11,170	11,170	11,650	11,983	+333
Other Services	1,484	1,484	1,484	1,484	0
Total, Other Related Expenses	14,004	14,004	14,484	14,777	+293

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$65,000,000	\$59,114,000	-\$5,886,000
Salaries and Benefits \$36,140,000	\$33,233,000	-\$2,907,000
Funding in support of 226 FTEs. Funding provides for salaries/benefits, overtime, lump sum leave, and performance awards.	Funding in support of 210 FTEs.	Net change reflects funding in support of 210 FTEs. 24 FTEs transferred from MA to the newly established Project Management Oversight and Assessment Office (PM) (-\$4,248,000). Funding to support an additional 3 FTEs for operations staff for the Office of the Under Secretary for Management and Performance (+\$570,000), 4 FTEs for SPO (+\$606,000), and 1 FTE for Ombudsman the (+\$165,000). Pay increases and cost of living adjustments will be offset by savings that result from anticipated staff attrition.
Travel \$940,000	\$858,000	-\$82,000
Funding in support of MA/SEAB staff travel; all travel associated with scheduling and logistics for Secretarial trips; travel related to meetings of the National Laboratory Operations Board and subgroups of the Board; travel associated with program oversight and evaluation, procurement, construction management activities. Includes the rental of vehicles from the General Services Administration motor pool and the DOE fleet.	Continuation of FY 2016 activities.	Net change reflects a transfer in funding for travel expenses (-\$88,000) for PM staff and additional funding to support travel for SPO (+\$6,000).
Support Services \$13,436,000	\$10,246,000	-\$3,190,000
Funding in support of contractual requirements, including External Independent Reviews (EIRs) (\$2,203,000), EVMS (\$429,000), PARS II (\$2,000,000), ACMP (\$500,000); Cost Estimating/Cost Analysis (\$2,748,000); and Internal Evaluation (\$2,400,000); implementation of the Cross Agency Priority Goals (\$422,000); NLOB (\$95,000); and Other Support Services (\$2,639,000). More detail provided in following sections.	Continuation of FY 2016 activities, with a transfer of funding in support of PM contractual requirements.	Transfer of funding in support of PM contractual requirements for External Independent Reviews (EIRs) (-\$2,203,000), EVMS (-\$429,000), PARS II (-\$2,000,000), Cost Estimating/Cost Analysis (-\$2,748,000); and Other Support Services (-\$157,000). Increase funding for additional support services for the Office of the Under Secretary for Management and Performance (+\$225,000), SPO (+\$2,912,000); and Internal Evaluations (+\$1,210,000).

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
External Independent Reviews (EIRs) \$2,203,000 Finances EIRs, which provide assurance that projects can be executed at the proposed performance baseline (scope, cost, and schedule). EIRs are conducted for projects greater than \$100,000,000 for major programs and greater than \$10,000,000 for others lacking Project Management Support Offices.	\$0 No funding requested in FY 2017.	-\$2,203,000 Transfer of PM funding in support of EIRs contractual requirements (-\$2,203,000).
Cross Agency Priority Goals \$422,000 Contribution for implementation of the Cross Agency Priority Goals.	\$422,000 Continuation of FY 2016 activities.	\$0 No change.
Earned Value Management System (EVMS) \$429,000 Finances certification and surveillance reviews to ensure contractor EVMSs comply with industry standards. MA ensures contractors are EVMS compliant for projects \$100,000,000 or greater. EVMS is an industry-accepted process to ensure that projects are completed on cost, schedule, and within scope against a baseline. EVMS enables trend analysis and evaluation of estimated cost at completion and provides a sound basis for problem identification, corrective actions, and management re-planning.	\$0 No funding requested in FY 2017.	-\$429,000 Transfer of funding to PM in support of EVMS contractual requirements (-\$429,000).
Sustainability and Performance \$0 Funding not provided in FY 2016 Enacted Budget for this activity.	\$2,912,000 Funding is required to coordinate data collection, reporting, and analysis of DOE's sustainability data, including energy, water, and resource use; management and implementation of DOE's Strategic Sustainability Performance Plan; and oversight of energy, water, and resource assessments at DOE sites and National Laboratories.	+\$2,912,000 Funding supports contractual requirements for the Sustainability Performance function.
Project Assessment and Reporting System (PARS II) \$2,000,000 PARS II provides project status and assessment information for senior management and other stakeholders. Current funding will be used to provide operations and maintenance for the existing system. This system is critical to enable appropriate project execution oversight, accurate monthly project assessments, and recommendations for senior management decision-making.	\$0 No funding requested in FY 2017.	-\$2,000,000 Transfer of funding to PM in support of PARS II contractual requirements (-\$2,000,000).

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Acquisition Career Management Program (ACMP) \$500,000 ACMP provides a training and career development certification program for contracting, purchasing, financial assistance, personal property management, contracting officers, and contracting officers' representatives.	\$500,000 Continuation of FY 2016 activities.	\$0 No change.
National Laboratory Operations Board (NLOB) \$95,000 Funding in support of the NLOB provides discrete projects to be undertaken by the NLOB, including data collection and analysis in support of efforts to improve efficiency and effectiveness on an enterprise-wide basis.	\$95,000 Continuation of FY 2016 activities.	\$0 No change.
Cost Estimating/Cost Analysis Improvement \$2,748,000 Funds ongoing efforts in cost estimating and schedule analysis capability; provides a standard Work Breakdown Structure (WBS) for DOE Program Offices; provides a standardized WBS cost and schedule data extractor; provides for an IT tool that automates schedule integrity and critical path analysis. Funds continuing education and professional development courses such as earned value management, cost estimating and schedule analysis. Enables the enhancement of our project assessment and reporting system to provide data-driven cost analysis capabilities and schedule analysis functionality.	\$0 No funding requested in FY 2017.	-\$2,748,000 Transfer of funding to PM in support of Cost Estimating/Cost Analysis contractual requirements (-\$2,748,000).

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Internal Evaluation \$2,400,000 Enables the Under Secretary for Management and Performance to continue an ongoing program to conduct performance evaluation studies of selected Departmental programs and operations. These studies seek to document the impacts and benefits of DOE programs, and the effectiveness and efficiency of DOE operations. The studies will enable DOE to develop recommendations for improvements in program or operational effectiveness and efficiency. Such studies will also inform and enhance DOE compliance with the GPRA Modernization Act of 2010. All individual program and operations evaluation studies will be centrally managed by the Office of the Under Secretary for Management and Performance to ensure objectivity and consistency. Evaluations will be conducted in close collaboration with program managers. The agenda for the studies will be determined by the Secretary of Energy and the Under Secretary for Management and Performance.	\$3,610,000 Continuation of FY 2016 activities. Additional funding enables the Under Secretary for Management and Performance to continue the ongoing program to conduct performance evaluation studies of selected Departmental programs and operations.	+\$1,210,000 Additional funding supports performance evaluation studies of selected Departmental programs and operations.
Other Support Services \$2,639,000 Professional support services, studies, analyses and evaluations; and engineering and technical services. Areas of support include project management control and performance; facilities and infrastructure; FAIR Act; contract management and administration; database maintenance; historic preservation; and aviation assessments.	\$2,707,000 Continuation of FY 2016 activities.	+\$68,000 Net change reflects a transfer of funding to PM for support services (-\$157,000) and additional funding for support services for the Office of the Under Secretary for Management and Performance (+\$225,000).
Other Related Expenses \$14,484,000 Other related expenses to cover Training, Energy IT Services, Working Capital Fund (WCF) and other services necessary for organizational mission support.	\$14,777,000 Continuation of FY 2016 activities.	+\$293,000 Net change reflects a transfer of funding to PM to cover Energy IT Services and WCF expenses (-\$500,000). Additional WCF funding to support employee credit monitoring/security clearances and operational estimates (+365,000). Additional funding also requested for the Office of the Under Secretary for Management and Performance (+\$205,000); SPO (+\$188,000) and Ombudsman (+\$35,000) training, Energy IT Services and WCF.

**Chief Human Capital Officer
Program Direction**

Overview

The mission of the Office of the Chief Human Capital Officer (HC) is to provide the most efficient and effective human resources (HR) services and human capital programs to the Department of Energy (DOE). The vision of HC is to help DOE accomplish its mission through collaborative and responsive partnerships; proactive problem identification and resolution; and innovative and sound human capital management services. HC advises and assists the Secretary and Deputy Secretary of Energy (and other agency officials) in recruiting, staffing, developing, training, and managing a highly skilled, productive, and diverse workforce, in accordance with merit system principles and all applicable statutory requirements.

Highlights of the FY 2017 Budget Request

The Department requests \$25,424,000 in FY 2017 for HC. This Request sustains FY 2016 operational levels, while improving customer service and reducing administrative overhead.

In November 2013, the Secretary of Energy approved HC's recommendation to implement a more efficient and effective HR Service Delivery (HRSD) model across the Department. By FY17, HC will have completed implementation of DOE's transformation from a highly decentralized (17 separate HR offices) and delegated HR operating environment to a hybrid model that is more centralized (5 Shared Service Centers with local HR Advisory Offices). This effort will improve the effectiveness, efficiency and service of Human Resources, thus aligning with the President's Management Agenda and executing the Secretary's DOE 2014-2018 Strategic Plan commitment to reduce employee cost of providing HR services across the Department.

FY 2017 will focus on change and project management, employee development, and organizational skill set capabilities to support the major transformational changes expected as a result of Human Resources Service Delivery (HRSD) implementation. Increased visibility of needs in workforce and succession planning, retention and recruitment, as well as performance management will be emphasized. With the completion of all five Shared Service Centers (SSCs) for Management & Performance (October 2015), Science & Energy (January 2016), National Nuclear Security Administration (NNSA), Bonneville Power Marketing Administration (BPA), and Power Marketing Administration (Sep 2016), HC will continue to assess internal reassignments to support and optimize workforce capability and potential following transition to the new HRSD operations model HC continues to be judicious with managed hiring and utilizing short-term contractor support to fill gaps to address unplanned attrition of HC FTEs.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	18,965	18,965	19,034	20,074	+1,040
Travel	130	130	130	130	0
Support Services	350	350	350	350	0
Other Related Expenses	5,055	5,055	4,986	4,870	-116
Total, Program Direction	24,500	24,500	24,500	25,424	+924
Federal FTEs	146	146	146	148	+2
Support Services					
Management Support					
Training and Education	100	100	100	100	0
Management Support, Other	250	250	250	250	0
Total, Support Services	350	350	350	350	0
Other Related Expenses					
Other Services	1,218	1,218	1,214	1,214	0
Working Capital Fund	3,837	3,837	3,772	3,656	-116
Total, Other Related Expenses	5,055	5,055	4,986	4,870	-116

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$24,500,000	\$25,424,000	\$924,000
Salaries and Benefits \$19,034,000	\$20,074,000	+\$1,040,000
Provides for 146 full time equivalents (FTEs). In addition to salaries and benefits, funding is also provided for workers' compensation payments on behalf of all employees funded through the HQ Departmental Administration appropriation. FTEs support core HC mission functions of: policy, oversight and automation; learning and development; HR operations and services (including executive resources, staffing/classification, benefits and labor management relations); strategic alignment and measurement of human capital management; and internal business management.	Provides for 148 FTEs which support core HC mission functions as well as workers' compensation payments.	Changes reflect 2 additional FTEs and staff within grade increases
Travel \$130,000	\$130,000	\$0
HC staff travel includes program oversight, program evaluation, recruitment, and permanent change of station moves. Primary travel need is associated with OPM-mandated HC/HR accountability audits; these audits are critical to maintaining agency-delegated HR authority.	Continuation of required HC staff travel activities in FY 2016. HC will explore options to partner with other internal organizations and web and video conference as feasible.	No change.
Support Services \$350,000	\$350,000	\$0
Includes funding for: HC staff training; HC Core Contractors; and other minor items.	Continuation of FY 2016 activities. Provides for Labor Relation Services and services for the Albuquerque office. HC will use no cost training opportunities, as feasible.	No change.
Other Related Expenses \$4,986,000	\$4,870,000	-\$116,000
Other Related Expenses provides for Working Capital Fund (WCF) and Energy IT Services. Includes funding for HC-internal office administration needs (e.g., software and hardware, Council fees, small automation system support, and rent for HC's duty station facility in Albuquerque). HC's Albuquerque duty station partners with the Office of Health Safety and Security, to utilize existing space in the local area in an effort to reduce rent and offset WCF and Energy IT Services increases.	Continuation of FY 2016 activities.	Adjustment to WCF projected overhead cost.

Office of the Chief Information Officer

Overview

The Office of the Chief Information Officer (CIO) funds Cybersecurity, Corporate IT Program Support, Program Direction, and the Digital Services Team. The CIO's mission includes:

- Leading DOE's cyber coordination across the extended DOE enterprise, including strategic policy approach and implementation that includes information sharing and information safeguarding;
- Increasing transparency and cooperation across the DOE enterprise on IT investment and planning;
- Enhancing collaboration on cyber programs, investments, and incident responses by continued emphasis on streamlining DOE governance bodies;
- Ensuring expanded participation by the entire DOE enterprise in support of the broader Energy sector; and
- Maturing the DOE enterprise information resources, focusing on information technology, leadership, and management.

The CIO is following the National Institute of Standards and Technology's (NIST) Cyber Security Framework Core – identify, protect, detect, respond, and recover – to develop and manage the Department's cybersecurity planning operations, and risk management processes.

By adapting our program's operations and structure to accommodate cyber demands (beyond its security functions), encouraging collaboration and partnership, and strengthening the DOE enterprise, we are able to advance the Department's mission and goals. Specifically, CIO has been striving to address and satisfy all of the goals outlined by the Department's Cyber Strategy, including:

- Share enterprise information more effectively with authorized users;
- Safeguard enterprise information, systems, and networks against unauthorized access, modification, disclosure, and use;
- Win the competition for cyber talent; and
- Mature and strengthen the energy enterprise.

The FY 2017 CIO Request supports these goals and will address these challenges.

Highlights of the FY 2017 Budget Request

For FY 2017, CIO requests a funding level of \$93,074,000 to significantly improve the Department's cyber posture through considerable investments in DOE's infrastructure, improved trusted internet connections, Identity Management, and continued operational architecture improvements. This funding level positions the Office to provide more secure and cost-effective IT services to the DOE Enterprise and to meet the requirements and responsibilities of the Federal Information Technology Acquisition Reform Act (Title VIII, Subtitle D of the National Defense Authorization Act (NOAA) for Fiscal Year 2015, Pub. L. No. 113-291) (FITARA), Records Management, Privacy, Information Technology Management Reform Act of 1996 (Clinger-Cohen), Federal Information Security Modernization Act of 2014 (FISMA) and other relevant statutes.

Chief Information Officer
Appropriated Funding (\$K)

	FY 2015 Enacted	FY 2016 Enacted	FY 2016 Comparable Enacted ¹	FY 2017 Request	FY 2017 vs FY 2016 Comparable
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Chief Information Officer

Cybersecurity

Incident Management (IM-32)	12,233	0	0	0	0
Enterprise Services (IM-33)	6,582	0	0	0	0
Policy, Guidance, and Planning (PG&P)	2,549	0	0	0	0
Programs and Reporting	0	8,402	0	0	0
Strategic Planning and Initiatives	0	12,604	0	0	0
Protecting Networks and Information (Protect)	0	0	3,180	10,700	+7,520
Detect, Analyze, and Mitigate Intrusions (Detect and Respond)	0	0	5,816	2,097	-3,719
Shaping the Cybersecurity Environment (Identify and Recover)	0	0	17,528	7,229	-10,299
Total, Cybersecurity	21,364	21,006	26,524	20,026	-6,498

Corporate IT Program Support

Corporate IT Project Management (IM-40)	1,460	0	0	0	0
IT Policy and Governance (IM-20)	3,694	4,968	0	0	0
Technology and Innovation (IM-50)	597	3,247	0	0	0
Energy IT Services (IM-60)	13,861	9,965	0	0	0
IT Modernization (IM-1)	0	2,044	0	0	0
IT Portfolio Summary	0	0	8,252	21,737	+13,485
Provisioned IT Services by Cloud Computing Service Model	0	0	0	0	0
IT Infrastructure	0	0	0	5,000	+5,000
End User- EITS	0	0	5,224	5,224	0
Policy and Performance Management	0	0	1,230	1,317	+87
Total, Corporate IT Program Support	19,612	20,224	14,706	33,278	+18,572

¹ Comparable Enacted column reflects the distribution of the FY 2016 budget had it been enacted in the structure presented for FY 2017.

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	FY 2015 Enacted	FY 2016 Enacted	FY 2016 Comparable Enacted	FY 2017 Request	FY 2017 vs FY 2016 Comparable
Program Direction					
Salaries and Benefits	20,863	19,663	19,663	20,807	+1,144
Travel	208	208	208	208	0
Support Services	3,424	3,424	3,424	3,424	0
Other Related Expenses	8,693	8,693	8,693	11,331	+2,638
Total, Program Direction	33,188	31,988	31,988	35,770	+3,782
Digital Services Team	0	0	0	4,000	+4,000
Use of Prior Year Balances	-2,205	0	0	0	0
Total, Chief Information Officer	71,959	73,218	73,218	93,074	+19,856
Federal FTEs	125	113	113	117	4

Explanation of Major Changes (\$K)

**FY 2017 vs
FY 2016
Comparable
Enacted**

Cybersecurity: The Cybersecurity budget has been restructured to follow the NIST Cybersecurity Framework for Critical Infrastructure and to capture expenditures in three major categories of Cyber activity. Funds that were previously expended in the Corporate IT Program Decision unit, such as funding for Requirements Analysis and Integration, were moved into the Cybersecurity decision unit. The request allows for the continuation of prioritized FY 2016 activities.	-6,498
Corporate IT Program Support: The Corporate IT Program Support budget has been restructured to be functional not organizational. Spending is divided into the six major parts of the IT Portfolio Summary from the Capital Planning guidance and contains a specific focus on provisioned services, infrastructure, and records and privacy management. Specific new funds will be used to develop an integrated, location independent Data Center infrastructure (\$5,000,000); modernize the access, distribution, and core networking layers of the network infrastructure, including expanding for future capacity and bandwidth (\$11,000,000); and further OCIO efforts to meet federal mandates related to FITARA, Records Management, and Privacy.	+18,572
Program Direction: Focus will be placed on quality improvements to existing functions to satisfy requests from senior management and program organizations. Increases to Salaries and Benefits (+\$1,144,000) reflect an additional 4 FTEs and to maintain our FY 2016 staffing level of 113 FTE's. Additionally, an increase in Other Related Expenses (+\$2,638,000) is reflective of changes to Working Capital Fund requirements and our Desktop services (EITS fee as a customer) charges.	+3,782
Digital Services Team: The Digital Services Team (DST) will be responsible for driving the efficiency and effectiveness of the agency's highest-impact digital services. The Department will continue its focus on the initial project identified in February 2015 – Visual Patent Search – as well as continue efforts to identify new areas for improvement.	+4,000
Total, Chief Information Officer	+19,856

Chief Information Officer
All Funding View (\$K)

	FY 2017			
	Request	WCF	Customer	Total
Chief Information Officer				
CYBERSECURITY				
Protecting Networks and Information (Protect)	10,700	5,575	7,208	23,483
Detect, Analyze, and Mitigate Intrusions (Detect and Respond)	2,097	**30,632	6,136	38,865
Shaping the Cybersecurity Environment (Identify and Recover)	7,229	1,174		8,403
TOTAL, CYBERSECURITY	20,026	37,381	13,344	70,751
CORPORATE IT PROGRAM SUPPORT				
IT Portfolio Summary	21,737			21,737
IT Infrastructure	5,000			5,000
End User - EITS	5,224	32,214	60,108	97,546
Policy and Performance Management	1,317	6,500		7,817
TOTAL, CORPORATE IT PROGRAM SUPPORT	33,278	38,714	60,108	132,100
PROGRAM DIRECTION				
Federal Salaries & Benefits	20,807			20,807
Travel	208			208
Support Services	3,424			3,424
Other Related Expenses	11,331			11,331
TOTAL, PROGRAM DIRECTION	35,770	0	0	35,770
DIGITAL SERVICES TEAM	4,000	0	0	4,000
TOTAL, DIGITAL SERVICES TEAM	4,000	0	0	4,000
OCIO payments into Shared Services and WCF*		(2,863)	(6,224)	(9,087)
Total, Chief Information Officer	93,074	73,232	67,228	233,534
Federal FTEs	117	8	0	

*As a customer, OCIO provides funds to Shared Services and WCF. In order to not double count those payments in the totals available, a bottom line adjustment was made.

** Includes funding from both the CyberOne business line and the Inter-agency transfer business line.

**Chief Information Officer
Cybersecurity**

Overview

Protecting the cybersecurity of our critical infrastructure is a top priority for the Nation. In February 2013, President Obama signed Executive Order (EO) 13636: Improving Critical Infrastructure Cybersecurity. One of the major components of the E.O. is the development of the National Institute of Standards and Technology (NIST) Cybersecurity Framework to help critical infrastructure sectors and organizations reduce and manage their cyber risk. The core of the NIST framework presents five functions—identify, protect, detect, respond and recover—that taken together allow any organization to understand and shape its cybersecurity program. The CIO is incorporating the NIST framework and its five functions into our Cybersecurity profile.

Highlights of the FY 2017 Budget Request

- Expand business processes to include extensive data analysis, metrics, and assessment of progress on against the FISMA metrics and the Cross-Agency Priority Goals.
- Introduce, test, pilot, and operationalize new cybersecurity products or services, such as hardware, software, applications, and equipment, designed to protect the DOE IT infrastructure.
- Develop and implement the enterprise Information Security Continuous Monitoring (ISCM) Strategy and implementation plan in accordance with Federal requirements.
- Establish programs and policies, as well as implement training initiatives to further the strategic cyber vision of the Department.

Protecting Networks and Information (Protect)

This budget line covers intrusion prevention systems, trusted internet connections, identity management and authentication, supply chain management, and network and data protection.

Detecting, Analyzing, and Mitigating Intrusions (Detect and Respond)

This portion of the Cybersecurity budget is primarily focused on Incident Response and Remediation efforts for the operation and the continuous improvement of the Department's Joint Cybersecurity Coordination Center (JC3). Activities also include procuring, implementing, and operating IT security tools and systems, as well as performance of FISMA testing and network penetration activities.

Shaping the Cybersecurity Environment (Identify and Recover)

The CIO is responsible for the strategic cyber vision for the enterprise as a whole. Key parts of that effort include implementing the Cyber Strategy, establishing policies, ensuring the workforce is properly trained, managing investments in initiatives to support strategic direction, and establishing programs to promote outreach and effective risk implementation.

Budget Line: Protecting Networks and Information - Protect (\$10,700,000 – request; \$5,575,035 – WCF; \$7,208,000 – Customer)

Protecting DOE networks and the information that reside on them is critical element to the success of DOE and its mission. The OCIO provides enterprise-level programs to help ensure accounts are being accessed by appropriate users through trusted equipment that is authentic and free of tampering and that network traffic is routed through trusted internet connections and equivalent capabilities. The OCIO also performs other activities centered on collecting data, performing analysis, and reporting on the cybersecurity posture of the Department.

Activity: Trusted Internet Connection (\$1,500,000)

The Department maintains a number of self-sustained Trusted Internet Connections (TIC) in support of Federal mandates to reduce and consolidate external access points, enhance security requirements for network and security operations, and increased security monitoring. This one-time funding request is to migrate to an alternative to the present DOE-owned and managed TIC services to leverage commercially-managed TIC services, Managed Trusted Internet Protocol Services (MTIPS), provided by vendors through the General Services Administration's (GSA) Networx contract.

MTIPS will provide comparable security for Departmental network traffic and complies with OMB guidance on TIC. The investment provides the Department with a number of benefits including:

- Allowing the Department to shift from cyclic capital-intensive investments to operational-based cost and chargeback models for secure connectivity.
- Leveraging commercially managed capabilities provided through GSA's Networx contract, including industry-standard Service Level Agreements.

In addition, depending on the implementation methodology, the investment can also increase the overall security standards for DOE's private-IP address space (PIP) used to provide internal DOE Network connectivity.

Activity: Reporting - Data Collection, Analysis, and Metrics (\$1,200,000)

Perform subject matter analysis on data available to the OCIO through data calls and other mechanisms to identify success strategies, systemic weaknesses, anomalies, root causes, etc. that can influence situational awareness for the enterprise risk management and cybersecurity programs. Measures and metrics are essential for proper trend analysis of threats and deployed solutions. This analysis is valuable to in understanding effectiveness of policies and technical solutions. It also provides the ability to be alerted of vulnerabilities that may lead to a potential cyber event.

Activity: Cyber Supply Chain-Supply Chain Management (\$1,500,000)

When partnered with the myriad of cybersecurity threats from the connectivity and complexity of interconnected technology, the reliance on globally sourced ICT exposes federal information systems to the risk of exploitation through counterfeit materials, malicious software, or untrustworthy products. Therefore, the Department deploys and sustains an enterprise Supply Chain Risk Management Program (SCRM) to protect critical missions through comprehensive management of supply chain risk. The Program includes policies, procedures, responsibilities, and threat analysis. The Department will:

- Enhance and administer an open-source vendor and product risk assessment capability, including taxonomies and processes for criticality analysis and determination of risk tolerance;
- Establish policy that ensures Supply Chain Risk Management (SCRM) is integrated into DOE programs with mission-oriented, risk-based protection that supports information technology-based services, external access, and collaboration;
- Align and standardize supply chain incident management processes and escalation procedures;
- Cultivate inter-Agency and intra-Departmental SCRM communications and outreach to prepare users to perform their SCRM responsibilities, prepare personnel to react effectively to threats, and assist in understanding and correct use of threat information and mitigation techniques to protect DOE information assets from supply chain risks; and
- Provide vendor and product risk assessment capabilities, and develop mechanisms to assess and monitor the overall effectiveness and efficiency of SCRM activities across the Department, including NNSA.

Activity: Identity Management and Authentication (\$6,500,000)

The goal of DOE's ICAM program is to develop Identity, Credential and Access enterprise solutions and services to enable interoperability in the areas of Digital Identity, Credentialing, Privilege Management, Authorization, Authentication, Audit, and Cryptography. It is intended to achieve compliance with legislative and regulatory requirements (i.e. FISMA, OMB M-05-24, OMB M-04-04, OMB M-11-11, etc.) as well as position the agency to face increasing complex security threats. Current ICAM efforts are focused around the issuance of PIV and other SP 800-63 Level of Assurance 4 compliant credentials for standard and privileged organizational users; implementation of new Enterprise Public Key Infrastructure services. Implementation of ICAM is a vital enabling solution to ensuring that DOE's Strong Authentication efforts continue in FY 2017 and beyond. ICAM provides critical services to support DOE's aggressively shift from on premise traditional infrastructure and system based dedicated computing to share cloud services which in turn supports data center consolidation.

Summary of Funding from Working Capital Fund – CyberOne business line (\$5,575,035)

Cyber Federated Model (\$1,529,000)

The Cyber Fed Model (CFM) is a JC3 service that has driven machine-to-machine sharing of cyber threat intelligence, speeding up proactive defense, and distributed detection for the Department's National Laboratories and site offices. CFM began with a pilot in FY 2004 and entered production status in FY 2009 and has distributed over 7 million bad actor addresses to date. In FY 2014, over 1.5 million bad actor addresses were distributed with an average of 5,000 per day. In many cyber incidents, timely sharing of information is often a second thought and CFM allows for the cyber systems to share, act, and provide a coordinated defense 24x7x365 with minimal human interaction. CFM supports the Deputy Secretary's direction to operate at machine speed in responding to cybersecurity threats and incidents. Flexible and customizable, CFM integrates the latest advancements and technologies developed by its project team members and partners. CFM can deliver signatures and indicators of compromise to automatically update cyber defenses, such as intrusion detection systems, intrusion prevention systems, and firewalls.

ICAM (\$4,046,035)

The DOE ICAM program transforms Identity, Credential, and Access Management (ICAM) from a system or facility effort to an enterprise strategic resource for leveraging the enhancement of cybersecurity and the improvement of efficiency of business processes in each DOE Element. Specifically, efforts within the WCF are focused on:

- PKI-to-cloud initiative to establish an enterprise Public Key Infrastructure (PKI) that is on the Federal Bridge and provides PKI certificates for interoperable and secure information exchange internal and external to DOE. Support for removing local certificates to comply with the Federal Bridge.
- Personal Identity Verification (PIV) enablement in support the Homeland Security Presidential Directive (HSPD)-12 directive and Cross-Agency Priority (CAP) goal of strong authentication through continued issuance of PIV cards.

* WCF and customer fund dollars include CIO contributions

Customer funding provided as part of EITS (\$7,208,000) – Covers things like Antivirus Software, PKI encryption, website filtering, and two-factor authentication.

Budget Line: Detect, Analyze, and Mitigate Intrusions – Detect and Respond (\$2,097,000 – request; \$30,631,804 – WCF; \$6,136,000 - Customer)

DOE continues to refine its cybersecurity capabilities to allow for nimble detection, analysis and mitigation of cyber intrusions. The implementation of these refinements will result in a DOE-centric cyber risk management strategy that is aligned with the NIST Risk Management Framework and meets the needs of DOE's complex network environment. To remain relevant in a rapidly evolving cyber environment, the Department will advance the science of cyber by investing in innovative technologies. The Department's cyber capabilities must support an environment to prevent, deter, and detect cyberattacks. In addition to operational initiatives, DOE also regularly evaluates tools and technologies that can enhance the cybersecurity capabilities necessary to defend the Department against potential cyber adversaries (e.g., information sharing, incident response, and situational awareness). This process allows the Department to test and scale "best of breed" solutions prior to full scale implementation. This activity also includes processes to introduce, test, pilot, and

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operationalize new cybersecurity products or services, such as hardware, software, applications, and equipment, designed to protect the DOE IT infrastructure.

In addition, the CIO supports greater information sharing within the Department and with other federal partners. A key part of that effort includes the use of standard tools to improve continuous monitoring and sharing of data.

- Participate in Continuous Data Monitoring (CDM) activities to include status tracking of purchases, reading room index status activities, hosting reading rooms, training, etc.
- Develop and implement the enterprise ISCM Strategy and implementation plan in accordance with DHS, OMB and NIST requirements.
- Monitor the security controls in federal information systems and the environments in which those systems operate.
- Maintain ongoing awareness of information security, vulnerabilities, and threats to support organizational risk management decisions.
- Address the requirements listed in OMB Memorandum 14-03 and the evolving Information Security Continuous Monitoring Program (ISCM) ConOps.
- Define new ISCM requirements for inclusion in DOE Order 205.1B.
- Continue deployment of the DOE ISCM Strategy and develop tracking mechanisms for tools and services procured through (1) CDM Congressional Funds (survey) and (2) Direct Order purchases through BPA for DOE Programs, Laboratories, and Sites.
- Develop metrics for tools and services procured under the program.

Summary of Funding from Working Capital Fund – CyberOne business line (\$26,231,804)

Joint Cybersecurity Coordination Center

The JC3 provides Departmental, enterprise level, situational awareness in a rapidly increasing threat environment. At its core, JC3 facilitates the aggregation, correlation, and de-confliction of enterprise-deployed sensor inputs like those provided by the CPP and other data sources; provides threat analysis in coordination with DOE laboratories; conducts attack trending and tracking of advanced persistent threats; and distributes threat information and indicators of compromise to DOE entities in an automated manner. The JC3 provides cybersecurity enterprise services and tools to customers Department-wide and facilitates enterprise cybersecurity training for the Department. JC3 serves as the coordinating, monitoring, reporting, and response arm of the Department's Enterprise cybersecurity program. JC3 capabilities and activities fall within the following JC3 six primary functional areas:

- Information Collection and Situational Awareness
- Advanced Analytics
- Incident Management and Response
- Advise and Consult
- Information Sharing and Reporting
- Program Management

The JC3 integrates Departmental Incident Management capabilities and coordinates all enterprise activities including prevention, detection, containment, and recovery for all DOE Elements. This includes activities on both unclassified and classified networks through partnerships with DOE Programs with direct support to classified networks through the National Nuclear Security Administration (NNSA) and the DOE Counterintelligence and Intelligence (IN). The JC3 also coordinates communications on behalf of the DOE for cybersecurity events and cyber emergency response with United States Computer Emergency Response Team (US-CERT) and other agency partners.

Summary of Funding from Working Capital Fund – Interagency business line (\$4,400,000)

Credit Monitoring

To provide funding for credit monitoring services for employees of the Department following the OPM PII data breach.

Customer funding provided as part of EITS (\$6,136,000) – Includes items such as continuous monitoring, cybersecurity assurance and accreditation, and information systems security officer support.

* WCF and customer fund dollars include CIO contributions

Budget Line: Shaping the Cybersecurity Environment – Identify and Recover (\$7,229,000 – request; \$1,174,000 - WCF)

The CIO is responsible for the strategic cyber vision for the enterprise as a whole. Key parts of that effort include implementing the Cyber Strategy, establishing policies, ensuring the workforce is properly trained, managing investments in initiatives to support strategic direction, and establishing programs to promote outreach and effective risk implementation.

Activity: Planning, Policy, and Management (\$2,700,000)**Sub-Activity: Enterprise Risk Management (\$1,000,000)**

The Enterprise Risk Management Program (ERMP) builds on federal direction and guidance, Departmental policy, and organizational best practices to organize and clarify risk management goals and provide a consistent approach through which to make risk-based cybersecurity decisions, address risk at the: (i) organization level; (ii) mission/business process level; and (iii) information system level, and employ common-practice processes for use as outlined in Departmental policy. By providing foundational guidance, strategies, and implementation plans, such as an enterprise Risk Management Approach and Methodology, and working closely with programs and sites, the ERMP will develop, document, and deploy fundamental approach(s) to cybersecurity and risk management for use within the DOE enterprise to include:

- An enterprise risk management approach; proof of concept; and standards, processes, and procedures;
- Implementation guidance and technical support for the DOE Risk Management Approach;
- Measures and Metrics;
- Maturity Model and self-assessment; and
- Systematic and objective review of organizational implementation and metrics process.

Sub-Activity: Strategic Planning and Analysis (\$1,700,000)

A foundation of the Department's Cyber Strategy is a standards-based risk management approach, which includes a mature governance structure, integrated management coordination, and performance measurement. The Department leverages strategic planning to identify critical cybersecurity gaps, establishing priorities, and determine appropriate actions are necessary to improve the Department's Cyber posture. Strategic Planning is a continuous process across the enterprise and includes execution of the DOE Cyber Strategy into more discreet operational initiatives. Strategic planning includes engagement and participation in DOE's governance framework including the DOE Cyber Council and Information Management Governance Board. In addition, the Department participates in governance bodies and activities coordinated by the National Security Council (NSC) including Deputies Committee, Interagency Policy Committees (IPC), and Sub-IPCs. The Department drives completion of cybersecurity initiatives through various working groups. Strategic Planning ensures the Department's interests are included in the development of federal cyber initiatives.

- Analysis and Documentation: Collecting, quantifying, and prioritizing requirements and requests, based on CIO and Chief Information Security Officer (CISO) guidance; and developing DOE's strategies to address new federal programs and support the DOE mission and operations. Analysis includes the automated collection and management of cybersecurity data and standardized reports. Analysis function also includes the collection, quantification, and prioritization of federal and DOE new and evolving cybersecurity requirements, which drive strategic planning. Automation in analysis and documentation improves management performance and reduces reporting errors through streamlined workflows and common reporting platforms.
- Information Sharing and Safeguarding (IS&S): Supporting the Senior Agency Officer's (SAO's) efforts to establish and direct a policy-based IS&S risk management framework for DOE; and ensuring enterprise-wide alignment, coordination and technical standardization in accordance with the National Strategy for Information Sharing and Safeguarding (NSISS).

Activity: Requirements Analysis and Integration (\$4,529,000)

The implementation of the Department's Cyber Strategy will be critical meeting the demands of an ever-changing cyber environment. The OCIO is charged with identifying key initiatives that will be responsive to the Cyber Strategy's

goals and objectives. The OCIO is responsible for collecting and helping build the enterprise architecture view and the list of Technical and Cybersecurity Requirements that inform the implementation of the Cyber Strategy. Based on enterprise and component requirements, solutions will be identified and a recommendation will be formed to meet the needs of the DOE environment. The OCIO provides the Project Management processes collecting status, risks, issues, and decision requests regularly for management escalation and reporting. Later in the project lifecycle they remain a key Point of Contact (POC) for status on cybersecurity certifications and controls implemented, hosting agreements, contract consolidations, and implementation approaches.

As DOE moves towards re-structuring IT applications and commodities to service domains with brokers, providers, and consumers, the OCIO will be key to designing and setting up the Shared Services architecture and process workflows for requested IT services across the enterprise. At the same time some enterprise implementations of like products with separate installations will start to see the cost savings and value of moving to shared Department solutions. IT investments will start to standardize and centralize allowing the Department to better achieve FITARA objectives of increased IT transparency and reduced redundancy of like investments. This evolution requires research/discovery of options and complex integration of component architectures and systems across the enterprise.

Summary of Funding from Working Capital Fund – CyberOne business line (\$1,174,000)

Cyberfire/Inferno Training events

Cyber FIRE/Inferno training provides cyber incident responders with the highly specialized skills needed to defend against and mitigate cyber threats. Cyber Fire provides classroom lab-style training, followed by a training exercise in which participants test their newly acquired skills in a challenging and motivating capture-the-flag competition. Cyber Inferno exercises are smaller-scale, week-long events that bring together advanced analysts from one or more sites to work together on data from real incidents. This training is currently open to all Federal Agencies, to include DOD, and there are plans open it up to Energy Sector industry partners in the near future.

* WCF and customer fund dollars include CIO contributions

OCIO Cybersecurity Crosscut

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 Control and Access Management (ICAM).

FY 2017 OCIO Crosscut (\$K)

	Cybersecurity	Total
Cybersecurity – CIO approp	20,026	20,026
JC3 – WCF	28,935	28,935
ICAM – WCF	4,046	4,046
EITS- Shared Services*	13,344	13,344
Total	66,351	66,351

*Captures funding from Shared Services used to conduct Cyber activities. These funds are also reflected in the EITS figures in the next section of this document.

Cybersecurity

Activities and Explanation of Changes

FY 2016 Enacted	FY2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
Cybersecurity \$21,006,000	\$26,524,000	\$20,026,000	-\$6,498,000
Programs and Reporting			
Programs and Reporting (\$8,402,000) <ul style="list-style-type: none">• Provides policy, training and awareness, reporting, and risk management programmatic activities and programs that directly support the Department's overall cybersecurity effort. This includes providing support in promulgation of Departmental cybersecurity requirements and directives through Program Offices' Risk Management Implementation Plans.	Programs and Reporting (\$0)	Programs and Reporting (\$0) <ul style="list-style-type: none">• Closeout of Program Funding Line	Programs and Reporting (\$0) <ul style="list-style-type: none">• Activities under Programs and Reporting in FY 2016 have moved under various functional categories in FY 2017.
Strategic Planning and Initiatives/ Enterprise Services			
Strategic Planning and Initiatives/ Enterprise Services (\$12,604,000) <ul style="list-style-type: none">• Supports expanded role in the federal approach to cybersecurity through federal-level representation and strategic input and staffing.• Supports short-term efforts necessary for responding to federal tasking, improving internal and federal reporting, and improving internal processes related to the management of cybersecurity programs.• Supports cybersecurity initiatives, including technical reviews, proof of concepts, pilots, and first year operation and maintenance for evaluation of new technologies and enhanced capabilities.	Strategic Planning and Initiatives/ Enterprise Services (\$0)	Strategic Planning and Initiatives/ Enterprise Services (\$0) <ul style="list-style-type: none">• Closeout of Program Funding Line	Strategic Planning and Initiatives/Enterprise Services (\$0) <ul style="list-style-type: none">• Activities under Programs and Reporting in FY 2016 have moved under various functional categories in FY 2017.
Protecting Networks and Information (Protect)			
Protecting Networks and Information (\$0)	Protecting Networks and Information (\$3,180,000) <ul style="list-style-type: none">• Cyber Supply Chain	Protecting Networks and Information (\$10,700,000)	Protecting Networks and Information (+\$7,520,000)

FY 2016 Enacted	FY2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
	<ul style="list-style-type: none"> Efforts connected to understanding and gaining visibility and control of the processes and practices used to create, deliver, and maintain software and hardware products and services. Reporting (Data Collection, Analysis, and Metrics), as required by DOE initiatives or other federal agencies. Includes performing validation and verification of reported Plan of Action and Milestones (POA&M) data collected from Departmental elements and score-carding of Cross-Agency Priority (CAP) status and progress. 	<ul style="list-style-type: none"> Continued FY 2016 programs and initiatives include: Cyber Supply Chain and Reporting. 	<ul style="list-style-type: none"> Request reflects renewed efforts in ICAM and investment in commercial instance of TIC.
Detect, Analyze, and Mitigate Intrusions (Detect and Respond)			
Detect, Analyze, and Mitigate Risk (\$0)	<p>Detect, Analyze, and Mitigate Risk (\$5,816,000)</p> <ul style="list-style-type: none"> Technical Initiatives (\$4,376,000) These initiatives are designed to identify, test, and scale “best of breed” solutions to protect DOE assets by employing new technologies throughout the Department. Introduces, tests, pilots, and operationalizes new cybersecurity products or services, such as hardware, software, applications, and equipment, designed to protect the DOE IT infrastructure. Expand the Department’s ability support Continuous Monitoring and share information with departmental and federal entities. (\$1,440,000) 	<p>Detect, Analyze, and Mitigate Risk (\$2,097,000)</p> <ul style="list-style-type: none"> Continued efforts in FY 2017 on technical initiatives, and incident response and reporting improvements Continuous Monitoring (\$900,000) continued efforts from FY2016. 	<p>Detect, Analyze, and Mitigate Risk (-\$3,719,000)</p> <ul style="list-style-type: none"> Funding initiatives are designed to identify, test, and scale solutions to protect DOE assets by employing new technologies throughout the Department. The funding provided will support cybersecurity risk management capabilities that align with NIST standards The funding provided will support the development and implementation of an enterprise continuous monitoring strategy and IT security tools that will support Federal requirements.

FY 2016 Enacted	FY2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
Shaping the Cybersecurity Environment (Identify and Recover)			
Shaping the Cybersecurity Environment (\$0)	<p>Shaping the Cybersecurity Environment (\$17,528,000)</p> <ul style="list-style-type: none"> • Continue the OCIO efforts in establishing cybersecurity vision and strategic plans to meeting federal requirements; establish policies and programs in support of the plans; ensure the workforce is trained and aware; and promote outreach and innovation through public-private partnerships. 	<p>Shaping the Cybersecurity Environment (\$7,229,000)</p> <ul style="list-style-type: none"> • Focuses funding on Planning, Policy and Management as well as Analysis and Integration activities 	<p>Shaping the Cybersecurity Environment (-\$10,299,000)</p> <ul style="list-style-type: none"> • Scope of work reduced to focus on other Cyber-related priorities. • Funding reductions to the areas of Outreach and Innovation and Strategic Initiatives allow additional funding to be applied to higher priority sub-activities. • The funding provided will support Requirements Analysis and Integration activities.

**Chief Information Officer
Corporate IT Program Support**

Overview

In FY 2017, OCIO will be devoting significant attention to addressing long-standing infrastructure issues. Therefore, approximately half of the request is to modernize DOE's critical network infrastructure and data center. OCIO is requesting \$33,278,000 for this decision unit.

Highlights of the FY 2017 Budget Request

- Networking: Modernization of critical network infrastructure which will decrease its vulnerability to breaches and allow for capacity expansion.
- Data Center: Procurement of an integrated, location independent infrastructure, combining multiple service capabilities via federally-approved private/public/hybrid cloud services which will provide DOE CIO and Departmental Elements with the scalable and cost-efficient IT infrastructure capacity it requires.
- FITARA: Implementation of recent Federal Information Technology Acquisitions Reform Act (FITARA) which requires DOE to develop a common baseline for roles, responsibilities, requirements and authorities for the management, oversight, and governance of IT in federal civilian agencies and to establish a framework to manage IT and evaluate the financial and programmatic performance of IT systems and investments.

Budget Line: IT Portfolio Summary (\$21,737,000)Activity: IT Investments for Mission Delivery and Management Support (\$3,288,000)

Sub-Activity: Program Management (\$400,000)

Program Management will provide governance advice and strategic recommendations for the Chief Technology Officer (CTO), support various intra- and inter-agency collaborative federal partnerships, as required to support the CTO. It will also maintain project management materials, such as cost, schedule, activity and deliverable reports, financial and quality reviews, plans, reports and presentations.

Sub-Activity: Emerging and Disruptive Technologies (\$275,000)

Emerging and disruptive technologies are the focal point for cutting-edge advances in IT. It will provide strategic support in identifying and researching emerging and disruptive technology trends through a partner engagement framework to connect with industry; and be aware of disruptive technologies that can be used by DOE and support the DOE Technology Roadmap and mission. This work will be executed through the analysis of alternatives, the development of a partner engagement catalog, the planning and execution of technology summits and partner demo days, and the drafting of reports on vendors and emerging technologies.

Sub-Activity: Geospatial/ Data Management (\$569,000)

Develop and promote a comprehensive vision of next-generation IT at DOE with a focus on cross-cutting initiatives such as geospatial science and open data activities. Geospatial and open data initiatives will make geospatial data available and easily integrated with other sources to support the core missions of the Department. It will also support the CIO in the interagency and intergovernmental sharing of geospatial data.

Sub-Activity: IT Modernization Support Activities (\$1,000,000)

- Provide support for the development of the CIO Operating Model to align with the IRM Strategic Plan.
- Facilitate sessions to review performance and implementation of the Cyber Strategy, Cyber Implementation Plan, IRM Strategic Plan, and DOE IT Roadmap with relevant stakeholders, obtain feedback, and refine strategic documentation as necessary.
- Provide guidance on the development of the CIO cost model(s), supporting establishment of a baseline for understanding current costs against the Work Breakdown Structure elements, and enabling the CIO to make informed decisions based on future spend projections.
- Monitor and measure performance of projects against the DOE IT Roadmap with the use of the CIO Balanced Scorecard.

Sub-Activity: Cyber Strategy Implementation Plan (120-Day IT Study Implementation Support) (\$1,044,000)

- Provide content development support, which will be necessary to deliver tools and content in an accelerated manner. Items for development may include: project charter, work-plan, templates, approach for assessment and analysis, reports, and presentations.
- Provide analysis/assessment skills and support, which is critical for providing a strong methodology, data analysis, and accelerated delivery of leadership decisions related to future cost efficiencies.
- Provide partnership engagement and facilitated analysis support to maintain collaborative dialogue throughout the 120-Day Study implementation with Program Office stakeholders.
- Provide objective, third-party support to facilitate regularity of pace and cooperation of the Integrated Project Team.
- Provide enterprise-wide socialization support for information sharing among the Program Offices.
- Facilitate and support disseminating accurate and timely information.
- Develop briefings for delivery to DOE decision making elements including, but not limited to, the Secretary, Deputy Secretary, Information Management Governance Board (IMGB), and the Information Technology Council (ITC).

Activity: IT Investments for Infrastructure, IT Security, Office Automation and Telecommunications (\$11,625,000)

Sub-Activity: Spectrum Management (\$625,000)

The DOE Spectrum Program is a Presidential Mandate under Title 47, U.S. Code of Federal Regulations, 901, et. seq., and is critical to all DOE business lines in meeting national policy objectives. The Spectrum Management Program

mission is to plan, provide, manage and preserve DOE's radio frequency spectrum-dependent resources throughout the complex. Spectrum Management supports the enterprise in systems development and global operations through analysis and coordination with international and national civil and military organizations. Spectrum Management serves as the functional liaison between DOE and the Department of Commerce, the Federal spectrum authority, in representing DOE's interests in holistic telecommunications management and regulation compliance. The DOE Spectrum Program Office is responsible for supporting and protecting the National Nuclear Security Administration, Power Marketing Administrations, Office of Secure Transportation, and National Laboratories spectrum-dependent assets.

The electromagnetic radio spectrum is used by DOE's vast scientific/technical community exclusively for research purposes, protection of the power grid, system acquisition and operations in support of secure transportation and nuclear non-proliferation. Spectrum Management ensures that DOE radio frequency authorizations and spectrum-dependent system certifications, by the National Telecommunications and Information Administration (NTIA), fulfill DOE/CIO program missions. The Spectrum Management Office serves as the functional liaison between DOE, NTIA and federal agencies to represent DOE's interests in telecommunications management and regulation compliance.

The Program is currently responding to the mandatory requirements of Presidential Spectrum Policy Initiatives and implementing the recommendations in the President's Council of Advisors on Science and Technology, (PCAST) Report, and continued implementation of the DOE Strategic Spectrum Plan.

Sub-Activity: Network Refresh (\$11,000,000)

New funding is requested to modernize the access, distribution, and core networking layers of the existing network infrastructure, including expanding future for capacity and bandwidth. This is a two-year (FY 2017- 2018) project. The Network Refresh activity modernizes the access, distribution, and core networking layers, to include expanding capacity and bandwidth. The priority investments focus on:

- Cabling: Legacy wiring is pervasive throughout a number of areas within the DOE enterprise, and imposes technology and performance limitations. Upgrading the wiring is foundational for future modernization activities to support enhanced data delivery, connectivity, and performance. (\$1,200,000)
- Equipment: The majority of the Department's access, distribution, aggregation, and core switches have critical end-of-life deadlines within the next year. This equipment does not support modern protocols, including Unified Communications requirements, and will not meet continued demand. (\$8,400,000)
- Resiliency: The existing infrastructure lacks extensive fault-tolerant design and support for converged capabilities, allowing infrastructure investments including security to provide benefits for multi-protocol capabilities. (\$1,400,000)

The activity benefits the Department's connectivity and capacity. By investing in refreshing network infrastructure, the CIO is able to enhance the network's security services by having the capability to mitigate new attack vectors, including strong identification/authorization and quarantine of who, what, when and how a user and their device are connecting to DOE assets.

Activity: IT Investments for EA, Capital Planning, and CIO Functions (\$6,824,000)

Sub-Activity: Portfolio and Analysis Division (\$1,242,000)

The Portfolio and Analysis Division manages the governance of DOE's strategic IT investment portfolio, to ensure alignment with DOE and CIO missions. By overseeing DOE's Capital Planning and Investment Control (CPIC) programs, IM-21 conducts portfolio analyses to drive investment decision-making across the Department. Tasks and initiatives include:

- Capital Planning and Investment Control
- Budget-Related Exhibit Submission
- eCPIC Administration
- Portfolio Management Training
- PortfolioStat/TechStat

Sub-Activity: Policy and Performance Management Division (\$2,287,000)

The Policy and Performance Management Division provides leadership in IT planning, policy, and IT performance evaluation through focus on: IT strategic alignment, value delivery and performance management and uses analytics to support policy and project sustainability. IM-22 manages strategic and tactical IT policy development, maintenance, and implementation through coordination with internal and external governance groups. IM-22 also provides leadership and coordination for DOE's E-Government, Open Data and Data.gov, IT Sustainability and other federal Initiatives. Tasks and initiatives include:

- Policy Management
- Project Management
- Strategy and Performance Management
- Federal Data Center Consolidation Initiative (FDCCI)
- IT Sustainability
- Federal-wide Initiatives (FITARA, Section 508, Information Collection, e-Government, etc.)

Sub-Activity: Information Management (IM) Governance (\$694,000)

IM Governance provides oversight, support, and maintenance of government structures that enable coordination with elements from across the DOE enterprise on issues related to cybersecurity and information management. Functions include technical and administrative services for governance groups; research and analysis for requests from internal and external government entities. The purpose of IM Governance is to yield effective, efficient, and secure application of information and IT for mission enhancement, operational excellence, and risk management through the Cyber Council, Information Management Governance Board (IMGB), and Governance Support (Secretariats). Supported governance groups include:

- Cyber Council
- Information Management Governance Board (IMGB)
- Investment Review Board (IRB)
- Secretariat Support

Sub-Activity: Proof of Concepts and Pilots (\$601,000)

The purpose of proofs-of-concept and pilots is to showcase next generation IT solutions for the DOE enterprise. It incorporates CIO-driven technology initiatives, as well as agency-wide feedback into the proofs-of-concept and piloting framework for DOE enterprise solutions. It also provides direct access to commercial solutions to allow for leading practices and industry insight on open-innovation, Facilitate Lab to Market Transitions, and Promote Technology Transfer and Commercialization.

Sub-Activity: Federal Information Technology Acquisition Reform Act (FITARA) Implementation (\$2,000,000)

Additional funding is requested to address DOE's Implementation of recent FITARA requirements for DOE to develop a common baseline for roles, responsibilities, requirements and authorities for the management, oversight, and governance of IT in federal civilian agencies and to establish a framework to manage IT and evaluate the financial and programmatic performance of IT systems and investments, as stipulated in FITARA. Work includes ensuring CIO accountability, oversight of DOE Planning, Programming, Budgeting and Execution (PPBE) of IT requirements, certification of IT investments, approval of IT budget requests, IT investment alignment with agency priorities, tracking of IT acquisition strategies and procurements, review of all IT contracts, review of IT cost estimates and incremental funding proposals, continuation of agency led TechStats for IT Programs, design of organizational and workforce change, and operation of the governance process to oversee all of these functions.

Budget Line: IT Infrastructure (\$5,000,000)Activity: Data Center Migration- Data Center Modernization (\$5,000,000)

The CIO provides support for approximately 9,000 Federal employees and support service contractors across the complex. CIO's Energy IT Services (EITS) are enabled primarily by four data centers, two in the eastern United States, and two in the western United States. As a result of technology's accelerated maturation and innovation, modernized and highly secure data centers and relevant services are critical to maintain continuity of mission-critical services. For two (2) of the four (4) data centers, specifically the DOE-owned facilities, there are concerns related to power, cooling and floor space, which challenge availability and continuity of service. Risks identified are symptoms of the historical organic evolution of DOE and its siloed organization and technical infrastructure. Additional one-time funding (\$5,000,000) will be used to address these risks through deliberate and methodological approaches to modernization. Specifically, CIO will procure an integrated, location independent infrastructure, combining multiple service capabilities via federally-approved private/public/hybrid cloud services which will provide DOE CIO and Departmental Elements with the scalable and cost-efficient IT infrastructure capacity it requires. This approach offers a flexible, integrated data center capability that provides DOE mission-focused customers with dynamic compute capacity while mitigating today's limited legacy infrastructure hosting services that are at risk of overload and systemic failure. This project is expected to be fully implemented in FY 2017 and any cost savings would result in a reduction in billings to the customer.

Budget Line: End User- EITS (\$5,224,000 – request; \$32,214,000 – WCF; \$60,108,000 - Customer)Activity: EITS Payment (\$5,224,000)

This funding allows EITS to pay its own bill just like any other customer. EITS moved to a full cost recovery model in FY 2016 and the amount requested is an estimate of EITS's bill.

Summary of Funding from Working Capital Fund – Telecommunications business line (\$32,214,000)

Provides connectivity for DOE Headquarters and Field operations through Local and Wide Area Networks. LAN connections provide access to the EITS application host systems and cybersecurity for the internet, electronic mail, and other applications for information processing and sharing through infrastructure. It also provides connectivity to the entire national complex through DOEnet, which is a centrally managed DOE-wide area network designed to support DOE corporate systems and carry business sensitive data to at 49 DOE customer sites. Provides an infrastructure connecting two main Headquarters buildings and satellite buildings for internal dialing and basic line service. The infrastructure includes communication networks and telephone processing switching equipment. Voice services includes local, long distance, international dialing; specialized services such as operator-assisted conference calls, voice mail, call forwarding, automatic ring-back, and custom calling cards; and trained technical personnel to install, repair and operate the system. This service also includes wireless communications.

Summary of Funding from Customers – Shared Services direct billing (\$60,108,000)*End User Services*

Includes asset management, Tier 1/Tier 2 phone and deskside support, platinum support, and ServiceNow support.

IT Backend Infrastructure

Includes IDW/iManage application hosting support, as well as, Database, Enterprise Services, Messaging, Platform, Storage, and VTC support.

Program Management and Governance

Includes budget and financial support, customer care, program management and governance, and quality management.

*WCF and customer fund dollars include CIO contributions

Budget Line: Policy and Performance Management (\$1,317,000 - Request; \$6,500,000 - WCF)Activity: Records Management (\$614,000)**Departmental Administration/****Chief Information Officer**

Records management activities establish and maintain policies and procedures for the systematic management of DOE records throughout their lifecycle in order to preserve and protect records in accordance with requirements set forth by the National Archives and Records Administration (NARA), the Office of Management and Budget (OMB) and other Federal agencies. A recent NARA review criticized the Department for its Records Management efforts. Additional funds will be used to develop additional role based training for the department on records management. Additionally, CIO plans to address legacy and emerging challenges such as: unscheduled records; outdated schedules; records disposal reviews and processing; litigation holds and preservation notices; annual and ad hoc reporting and responses; records process evaluations; and internal inspections. The additional funding supports the development of guidance material and software systems to support the 2016 mandate for the management of email records using the capstone approach, and the 2019 mandate to manage electronic records electronically.

Activity: Privacy Information Management (\$703,000)

Privacy activities establish and maintain policies and procedures that adhere to and support the Privacy Act, E-Government Act, and OMB Privacy directives. It provides broad oversight, guidance, and specific technical support and reviews for unauthorized disclosures of privacy information and is the principal DOE liaison with external organizations and DOE offices for issues related to privacy management. The CIO provides oversight to ensure compliance with federal regulations and DOE policy and promulgates training and awareness programs for all federal and contractor employees regarding responsibilities for privacy information. Additional funding would allow the DOE Privacy Program to proactively meet statutory and regulatory mandates involving the protection of personal information and to be prepared to respond to incidents resulting in the compromise of personal information. The funding is critical in order for DOE to meet existing privacy mandates including new privacy requirements that will be forthcoming from OMB as a result of recent government-wide cyber incidents that compromised significant collections of personal information. This funding will provide additional man-hours to support the privacy program and well as technical tools to manage privacy search activities.

Summary of Funding from Working Capital Fund – Interagency Transfers business line (\$6,500,000)

Records Storage at NARA

Inactive and active records are stored at Federal Records Centers nationwide and select records must be accessioned to the National Archives for archiving and appropriate public access. DOE maintains an annual agreement with the National Archives and Records Administration (NARA) to provide records services and storage consistent with approved records schedules.

Integrated Acquisition Environment

IAE is operated under an Interagency Agreement with the General Services Administration (GSA) to provide packaged services; reduce costs and save DOE resources by leveraging economy of services. GSA is charged with the fiduciary responsibility to work across government to provide acquisition services to support agency missions by delivering timely acquisition tools and services, including but not limited to, the Central Contractor Registration, excluded parties list, electronic subcontracting reporting, federal business opportunities, federal procurement data, wage determinations, and others, as business requirements are identified by the acquisition community.

E-Government initiatives

Initiatives include consolidation studies of lines of businesses and other intergovernmental systems.

Corporate IT Program Support

Activities and Explanation of Changes

FY 2016 Enacted	FY 2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
\$20,224,000	\$14,706,000	\$33,278,000	+\$18,572,000
IT Policy and Governance			
IT Policy and Governance (\$4,968,000) • Funds provide for governance and oversight of the IRM Strategic Plan implementation, management, and performance measurement, 120-Day Study recommendation implementation, and support of Federal-wide IT initiatives. Additionally, funds will improve IT investment portfolio analysis, implementation of NARA's Capstone strategy, improve Privacy Program Operations, and establishment, execution, and management of a revised Information Management Governance model. Funding will support: • Portfolio and Analysis (\$1,216,000) • Policy and Performance Management (\$1,910,000) • IM Governance (\$612,000) • Records and Privacy Management (\$1,230,000) Specific details of planned activities are provided in the highlighted section of the budget.	IT Policy and Governance (\$0)	IT Policy and Governance (\$0) • Funding realigned to new budget structure	IT Policy and Governance (\$0) • Funding to this element has been realigned to accommodate the restructured CIO budget lines. • Funding was shifted to IT Portfolio Summary and Policy and Performance Management line items.
Technology and Innovation (\$3,247,000) • Funds support organizational realignment, program management of ICAM, the development of a proposal	Technology and Innovation (\$0)	Technology and Innovation (\$0) • Funding realigned to new budget structure	Technology and Innovation (\$0) • Funding to this element has been realigned to accommodate the restructured CIO budget lines.
Departmental Administration/ Chief Information Officer			

FY 2016 Enacted	FY 2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
<p>for a new Innovation and Collaboration Center for engagement with stakeholders and the DOE Technology Roadmap. Funds will contribute to the development and implementation of a Partner Engagement framework, development of a ConOps for an Information Sharing platform, Spectrum support, and the expansion and creation of specific data services that will be shared and accessible across the Department. Funding will support:</p> <ul style="list-style-type: none"> • Strategic Programs • Emerging Technology • Outreach and Innovation <p>• Specific details of planned activities are provided in the highlighted section of the budget.</p>			<ul style="list-style-type: none"> • Funding was shifted to IT Portfolio Summary line item.
Energy IT Services			
<p>Energy IT Services (\$9,965,000)</p> <ul style="list-style-type: none"> • From FY 2016 onwards, the EITS direct appropriation will fund a core engineering team and technology projects under Technology, Research and Development and will pay the EITS bill (EITS as their own customer). • All service-related costs will be covered by customer funds. <p>Funding will support:</p> <ul style="list-style-type: none"> • Program Management (\$0) • Cybersecurity (\$0) • Technology, Research and Development (\$4,741,000) • Service Catalog (\$5,224,000) 	<p>Energy IT Services (\$0)</p>	<p>Energy IT Services (\$0) Funding realigned to new budget structure</p>	<p>Energy IT Services (\$0)</p> <ul style="list-style-type: none"> • Funding to this element has been realigned to accommodate the restructured CIO budget lines. • Funding was shifted to End-User-EITS line item.

FY 2016 Enacted	FY 2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
<ul style="list-style-type: none"> Specific details of planned activities are provided in the highlighted section of the budget 			
IT Modernization			
<p>IT Modernization (\$2,044,000)</p> <ul style="list-style-type: none"> Funds provide for a structured analysis of the Federal IT Service Delivery of the Department of Energy (120-Day Study). Additionally, funds will provide program management support: IT Modernization support (\$1,000,000) 120 Day Study Implementation (\$1,044,000) <ul style="list-style-type: none"> Specific details of planned activities are provided in the highlighted section of the budget. 			
IT Modernization (\$0)	IT Modernization (\$0)	IT Modernization (\$0)	IT Modernization (\$0)
		<ul style="list-style-type: none"> Funding realigned to new budget structure 	<ul style="list-style-type: none"> Funding to this element has been realigned to accommodate the restructured CIO budget lines. Funding was shifted to IT Portfolio Summary and IT Infrastructure line items.
IT Portfolio Summary			
IT Portfolio summary (\$0)	IT Portfolio summary (\$8,252,000)	IT Portfolio summary (\$21,737,000)	IT Portfolio summary (+\$13,485,000)
	<ul style="list-style-type: none"> Funding supports activities such as: IT Investments for Mission Delivery and Management Support: \$3,288,000 IT Investments for Infrastructure, IT Security, Office Automation and Telecommunications: \$625,000 IT Investments for EA, Capital Planning, and CIO Functions: \$4,339,000 	<ul style="list-style-type: none"> Funding is for the continuation of projects and activities from FY 2016 including emerging and disruptive technologies, geospatial management, and modernization activities. Additional funding is requested for Network Refresh activities and FITARA implementation efforts. 	<ul style="list-style-type: none"> New line item; we are providing a functional allocation of resources versus an organizational allocation. Network Refresh (\$11,000,000) new funding is requested to modernize the access, distribution, and core networking layers of the existing infrastructure. Activity details are proved in the overview section. FITARA Implementation (\$2,000,000) Funding required to address mandates of the FITARA legislation

FY 2016 Enacted	FY 2016 Comparable Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016 Comparable
IT Infrastructure			
IT Infrastructure (\$0)	IT Infrastructure (\$0)	IT Infrastructure (\$5,000,000) <ul style="list-style-type: none"> • New one time funding is requested to migrate to new, off-premise data centers \$5,000,000 • Detailed explanation of planned activities provided within narrative. 	IT Infrastructure (+\$5,000,000) <ul style="list-style-type: none"> • New line item; we are providing a functional allocation of resources versus an organizational allocation. • New one time funding is requested to migrate to new, off-premise data centers (+\$5,000,000)
End User- EITS			
End User- EITS (\$0)	End User- EITS (\$5,224,000) <ul style="list-style-type: none"> • Funding supports: • EITS payment (\$5,224,000) <p>This funding pays for the EITS staff as customers of their own products.</p>	End User- EITS (\$5,224,000) <ul style="list-style-type: none"> • Continued funding support for EITS payment as a customer 	End User- EITS (\$0) <ul style="list-style-type: none"> • New line item; we are providing a functional allocation of resources versus an organizational allocation. Funding level is flat from FY 2016 Enacted.
Policy and Performance Management			
Policy and Performance Management (\$0)	Policy and Performance Management (\$1,230,000) <ul style="list-style-type: none"> • Funding supports Records and Privacy Management and Training 	Policy and Performance Management (\$1,317,000) <ul style="list-style-type: none"> • Funding continues current efforts in records and privacy and requests additional funding to address legacy and emerging challenges. 	Policy and Performance Management (+\$87,000) <ul style="list-style-type: none"> • New line item; we are providing a functional allocation of resources versus an organizational allocation. • Additional funding is requested in both the Records and Privacy areas to address significant emerging challenges.

Program Direction

Overview

Program Direction provides Federal staffing and associated costs for the overall management of activities carried out by the Chief Information Officer (CIO).

A funding level of \$35,770,000 is required for Program Direction to provide the federal support required to improve the Department's cyber posture, position the CIO to provide more secure and cost-effective IT services to the Enterprise, and to meet requirements and responsibilities outlined in Federal Information Technology Acquisition Reform Act (Title VIII, Subtitle D of the National Defense Authorization Act (NOAA) for Fiscal Year 2015, Pub. L. No. 113-291) (FITARA), Records Management, Privacy, Information Technology Management Reform Act of 1996 (Clinger-Cohen), Federal Information Security Modernization Act of 2014 (FISMA) and other relevant statutes.

Highlights of the FY 2017 Budget Request

Corporate budget lines (salaries and benefits, travel, training, WCF, and desktop support) play an integral role in supporting operations within CIO. In the areas of corporate management, acquisitions/contract administration, human capital management, and budget support, CIO will continue to support improved efficiency and effectiveness in addressing internal, Departmental, and user community requests. The program is requesting an increase in full-time equivalents (FTEs) of 4 FTEs, for a total of 117 FTEs in FY 2017 up from 113 FTEs in the FY 2016 Request. Program and additional federal oversight is required to ensure effective program execution for established and new activities.

Focus will be placed on quality improvements with existing functions to satisfy requests from senior management and program offices. Increases to Salaries and Benefits (+\$1,144,000) reflect funding required to fund an additional 4 FTEs and to maintain our FY 2016 staffing level of 113 FTEs. Additionally, an increase in Other Related Expenses is reflective of changes to Working Capital Fund requirements and our IM Desktop services (EITS fee as a customer) charges.

Program Direction Funding (\$K)			
	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request
Program Direction Summary			
Headquarters			
Salaries and Benefits	20,863	19,663	20,807
Travel	208	208	208
Support Services	3,424	3,424	3,424
Other Related Expenses	8,693	8,693	11,331
Total, Program Direction	33,188	31,988	35,770
Federal FTEs			
Federal FTEs- Program Direction Funded	125	113	117
Federal FTEs- WCF Funded	13.15	13.15	13.15
Total FTEs	138	126	126
Support Services			
Technical Support Services	1,549	1,549	1,549
Business, Finance, and Procurement	1,875	1,875	1,875
Total, Support Services	3,424	3,424	3,424
Other Related Expenses			
Training	120	120	120
Working Capital Fund (WCF)	7,714	7,714	10,211
Desktop Services	859	859	1,000
Total, Other Related Expenses	8,693	8,693	11,331

Activities and Explanation of Changes**Program Direction**

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$31,988,000	\$35,770,000	+\$3,782,000
Salaries and Benefits		
(\$19,663,000) funding supports federal staff and related benefits requirements for 113 FTEs	(\$20,807,000) Funding requested will support 117 federal FTEs. In addition to providing approximately \$715,000 for 4 additional FTEs (117 total up from our FY 2016 request of 113 FTEs), the balance of the increase is required to right size the budget for the projected 113 FTEs planned to be on-board at the start of FY 2017. Projections reflect current staffing requirements and include planned within grade increases, promotions and a 1% cost of living adjustment. The current staff and planned additions of 4 FTEs are required to provide program review and oversight of the activities and programs managed by the CIO program. The proposed budget is growing significantly for the program and additional federal oversight will be required to support this increase to ensure effective program execution for established and new activities, including FITARA management.	(+\$1,144,000) An additional \$715,000 is required to support +4 FTEs requested for FY 2017.
Travel		
(\$208,000) Travel supports federal staff that is required to attend mission-critical training and development events. Funds are also used to facilitate communication with field sites. Continuation of FY 2015 activities.	(\$208,000) Continuation of FY 2016 activities.	(\$0) No change.
Support Services		
(\$1,549,000) Sustain operations within the front office of the CIO. Funds support contractor activities and memberships/subscription services for the CIO and senior staff.	(\$1,549,000) Continuation of FY 2016 activities.	(\$0) No change.
(\$1,875,000) Funding used to maintain contractor activities in the areas of Budget and Internal Controls, Acquisitions, and Human Capital. These activities are critical to programmatic operations and accomplishment of program goals.	(\$1,875,000) Continuation of FY 2016 activities.	(\$0) No change.

Other Related Expenses		
(\$120,000) Training costs to ensure all FTEs are appropriately trained to perform their duties, and development opportunities are available to CIO's federal staff.	(\$120,000) Continuation of FY 2016 training activities.	(\$0) No change.
(\$7,714,000) WCF funding level accounts for estimated OCIO as the customer costs, as well as overhead expenses.	(\$10,211,000) Continuation of FY 2016 activities. Funding requested will support the planned on-board FTE's for the program as well as address the projected requirements for the CIO as identified by the WCF manager. This Request will fully fund the current WCF estimate provided to the CIO by the fund manager. In addition to the planned Federal staff of 117 FTEs this activity also supports an average of over 525 contractor employees located on the DOE sites.	(+\$2,497,000) Additional funds required to cover shared services. The estimate is required to cover federal and contractor support. The CIO is requesting additional funding for WCF payments to ensure that it can meet its projected commitments to the fund in FY 2017 without impacting program activities.
(\$859,000) Desktop Services funds are used to provide IT services and hardware to employees. Continuation of FY 2015 Desktop Services activities (EITS fee).	(\$1,000,000) These funds provide for OCIO requirements as a customer of the EITS program and pays our user based billing requirements for 117 federal and contractor staff for our desktop services. The increase will also cover anticipated adjustments to our bill related to full-cost recovery as the EITS program is transitioned to the WCF.	(+\$141,000) Additional funding required to cover anticipated price increases to the EITS program in FY 2017.

**Chief Information Officer
Digital Services Team**

Overview

The success rate of government digital services is improved when agencies have digital service experts on staff with modern digital product design, software engineering and product management skills. To ensure DOE can effectively build and deliver important digital services, the FY 2017 Budget includes \$4,000,000 in funds to enable the Department to focus on transforming its digital services with the greatest impact to citizens and businesses.

Highlights of the FY 2017 Budget Request

During FY 2017, DOE will continue efforts started in FY 2016 around “Visual Patent Search.” The goal of the project is to simplify identification of DOE-owned patents that meet the application needs of small businesses, entrepreneurs and other potential commercial and industrial sector partners by developing an improved searchable and portable database — connecting stakeholders and members of the public with the vast array of intellectual property owned by DOE and its National Laboratories. This application would also go one step further, mapping DOE invention and patent disclosures to those at other agencies, such as National Aeronautics and Space Administration (NASA) or National Institutes of Health (NIH), and provide for cross-agency discovery and portfolio comparisons. The Visual Patent Search tool would tie into a rudimentary Customer Relationship Management (CRM) solution for DOE Labs, providing for lead tracking, measurement and reporting across licensing and lab-to-market activities. In addition, DOE will seek additional projects that are:

- Public-facing, or have an internal impact so significant that it would be of interest to others as a model.
- High impact, meaning that it would generate or mend a public-facing tool that is responsible for a large number of transactions between DOE and the public, or would make a large number of assets available for a low cost.
- Easily identifiable and publicly understandable benefits, such as contributing to economic activity in the U.S., major use enhancements, or significant cost savings.

Digital Services Team

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Digital Services Team \$0 (\$0) No funding enacted	\$4,000,000 (\$4,000,000) Funding requested to complete efforts pertaining to identified projects and to review new submissions for consideration.	+\$4,000,000 (+\$4,000,000) Funding increased to reflect support for the Digital Services Team Initiative. Established funding level is adequate to address the requirements and goals of the program.

Congressional and Intergovernmental Affairs Program Direction

Overview

The Office of Congressional and Intergovernmental Affairs (CI) contributes to the success of the Department by focusing on accurate and timely communication of Administration and Departmental objectives and activities with Congress, state, local and Tribal governments, and other stakeholder organizations. Specifically, CI:

- Directs, manages and ensures coordination of relationships between all Departmental organizations in their interaction with external stakeholders.
- Develops and recommends legislative strategies and engagements in connection with the Department's policy and program initiatives.
- Monitors legislative activity to inform and advocate on behalf of the Department in the legislative process. Works with Members of Congress, their staffs, and Committees to define, articulate and advance DOE's position on pending legislation and to implement national policy priorities as enacted into law by the Congress.
- Provides timely notifications to Members of Congress, Governors, Mayors, and Tribal officials on DOE matters of specific interest including pending awards/grants/contracts that have an impact upon the Member's State and District. Provides timely and full response to inquiries, requests for information, and constituents' concerns.
- Coordinates and prepares Departmental officials for congressional briefings and meetings as well as gubernatorial and Tribal events.
- Directs and coordinates the preparation of congressional testimony, transcripts, pre- and post-hearing questions and answers, and inserts for the record promoting timely responses and completeness of content.
- Works with Governors and their staffs, local elected and appointed officials, as well as Tribal leaders to provide information on DOE activities and decisions; articulate and advance DOE's position on pending legislation; notify them regarding pending awards/grants/contracts that have an impact upon their constituencies; and to elicit concerns and interests to assure their consideration in DOE decision processes.
- Coordinates engagement with private industry and public interest groups to provide information and assistance in regard to Department programs and activities of special concern.

Highlights of the FY 2017 Budget Request

The Department requests \$6,200,000 in FY 2017 for CI to maintain operational levels consistent with Departmental needs and Secretarial priorities. Funding will ensure CI can continue to provide accurate and timely communications of Administration and Departmental activities and objectives to Congress, State, local and tribal governments and external organizations.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	4,656	4,202	4,663	4,663	0
Travel	95	95	95	95	0
Support Services	234	234	254	246	-8
Other Related Expenses	1,315	1,315	1,288	1,196	-92
Subtotal, Washington Headquarters	6,300	5,846	6,300	6,200	-100
Use of Prior Year Balances	-1,600¹	-1,146²	0	0	0
Total, Program Direction	4,700	4,700	6,300	6,200	-100
Federal FTEs	33	28	33	33	0
Support Services					
Management Support					
Print and electronic information subscription services	75	75	86	100	+14
Contractor support	100	100	102	110	+8
Other, including office maintenance, furniture, etc.	59	59	66	36	-30
Total, Management Support	234	234	254	246	-8
Total, Support Services	234	234	254	246	-8
Other Related Expenses					
Training	25	25	25	25	0
DOECOE	238	238	243	243	0
Working Capital Fund	1,052	1,052	1,020	928	-92
Total, Other Related Expenses	1,315	1,315	1,288	1,196	-92

¹ Reflects the use of prior-year unobligated balances (\$1,500,000) from FY 2011 and (\$100,000) from FY 2014.

² Reflects the use of prior-year unobligated balances (\$1,500,000) from FY 2011 and (\$100,000) from FY 2014 and \$454,000 in reprogramming between Congressional and Intergovernmental Affairs and International Affairs in FY 2015.

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$6,300,000	\$6,200,000	-\$100,000
Salaries and Benefits \$4,663,000	\$4,663,000	\$0
<ul style="list-style-type: none"> Provides funding for 33 FTEs to include salaries and benefits. 	<ul style="list-style-type: none"> Continuation of FY 2016 activities. 	<ul style="list-style-type: none"> No change
Travel \$95,000	\$95,000	\$0
<ul style="list-style-type: none"> Funding for travel requirements to support the Department's engagements with congressional, intergovernmental and other stakeholders. 	<ul style="list-style-type: none"> Continuation of FY 2016 activities. 	<ul style="list-style-type: none"> No change
Support Services \$234,000	\$246,000	-\$8,000
<ul style="list-style-type: none"> The majority of costs associated with CI's support services are related to the acquisition of annual subscriptions to information sources which are essential resources to ensure CI staff is well-informed of congressional and intergovernmental activities and interests. 	<ul style="list-style-type: none"> Continuation of FY 2016 activities. 	<ul style="list-style-type: none"> Decrease in funding reflects a shift of support services funding for subscriptions and contractor services.
Other Related Expenses \$1,288,000	\$1,196,000	-\$92,000
<ul style="list-style-type: none"> Funds support business costs associated with the Department's Working Capital Fund (office space, phones, utilities, etc.); IT equipment and support; as well as staff development and training. 	<ul style="list-style-type: none"> Continuation of FY 2016 activities and credit monitoring for personnel. 	<ul style="list-style-type: none"> Projected increases in the WCF based on additional FTEs have not been realized.

**Office of Small and Disadvantaged Business Utilization
Program Direction**

Overview

The Office of Small and Disadvantaged Business Utilization (OSDBU) is responsible for maximizing contracting and subcontracting opportunities for small businesses interested in doing business with the Department. A primary responsibility of OSDBU is to work in partnership with DOE program elements to achieve Departmental prime and subcontracting small business goals set forth by the U.S. Small Business Administration (SBA).

To achieve its mission, OSDBU is tasked with monitoring, enforcing, and strengthening DOE programs and policies by implementing a wide range of initiatives that strengthen small and disadvantaged business support at the Department.

In FY 2017, OSDBU will work to enhance the Department's small business program and enable it to more effectively perform its statutory requirements. Priority activities include: implementation of Consolidated Appropriation Act of 2014, Section 318, subcontracting policy, Mentor Protégé Program policy, data analysis of prime and subcontracting procurement base (metrics and quality assurance program, consolidation of the Department's small business forecast, and execution of small business outreach, and collaboration with program elements to create additional small business set aside opportunities.

OSDBU provides for 9 federal staffing responsible for the overall direction and administrative support of the office.

Highlights of the FY 2017 Budget Request

In FY 2015, the OSDBU was established as a separate program office within the Departmental Administration (DA) account. The OSDBU and its' support activities, along with federal staff, had a net zero effect on the DA topline.

In FY 2017, OSDBU will build upon FY 2016 activities, meanwhile shifting focus to small business outreach, program office in-reach, policy development, and enhanced data analysis to impact policy and decision-making.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salary & Benefits	1,013	1,013	1,545	1,745	+200
Travel	20	20	34	34	0
Support Services	1,000	1,000	1,022	1,022	0
Other Related Expenses	220	220	399	499	+100
Total, Program Direction	2,253	2,253	3,000	3,300	+300
Federal FTEs	6	6	9	11	+2
Support Services					
Mentor Protégé Program	80	80	100	100	0
Policy and Data Analysis	300	300	300	300	0
Consolidated Acquisition Forecast	95	95	120	120	0
Communications and Management Support Services	140	140	160	160	0
Other Advisory and Assistance Services	385	385	342	342	0
Total, Support Services	1,000	1,000	1,022	1,022	0
Other Related Expenses					
EITS	40	40	40	93	+53
Working Capital Fund	167	167	333	267	-66
Training	13	13	26	139	+113
Total, Other Related Expenses	220	220	399	499	+100

Program Direction		
Activities and Explanation of Changes		Explanation of Changes FY 2017 vs FY 2016
FY 2016 Enacted	FY 2017 Request	
Program Direction \$3,000,000	\$3,300,000	+\$300,000
Salaries and Benefits \$1,545,000	\$1,745,000	+\$200,000
Funding covers salaries and benefits for 9 FTEs.	Funding covers salaries and benefits for 2 additional full-time Federal employees. An increase in Federal personnel is critical for the full implementation and execution of the functions and duties of Section 8 and 15 of the Small Business Act (SBAct).	Funding covers salaries and benefits for 2 additional full-time Federal employees.
Travel \$34,000	\$34,000	\$0
Funding supports travel for essential outreach to small and disadvantaged businesses (including women-owned, veteran owned, HUB-zone, etc.).	Continuation of FY16 activities.	No change
Support Services \$1,022,000	\$1,022,000	\$0
OSDBU will employ support services contractors to enhance the Department's small business program and enable it to more effectively perform its statutory requirements. An abbreviated list of priorities the support service contractors will address include subcontracting policy, Mentor Protégé Program policy, data analysis of prime and subcontracting procurement base (metrics and quality assurance program), SBA's implementation of the 2010 Small Business Jobs Act (Multiple Award Contract final rule, Mentor Protégé final rule, etc.), the Department's small business forecast and execution of small business outreach.	Continuation of FY16 activities.	No change
Other Related Expenses \$399,000	\$499,000	+\$100,000
Funding provides for computer hardware and software services, WCF contributions, space, and necessary supplies, staff training and outreach (co-sponsorships).	Continuation of FY16 activities.	Increase in overhead costs due to inflation and additional staff.

Departmental Administration/
Office of Small and Disadvantaged Business Utilization/
Program Direction

Office of Energy Jobs Development Program Direction

Overview

In 2014, the Secretary of Energy chartered a Jobs Strategy Council (Council), composed of the heads of the Department's program offices. The mission of the Council is to accelerate the growth of and access to jobs in all sectors of the United States energy economy while meeting the goals of the Administration's Climate Action Plan. In an effort to formalize and consolidate ongoing activities related to energy jobs development across the Department (formerly tasked to the Council), the FY 2017 Request supports standing up the Office of Energy Jobs Development (EJD).

EJD will focus on three key areas:

1. Managing the collection of annual energy jobs growth data and issuing an annual energy jobs report;
2. Coordinating the ongoing energy workforce development activities within the program offices and laboratories and managing external partnerships with other federal agencies on energy workforce; and
3. Providing energy economic development technical services to states, municipalities, and tribal governments.

The \$3,700,000 budget would support 6 FTEs and fund program activities, including a support services contract to compile survey data and deliver the energy jobs and workforce report that would detail job growth/shifts in the energy and advanced manufacturing industries; fill the gaps that currently exist in Bureau of Labor Statistics data gathering on renewable energy, energy efficiency, and advanced manufacturing jobs; and compile data on energy job skill needs of employers and public agencies.

The budget would support staff activities in three core areas: 1) supervision of the energy jobs data collection; 2) coordinating and leading workforce development activities in new energy technologies, curricula development, interagency activities (e.g., supporting the Skills Working Group), and other private sector partnerships in the utility, energy, and advanced manufacturing sectors; and 3) energy economic development, leading and supporting the Department's engagement on job creation strategies with municipal, regional and state governments and the private sector.

Highlights of the FY 2017 Budget Request

The FY 2017 Request will complete the standup of the EJD, which will focus on:

- Annual national and state energy jobs and jobs skills report;
- Energy workforce development programs; and
- Energy economic development programs and technical advice.

	Program Direction Funding (\$K)				
	FY 2015 Enacted ¹	FY 2015 Current	FY 2016 Enacted ²	FY 2017 Request	FY 2017 vs FY 2016
Program Direction					
Washington Headquarters					
Salaries and Benefits	0	0	0	1,100	+1,100
Travel	0	0	0	300	+300
Support Services	0	0	0	1,822	+1,822
Other Related Expenses	0	0	0	478	+478
Total, Program Direction	0	0	0	3,700	+3,700
Federal FTEs	0	0	0	6	+6
Support Services					
Technical Support Services	0	0	0	1,822	+1,822
Total, Support Services	0	0	0	1,822	+1,822
Other Related Expenses					
Energy IT Services	0	0	0	90	+90
Training	0	0	0	18	18
Working Capital Fund	0	0	0	300	+300
Other Related Expenses	0	0	0	70	+70
Total, Other Related Expenses	0	0	0	478	+478

¹ In FY 2015, Jobs Strategy Council activities are being carried out by the Office of the Secretary, EERE, and other Program Offices.

² In FY 2016, Jobs Strategy Council activities are being carried out by the Office of the Secretary, EERE, and other Program Offices.

Office of Energy Jobs Development/

Program Direction

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$0	\$3,700,000	+\$3,700,000
Salaries and Benefits \$0	\$1,100,00	+\$1,100,00
In FY 2016 the activities were carried out through the Office of the Secretary, EERE, and other Program Offices.	Funding in support of 6 FTEs. Funding provides for salaries/benefits, overtime, lump sum leave, and performance awards.	Establishment of a new office.
Travel Expenses \$0	\$300,000	+\$300,000
In FY 2016 the activities were carried out through the Office of the Secretary, EERE, and other Program Offices.	Travel as required in the performance of mission activities, particularly in the delivery of energy workforce and economic development technical services in the states.	Establishment of a new office.
Support Services \$0	\$1,822,000	+\$1,822,000
In FY 2016 the activities were carried out through the Office of the Secretary, EERE, and other Program Offices.	Annual Energy Jobs Report managed internally by DOE; establishment of other support services offered by staff on economic and workforce development programs.	Establishment of a new office.
Other Related Expenses \$0	\$478,000	+\$478,000
In FY 2016 the activities were carried out through the Office of the Secretary, EERE, and other Program Offices.	Other related expenses to cover Training, Energy IT Services, Working Capital Fund (WCF) and other services.	Establishment of a new office.

Economic Impact and Diversity Program Direction

Overview

The Office of Economic Impact and Diversity (ED) advises the Secretary of Energy on the impact of energy policies, regulations, and Department of Energy (DOE) programs on minority communities, minority institutions, and specific segments of the U.S. population. ED is tasked with facilitating involvement of minority serving institutions, minority businesses, and other organizations in all aspects of the energy sector, and monitoring and strengthening DOE programs and policies by implementing a wide range of initiatives that address underrepresented populations in the Department's activities, and the energy workforce.

ED ensures DOE compliance with Titles VI & VII of the Civil Rights Act of 1964 and Title IX of the Education Amendments Act of 1972. ED is also responsible to the Secretary of Energy for planning and executing a strategy that promotes a diverse workforce and an inclusive work environment, as directed by Executive Order 13583, "Establishing a Coordinated Government-wide Initiative to Promote Diversity and Inclusion in the Federal Workforce," along with implementation guidance provided by the Office of Personnel Management. ED is responsible for planning and leading DOE's Minorities in Energy (MIE) Initiative. MIE is a national initiative supporting minority and tribal participation in the energy sector and including businesses opportunities; science, technology, engineering, and mathematics (STEM) education; workforce development; and energy economic development. MIE externally links academia, industry, government, and nonprofits to address future challenges related to the energy workforce.

Highlights of the FY 2017 Budget Request

The FY 2017 ED Request includes an increase of \$1,319,000 to support additional program direction dollars 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). The ED Request also increases funding of the MIE Initiative, to ensure long-term engagement of minority and tribal communities in order to achieve sustained participation in the energy sector. MIE provides critical support for Administration Initiatives, including the President's Climate Action Plan, My Brother's Keeper, Women and Girls in STEM, Women and Girls of Color, Educational Excellence for African Americans, Initiatives on Minority Serving Institutions and Tribal Communities, Energy Efficiency, Ready to Work: Job-Driven Training, and STEM Education. Involvement of tribal and historically underrepresented communities in energy will continue to create jobs and improve economic conditions for those communities, positively impacting the entire nation. Broader participation in the national energy sector will support the growing energy workforce as the national population becomes more diverse.

Economic Impact and Diversity Funding (\$K)					
	FY 2015 Enacted	FY 2015 Current¹	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Economic Impact and Diversity					
Program Direction	6,200	6,000	10,000	11,319	+1,319
Minority Economic Impact	2,800	2,800	0	0	0
Total, Economic Impact and Diversity	9,000	8,800	10,000	11,319	+1,319
Federal FTEs	28	28	37	40	+3

¹ Reflects a reprogramming of \$200,000 between Economic Impact and Diversity and International Affairs in FY 2015.

Departmental Administration/Economic Impact and Diversity/

Program Direction

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction					
Washington Headquarters					
Salaries and Benefits	4,200	4,200	5,750	6,279	+529
Travel	120	120	120	120	0
Support Services	3,433	3,353	2,155	2,827	+672
Other Related Expenses	1,247	1,127	1,975	2,093	+118
Total, Program Direction	9,000	8,800	10,000	11,319	+1,319
Federal FTEs					
	28	28	37	40	+3
Support Services					
Management support					
Minority Economic Impact (OMEI) [includes MIE]	1,400	1,400	1,009	1,315	+306
Minority Business & Economic Development (MBED) [includes MIE]	400	400	300	400	+100
Office of Civil Rights (OCR)	400	400	496	667	+171
Diversity and Inclusion (D&I)	300	300	100	120	+20
Equal Employment Opportunity (EEO)	300	300	100	100	0
Other Support Services	633	553	150	225	+75
Total Support Services	3,433	3,353	2,155	2,827	+672
Other Related Expenses					
Training	80	78	75	75	0
DOECOE	115	124	370	470	+100
Working Capital Fund	1,052	925	1,530	1,548	+18
Total, Other Related Expenses	1,247	1,127	1,975	2,093	+118

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$10,000,000	\$11,319,000	+\$1,319,000
Salaries and Benefits \$5,750,000	\$6,279,000	+\$529,000
Provides funding for 37 FTEs who directly support the ED mission.	Request provides funding for 40 FTEs who directly support the ED mission.	This change reflects an addition of 3 FTEs: 2 FTEs for Civil Rights and 1 FTE for MBED support
Travel \$120,000	\$120,000	\$0
Request reflects the mission requirements for outreach as well as regulatory activities of the Office of Civil Rights and the Equal Employment Opportunity function of the Office.	Continuation of FY 2016 activities.	No change.
Support Services \$2,155,000	\$2,827,000	+\$672,000
<i>(\$1,009) Minority Economic Impact (OMEI) (includes MIE)</i> Request supports a shift in resources to MIE initiatives, which include energy-related engagement of MSIs and minority communities. MIE educational outreach includes K-12 and higher education support. MIE also supports Administration initiatives such as My Brother's Keeper, Initiative on Women and Girls, minority communities, and STEM teachers. ED works through partnerships with the Department of Housing and Urban Development and the Department of Education to reach minority youth in public housing and low-income communities.	<i>(\$1,315,000)</i> Continuation of FY 2016 activities, with addition of resources to support additional MIE initiatives, which include energy-related engagement of MSIs and minority communities. Expanded efforts include mentoring programs for women and minority students, development of energy learning tools to directly impact pre-college students, and programs to introduce interns to DOE Laboratory capabilities and how to take advantage of new technologies for business opportunities. Resources will also support development of relationships with community colleges and trade schools that will focus on training for specific skills needed in the energy industry.	<i>+\$306,000</i> Increase establishes MIE as a DOE-wide sustainable platform for engagement of minority communities in the energy sector, specifically in areas of STEM education, workforce development, community development, and climate change. Additional funds will be used to build long-term relationships with federal agencies, academic institutions, businesses, corporations, and non-profit organizations in order to enhance MIE capabilities
<i>(\$300,000) Minority Business & Economic Development (MBED) (Includes MIE)</i> Request supports development of technical assistance programs to encourage, promote, and assist minority business enterprises in establishing and expanding energy-related business	<i>(\$400,000)</i> Continuation of FY 2016 activities. ED will continue regional activities that support minority business participation and employment opportunities in major regional energy development projects. Activities and	<i>+\$100,000</i> Increase establishes and implements an energy economic development framework for increased minority business growth and participation in the energy sector, including innovation, commercialization, energy research and

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
opportunities in minority communities that can provide jobs to residents. ED will bring together communities and corporations to support minority participation in major energy development projects. Resource applications include support of ED's partnership with the Minority Business Development Agency to plan and execute local and regional programs that prepare minority businesses to participate in the energy sector work.	methodologies to implement a regional partnership in Southwest Louisiana to create economic growth in key areas, including local recruitment and hiring, along with acquisition of key goods and services locally, will inform development of a model for impacting other, similar regional or local efforts.	development, and other capacities. Funds will be used to develop a model for conducting place-based initiatives to connect minority businesses, major energy corporations, state and local officials, and community programs. Through place-based initiatives, DOE will be able to assist with linking major energy developments with employment opportunities for minority and tribal community workers.
<i>(\$496,000) Office of Civil Rights (OCR)</i> Request supports developing and delivering Civil Rights training tailored to the DOE enterprise. Funds support conducting investigations of civil rights issues	(\$667,000) Continue to provide Civil Rights support to DOE staff, DOE employees seeking redress, and address statutory requirements under Title VI, Title VII, and Title IX. Continue to manage processing of EEO complaints	+\$171,000 OCR requires additional funding for contract support (including training and records management) for EEO complaint investigations. Funding increase also supports Title IX investigations and new Title VI reviews, which address requirements associated with external recipients of federal funding, and include exploratory visits and investigations
<i>(\$100,000) Diversity & Inclusion (D&I)</i> Request reflects a shift in activities to EEO and the MIE Initiative. The Diversity and Inclusion staff will continue to work closely with EEO staff to extend the EEO principles and practices from a model EEO program to a fully inclusive DOE work environment that supports high performance and high employee satisfaction, while positioning DOE to attract a diverse workforce necessary to accomplish the mission responsibilities.	(\$120,000) Continue to work closely with the EEO staff to extend the EEO principles and practices from a model EEO program to a fully inclusive DOE work environment that supports high performance and high employee satisfaction. The Request fully implements a multi-year action plan for achieving DOE and OPM diversity and inclusion objectives.	+\$20,000 Additional funds support employee resource groups and workforce training.
<i>(\$100,000) Equal Employment Opportunity (EEO)</i> Request supports contractual resources to assist with integration of Headquarters EEO site-based EEO functions, as outlined in Management Directive 715 and other EEOC directives.	(\$100,000) Continue to integrate EEO functions throughout DOE in accordance with model program requirements established in Management Directive 715 and other regulatory guidance or EEOC directives. Establish a collaborative effort between Civil Rights, Diversity & Inclusion, and the recently established EEO office to achieve full spectrum support of DOE executives and	\$0 Shared Resources will be required to ensure EEO is fully functional in FY 2017, including oversight of DOE offices across the complex and a synergistic relationship with other ED offices. Funds will support EEO staff training and education, as well as training programs for all DOE employees. Resources will enable EEO to establish headquarters oversight across the DOE

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
	managers, the DOE workforce, human capital efforts, and external requirements.	complex.
<i>(\$150,000) Other Support Services</i> Funding for internal evaluation and performance reviews	(\$225,000) Request reflects an increase in support service requirements due to expanded mission responsibilities	+75,000 Request reflects an increase in support service requirements due to expanded mission responsibilities
Other Related Expenses \$1,975,000	\$2,093,000	+\$118,000
<i>(\$75,000) Training</i> Funding for existing FTE count.	(\$75,000) No significant additional training requirements	\$0 No change
<i>(\$370,000) DOE-COE</i> Energy IT Services request supports the office desktop and any departmental mobile capabilities.	(\$470,000) Continuation of FY 2016 activities.	+\$100,000 Increase supports cost estimate based on FTEs and contractors.
<i>(\$1,530,000) Working Capital Fund</i> Working Capital Fund request supports rent and overhead costs associated with the office.	(\$1,548,000) Continuation of FY 2016 activities.	+\$18,000 Increase supports cost estimate for WCF based on FTE count.

**General Counsel
Program Direction**

Overview

The Office of the General Counsel (GC) is responsible for providing legal services to all Department of Energy offices, and for determining the Department's authoritative position on any question of law with respect to all Department offices and programs, except for those belonging exclusively to the Federal Energy Regulatory Commission. GC's responsibilities include the provision of legal opinions, advice, and services to administrative and program offices, and participation in or management of both administrative and judicial litigation. GC is responsible for the coordination and clearance of proposed legislation affecting energy policy and Department activities. The General Counsel serves as the Department's Regulatory Policy Officer under Executive Order 12866, and is responsible for ensuring consistency and legal sufficiency of the Department's regulations. GC administers and monitors standards of conduct requirements, conducts patent program and intellectual property activities, and coordinates rulemaking actions of the Department with other federal agencies.

GC includes the Office of NEPA (National Environmental Policy Act) Policy and Compliance, which provides independent technical and policy reviews to ensure that proposed Department actions comply with the NEPA and related environmental requirements. This office also serves as the focal point of the Department's NEPA expertise, develops NEPA compliance strategies, coordinates with other agencies on key policy matters, and prepares guidance and provides technical assistance to improve the efficiency and effectiveness of DOE's implementation of the NEPA process. GC also includes the Office of Standard Contract management which manages the Standard Contracts for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste between the Department and the nuclear industry under the Nuclear Waste Policy Act. This office also manages the Department's Nuclear Waste Fund activities.

Highlights of the FY 2017 Budget Request

There are no major programmatic changes proposed for General Counsel.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction Summary					
Washington Headquarters					
Salaries and Benefits	23,050	23,050	22,984	22,739	-245
Travel	86	86	87	88	+1
Support Services	928	928	938	948	+10
Other Related Expenses	8,936	8,936	8,991	9,225	+234
Subtotal, Program Direction	33,000	33,000	33,000	33,000	0
Prior Year Balance Use	-2,000	-2,446¹	0	0	0
Total, Program Direction	31,000	30,554	33,000	33,000	0
Federal FTEs	145	145	145	145	0
Support Services and Other Related Expenses					
Support Services					
Technical Support					
NEPA	918	918	928	937	+9
Intellectual Property	10	10	10	11	+1
Total, Support Services	928	928	938	948	+10
Other Related Expenses					
Government Agencies - Intellectual Property	351	351	354	358	+4
Information Technology	1,450	1,450	1,405	1,428	+23
Online Legal Resources	700	700	735	742	+7
Law Library Materials	192	192	155	156	+1
Working Capital Fund	6,061	6,061	6,158	6,356	+198
Miscellaneous	182	182	184	185	+1
Total, Other Related Expenses	8,936	8,936	8,991	9,225	+234

¹ Reflects the use of prior-year unobligated balances (\$2,000,000) from FY 2014 and a reprogramming of \$446,000 between General Counsel and International Affairs in FY 2015.

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$33,000,000	\$33,000,000	\$0
Salaries and Benefits \$22,984,000	\$22,739,000	-\$245,000
Provides funding for 145 FTE to include salaries, benefits, overtime, etc.	Same as FY 2016. Prior year balance use of \$1,513,000 will be applied to offset Salaries and Benefits.	Additional prior year balances may be used to offset cost for Salaries and Benefits for FY 2016.
Travel \$87,000	\$88,000	+\$1,000
Provides funding for travel for hearings, depositions, court proceedings, site visits, conferences, and training.	Same as FY 2016.	Inflationary increase.
Support Services \$938,000	\$948,000	+\$10,000
(<i>\$928,000</i>) NEPA Provides contractor support for technical analysis of Environmental Impact Statements and other information required by the National Environmental Policy Act.	(<i>\$937,000</i>) Same as FY 2016.	(<i>+\$9,000</i>) Inflationary increase.
(<i>\$10,000</i>) Intellectual Property Provides for outside patent law firms to process the Department's intellectual property actions.	(<i>\$11,000</i>) Same as FY 2016.	(<i>+\$1,000</i>) Inflationary increase.
Other Related Expenses \$8,991,000	\$9,225,000	+\$234,000
(<i>\$354,000</i>) Government Agencies-Intellectual Property - Provides for U.S. Patent Office costs of processing/maintaining DOE patents, trademarks, copyrights, etc.	(<i>\$358,000</i>) Same as FY 2016.	(<i>+\$4,000</i>) Inflationary increase.
(<i>\$1,405,000</i>) Information Technology Provides for all GC IT service including desktop workstations and support (DOE/COE), database systems hosting, FISMA reviews and reporting, etc.	(<i>\$1,428,000</i>) Same as FY 2016.	(<i>+\$23,000</i>) Inflationary increase.
(<i>\$735,000</i>) Online Legal Resources Provides for legal research resources such as Westlaw, LexisNexis, etc.	(<i>\$742,000</i>) Same as FY 2016.	(<i>+\$7,000</i>) Inflationary increase.
(<i>\$155,000</i>) Law Library Materials Provides for legal research materials.	(<i>\$156,000</i>) Same as FY 2016.	(<i>+\$1,000</i>) Inflationary increase.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
(\$6,158,000) <i>Working Capital Fund</i> Provides for rent, telecommunications, I-Manage, supplies, copiers, printing, etc.	(\$6,356,000) Same as FY 2016.	(+\$198,000) Inflationary increase plus a 2.5% GSA rent increase.
(\$184,000) <i>Miscellaneous</i> Provides for training, E-Gov, office furniture, supplies, etc.	(\$185,000) Same as FY 2016.	(+\$1,000) Inflationary increase.

Energy Policy and Systems Analysis Program Direction

Overview

The Office of Energy Policy and Systems Analysis (EPSA) serves as the principal policy advisor to the Secretary of Energy on energy and related integration of energy systems. The Office serves as a focal point for policy coordination within the Department on the formulation, analysis, and implementation of energy policy and related programmatic options and initiatives that could facilitate the transition to a clean and secure energy economy.

EPSA carries out strategic studies and policy analysis, and maintains and coordinates a supporting set of analytical capabilities. EPSA carries out assessments of the strength, resiliency, and anticipated challenges of national energy systems and identifies and prioritizes ways in which DOE programs may be strengthened to contribute to the economic well-being, environmental quality, and national energy security of the United States. EPSA advises the Secretary on DOE's energy policy and program strategies. EPSA coordinates with and helps to orchestrate technical assistance and advice to State and local entities on various energy policies and measures. Much of EPSA's work is connected to expertise or information in the various program offices across the Department and EPSA works closely with other offices to harmonize activities, maximize results, and avoid duplication.

EPSA also serves as the Secretariat of the multi-agency Quadrennial Energy Review (QER), and provides systems analysis to support this Administration's initiative. The QER is the cornerstone of the Administration's commitment to establishing a comprehensive, integrated review of energy policy that is formulated with the active engagement of interagency and external stakeholders.

EPSA is comprised of five program offices and two support offices:

Program Offices

- Climate, Environment, and Efficiency (EPSA-20) serves as the Departmental focal point for the development, coordination, and implementation of DOE-related aspects of climate change and environmental policies and strategies to address impacts and vulnerabilities, including technical programs and initiatives.
- Energy Security (EPSA-30) serves as the focal point for policy analysis, analytic support, and advice relating to energy supply and demand and energy markets. It assists in developing long-term strategies to ensure energy security and to prepare for and respond to energy supply disruptions.
- Energy Systems and Integration (EPSA-40) analyzes complex interactions within the energy system, which requires integrating overlapping policies, including those related to all aspects of energy supply and demand, such as the electric grid and natural gas delivery infrastructure.
- Energy Finance, Incentives and Program Analysis (EPSA-50) serves as the focal point within the Department for coordinating the development of policies and programs to accelerate investment and deployment of clean energy technologies that make use of innovative financing incentives. This group provides technical analytic support and identifies opportunities that will promote investment and financing in the energy sector.
- State and Local Cooperation (EPSA-60) serves as the Departmental focal point for developing and carrying out coordinated strategies for assisting State and local authorities in assessing and implementing energy policies, programs and related activities.

Support Offices

- The Office of the Chief Operating Officer (EPSA-10) manages all budgetary, financial, procurement, human capital, security, travel, training, and other administrative functions for EPSA in support of the Secretary's priorities.
- Secretariat for the Quadrennial Energy Review (EPSA-90) provides secretariat functions, including multiagency coordination and analytical support, for the development of the Administration's Quadrennial Energy Review.

Highlights of the FY 2017 Budget Request

EPSA is the Department's lead office for energy policy and systems analysis. In FY 2017, it will work to create comprehensive data sets and systems models to develop a more rigorous analytical basis for evaluation of energy-related policy drivers. In addition, EPSA will continue its efforts related to the energy-water nexus and stakeholder engagement and State, local, and tribal support to help ensure the relevance of its analyses and assessments. EPSA will continue to be the Administration lead for the QER.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	9,917	9,917	10,200	10,500	+300
Travel	400	400	400	400	0
Support Services	18,774	18,774	18,877	17,783	-1,094
Other Related Expenses	2,090	2,090	1,820	2,317	+497
Total, Program Direction	31,181	31,181	31,297	31,000	-297
Federal FTEs	64	64	67	70	3
Support Services					
Subscriptions	430	430	400	400	0
Management Support Services	500	500	500	500	0
Technical Support Services	17,714	17,714	17,777	16,683	-1,094
Other Support Services	130	130	200	200	0
Total, Support Services	18,774	18,774	18,877	17,783	-1,094
Other Related Expenses					
Working Capital Fund	1,500	1,500	1,420	1,917	+497
Training	80	80	100	100	0
DOECOE	510	510	300	300	0
Total, Other Related Expenses	2,090	2,090	1,820	2,317	+497

Program Direction			
Activities and Explanation of Changes	FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Salaries and Benefits \$10,200,000 Funding will support 67 FTEs in carrying out the mission of the Office. Funding provides for salaries and benefits, performance awards, and other personnel-related costs.	\$10,200,000	\$10,500,000	+\$300,000 Increase in funding (+\$300,000) due to an additional three FTEs.
Travel \$400,000 Funds will support travel for mission activities related to technical and analytical support. In FY 2016, EPSA will play a more prominent role in engaging external stakeholders including other Federal agencies, States, tribal and local governments, and regional organizations on energy policy development.	\$400,000	\$0	No increase.
Support Services \$18,877,000 EPSA has a portfolio of analytical requirements (\$17,777,000) related to advising the Secretary on a broad-range of energy security and other energy policy issues, and developing the QER. Funds will also provide for management support services (\$500,000); subscriptions (\$400,000); and other support services (\$200,000).	\$17,783,000	\$17,783,000	-\$1,094,000 Decrease in funding (-\$1,094,000) for technical support services, due to reduced use of support services contracts. No increase in other support services (+\$0).
Other Related Expenses \$1,820,000 Funding supports Working Capital Fund (WCF) expenses, DOECOE/IT services, staff training costs, and other necessary operational costs. (\$1,820,000)	\$2,317,000	\$2,317,000	+\$497,000 Increase in funding (+\$497,000) reflects increased estimate for WCF expenses.

**International Affairs
Program Direction**

Overview

DOE's Office of International Affairs (IA) performs a combination of strategy development, coordination, execution, and support functions for international engagements of the U.S. Department of Energy. IA integrates the institutional capacity found across DOE's program elements and national laboratories – capacity in science, technology, markets, and policies – to pursue United States Government (USG) objectives on energy and national security issues. IA develops and manages DOE's energy engagements with other countries in close coordination with the Department of State and other USG agencies.

IA has primary responsibility for DOE international engagements in energy, science, and technology. IA advises the Secretary, Deputy Secretary and other DOE leadership on implementation of USG international energy and national security policies. IA leads DOE's bilateral and multilateral energy Science & Technology (S&T) cooperation activities and represents the Department in interagency processes and intergovernmental forum. IA serves a vital interagency function by informing the National Security Council, Department of State, and others on how U.S. energy security and energy relations and energy developments with other countries could impact or be affected by national security decisions.

IA leads international aspects of DOE's science, technology, R&D, and deployment mission. IA also leads efforts and represents USG energy and security interests in multilateral fora such as the G-7 Energy Ministerial, the G-20 Energy Sustainability Working Group, the Asia Pacific Economic Cooperation forum, the East Asia Summit, the Energy and Climate Partnership of the Americas (ECPA), the North American Energy Ministerial, and the North American Leaders Summit. IA also leads engagement with the International Energy Agency, the International Renewable Energy Agency, International Partnership for Energy Efficiency, and the International Energy Forum.

IA supports cooperative efforts with other government agencies to address clean energy technology and climate change issues internationally and advance clean energy technology development via research and policy. DOE cooperates with governments of other key nations, directly and through international organizations.

IA contributes to progress on high-profile initiatives, including Power Africa, Mission Innovation, the Clean Energy Ministerial (CEM), the G-20 energy working group, and critical bilateral relationships with both energy policy and technology assistance. It supports technical analysis for U.S. leadership and contributions to integrated assessment reports. Through CEM, IA is able to forge multilateral initiatives in concert with major economy partners to drive accelerated policy, standards, and market development around energy efficiency, renewables, grid integration, and energy access. In FY 2016, the United States is hosting the seventh CEM meeting. IA will be responsible for organizing and executing these events.

Highlights of the FY 2017 Budget Request

IA's FY 2017 Budget Request of \$19,107,000 is \$1,107,000 more than the FY 2016 Enacted. The FY 2017 Request will enable DOE to more fully leverage international partnerships to advance U.S. energy objectives. IA will promote greater energy security among allies and key partners in Europe, Africa, the Americas, Asia, Eurasia, and the Middle East; further encourage government actions that facilitate additional U.S. company investment and trade opportunities in emerging markets such as Africa, Eastern Europe, the Middle East, South America and Southeast Asia; strengthen multilateral clean energy collaboration with major country partners through CEM7, ECPA, and other efforts to reduce greenhouse gases and foster economic growth; support DOE's Water/Energy crosscut, a vital interest to key partners in Africa, Eurasia, the Middle East and Southeast Asia; and significantly enhance science and technology cooperation that boosts energy and environmental security and spurs innovative technological progress of the US and our key partners.

International Affairs

International Affairs/Program Direction

International Affairs
Funding (\$K)

	FY 2015 Enacted	FY 2015¹ Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
International Affairs					
Program Direction	13,000	14,800	18,000	19,107	+1,107
USAID National Labs Transfer ²	0	10,143	0	0	0
Subtotal, International Affairs	13,000	24,943	18,000	19,107	+1,107
USAID National Labs Transfer	0	-10,143	0	0	0
Total, International Affairs	13,000	14,800	18,000	19,107	+1,107
Federal FTEs	72	72	72	76	+4

¹ Funding reflects a transfer of \$500,000 from USAID for Ukraine Winter Action & Resiliency support and reprogramming of \$1,300,000 for program direction from DA programs.

² Funding reflects a transfer of \$10,143,247 from USAID to National Labs to support USAID with advisory services, technical expertise and peer review services for renewable energy development, integrated resource planning, energy efficiency initiatives and optional coal bed methane studies.

Program Direction
Funding (\$K)

	FY 2015 Enacted	FY 2015 Current¹	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
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Program Direction

Washington Headquarters

Salaries and Benefits	10,250	10,454	10,454	11,150	+696
Travel	700	700	700	1,000	+300
Support Services	0	0	2,959	3,043	+84
Other Related Expenses	2,050	3,146	3,887	3,914	+27
Ukraine Funding Transfer Support	0	500	0	0	0
Total, Program Direction	13,000	14,800	18,000	19,107	+1,107
Federal FTEs	72	72	72	76	+4

Support Services

Energy Security and Clean Energy Technology	0	0	2,371	2,445	+74
Subscriptions/Publications Services	0	0	45	55	+10
Management Support Services	0	0	221	221	0
Embassy Assistance	0	0	75	75	0
Other Support Services	0	0	247	247	0
Total, Support Services	0	0	2,959	3,043	+84

Other Related Expenses

Working Capital Fund	1,950	2,665	3,217	3,244	+27
Energy IT Services	100	481	600	600	0
Training	0	0	70	70	0
Total, Other Related Expenses	2,050	3,146	3,887	3,914	+27

¹ Funding reflects transfer of \$500,000 from USAID for Ukraine Winter Action & Resiliency support and reprogramming of \$1,300,000 for program direction from DA programs (General Counsel \$500,000; Congressional and Intergovernmental Affairs \$400,000; Economic Impact and Diversity \$200,000; and Public Affairs \$200,000).

Program Direction		
Activities and Explanation of Changes		
FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$18,000,000	\$19,107,000	+\$1,107,000
Salaries and Benefits \$10,454,000 The IA budget for salaries and benefits supports full-time equivalent staff to provide professional expertise required to execute the Office mission.	\$11,150,000	+\$696,000 Continuation of FY 2016 activities, with the addition of 4 FTEs to carry out sustained and growing international Administration & DOE commitments and maintain existing strategic engagements.
Travel \$700,000 Travel funding is used for international travel to meetings and events relevant to international energy policy, science and technology, and multilateral national security engagements.	\$1,000,000	+\$300,000 Continuation of FY 2016 activities, with additional funds to enhance energy security with partners in the Americas, Asia and Europe.
Support Services \$2,959,000 IA is the Department's lead representative in international efforts relating to energy security and clean energy. Promote U.S. company investment and trade throughout key international markets; <ul style="list-style-type: none">• Support multilateral efforts, such as the Clean Energy Ministerial and Mission Innovation, to advance science and technical expertise to accelerate clean energy deployment, encourage greater efficiency, promote grid integration and resilience, and boost economic opportunities.• Subscriptions/Publications.• Management Support – Provide administrative support services as well as service contracts to provide technical experts for critical and complex initiatives (clean energy, innovation, energy security analysis, and infrastructure resilience).	\$3,043,000	+\$84 Continuation of FY 2016 activities to support energy security and clean energy.
Other Related Expenses \$3,887,000 Funds support Working Capital Fund expenses (including overseas presence), IT Services, and staff training.	\$3,914,000	\$27,000 Continuation of FY2016 activities.
		Funding increase covers overhead costs associated with the additional FTEs.

**Public Affairs
Program Direction**

Overview

The mission of the Office of Public Affairs (PA) is to communicate information about DOE's work in a timely, accurate, and accessible way to the news media and the general public.

The Office of Public Affairs (PA) directly supports the mission of the Department and the Secretary of Energy by developing and implementing strategies for communicating the Department's message, its policies, initiatives and information to the news media and the general public. PA is also responsible for managing and coordinating public affairs activities for DOE headquarters, field offices, and DOE laboratories; serving as DOE's primary spokesperson in the news media; responding to requests for information from the public and the news media; arranging interviews with Department officials; providing speechwriting and media support services to the Secretary, Deputy Secretary and Under Secretaries; and preparing written press releases, fact sheets, electronic media and other products that communicate Departmental activities.

Through its Digital Strategy and Communications Office, PA continues to affect cost savings at the Department by consolidating website platforms, reducing duplication and improving transparency and accessibility of information. The Digital Strategy and Communications Office drives the Department's mission online via the Energy.gov website, social networking tools, blog outreach, citizen engagement tools, and other emerging online communication technologies. Digital Strategy and Communications is an innovative and growing part of our mission, as we seek to serve the public in more efficient and effective ways online. It is through our Digital Strategy Office that we are accomplishing the Administration's Open Government principles of making government more transparent, collaborative and participatory.

Highlights of the FY 2017 Budget Request

No major changes

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current ¹	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	2,485	2,285	2,339	2,517	+178
Travel	150	150	150	150	0
Support Services	90	90	90	90	0
Other Related Expenses	706	706	852	674	-178
Total, Program Direction	3,431	3,231	3,431	3,431	0
Federal FTEs	24	24	24	24	0
Support Services					
Digital Communication and website support	90	90	90	90	0
Total, Support Services	90	90	90	90	0
Other Related Expenses					
Energy IT Services	58	58	58	58	0
Working Capital Fund	648	648	794	616	-178
Total, Other Related Expenses	706	706	852	674	-178

¹ Reflects a reprogramming of \$200,000 between Public Affairs and International Affairs in FY 2015.

Departmental Administration/Public Affairs/

Program Direction

Program Direction		
Activities and Explanation of Changes		Explanation of Changes FY 2017 vs FY 2016
FY 2016 Enacted	FY 2017 Request	
Salaries and Benefits \$2,339,000	\$2,517,000	\$178,000
Provides funding for 24 full time employees. This includes the Department's team of media spokespersons, the New Media team that is managing an innovative and cost-saving effort to help upgrade the Department's digital communications and website efforts, the speechwriting team that supports the Secretary, the Deputy Secretary and other senior Department officials, and the administrative staff required to support the Department's public affairs mission.	Continuation of FY 2016 activities.	Increase due to pay increases and cost of living adjustments.
Travel \$150,000	\$150,000	\$0
Travel expenses support the office's ability to provide appropriate staffing when the Secretary and Deputy Secretary travel to public events.	Continuation of FY 2016 activities.	No change.
Support Services \$90,000	\$90,000	\$0
Support Services includes the contractors utilized to lead a cost-saving effort to help upgrade the Department's digital communications and website efforts, reducing costly duplications while improving transparency and customer service to the public.	Continuation of FY 2016 activities	No change.
Other Related Expenses \$852,000	\$674,000	-\$178,000
Funding to support Working Capital Fund (WCF) and Energy IT Services costs. WCF contribution provides for shared service cost and Departmental overhead expenses.	Continuation of FY 2016 activities.	Decrease in share of WCF estimate for FY 2017.

Project Management Oversight and Assessments

Program Direction

Overview

The Office of Project Management Oversight and Assessments (PM) was stood up on July 12, 2015, within the Office of the Under Secretary for Management and Performance. PM currently provides the Department of Energy (DOE) corporate oversight, managerial leadership and assistance in developing and implementing DOE-wide policies, procedures, programs, and management systems pertaining to project management, and manages the project management career development program for DOE's Federal Project Directors. The Office also conducts independent peer reviews of projects that are \$100,000,000 or greater in the Environmental Management (EM) portfolio, among other critical Department-wide functions. The responsibilities of the organization are functionally accomplished by the Director under the executive direction of the Under Secretary for Management and Performance.

Additionally, the Director serves as Executive Secretariat for the Department's Energy Systems Acquisition Advisory Board (ESAAB) and the Project Management Risk Committee (PMRC). In these capacities, the Director is accountable to the Deputy Secretary.

In FY 2017, PM will accomplish its mission through its program office components and associated Departmental budget lines:

- Project Assessments. Conduct independent Project Peer Reviews (PPRs) of EM capital asset projects with a Total Project Cost (TPC) of \$100,000,000 or greater.
- Project Oversight. Conduct External Independent Reviews (EIRs) that validate the project performance baselines (to include scope, cost, and schedule) of all capital asset projects with a TPC of \$100,000,000 or greater.
- Independent Cost Reviews/Estimates. Conduct independent cost reviews (ICRs) and/or prepare independent cost estimates (ICEs) at critical decisions and upon rebaselining as required by DOE Order 413.3B for capital asset projects with a TPC of \$100,000,000 or greater. All costs associated with the conduct of ICRs/ICEs, to include PM federal staff travel, will be funded by the Program Office/Project requiring the ICR/ICE.
- Earned Value Management System Certification. Conduct initial certification and periodic surveillance reviews to ensure contractor Earned Value Management Systems (EVMS) for capital asset projects comply with industry standards. All costs associated with the conduct of Reviews for Cause (RFC) and recertification of a contractor's system that had its certification withdrawn, to include PM federal staff travel, will be funded by the Program Office/Project requiring the RFC/recertification.
- Project Management Policy and Systems. Provide DOE policy, guidance and oversight for project management. Provide monthly project status report for senior leaders with independent assessments of capital asset projects with a TPC of \$10,000,000 or greater. Drive improvements in project management systems. Maintain independent central repository of all relevant project data and performance metrics.
- Professional Development. Manage the Project Management Career Development Program (PMCDP) to include the professional development, training and certification of our Federal Project Directors (FPDs). Serve as the co-chair and as Executive Secretariat for the FPD Certification Review Board.
- Energy Systems Acquisition Advisory Board (ESAAB). Serve as a member and as Secretariat of the ESAAB and the PMRC for the Deputy Secretary. The ESAAB responsibilities have been expanded. The Board will now review all capital asset projects with a TPC of \$100,000,000 (vice \$750,000,000) or greater, focusing on those projects at risk of not meeting their performance baselines, and making critical decisions for capital asset projects with a TPC of \$750,000,000 or greater. The Board will no longer be an ad hoc board, but will be a standing board, meeting at least once a quarter, if not more frequently. The ESAAB will be supported by a new committee, the PMRC, which will meet at least bi-weekly.

Highlights of the FY 2017 Budget Request

The Department requests \$18,000,000 in FY 2017 for PM. This Office will now conduct project peer reviews of EM projects that are \$100,000,000 or greater in addition to other critical Department-wide functions to include preparing independent cost estimates, performing external independent reviews to validate performance baselines, conducting earned value management system reviews, providing project management policy, guidance and oversight of all capital asset projects, overseeing the Project Management Career Development Program (PMCDP), and serving as Secretariat for the ESAAB and PMRC. PM will continue to support FY 2016 activities. PM's activities were previously funded within the Office of Management's (MA) budget, but is now requested as an independent office within the Departmental Administration account.

Program Direction
Funding (\$K)

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction					
Salaries and Benefits	4,081	4,081	5,300	6,708	+1,408
Travel	275	275	275	208	-67
Support Services	8,889	8,889	8,889	10,058	+1,169
Other Related Expenses	1,328	1,328	728	1,026	+298
Total, Program Direction	14,573	14,573	15,192	18,000	+2,808
Federal FTEs	24	24	34	37	+3
Support Services					
External Independent Reviews (EIRs)	2,203	2,203	2,203	1,872	-331
Project Assessments	500	500	500	500	0
Earned Value Management System (EVMS) Certification	429	429	429	1,929	+1,500
Project Assessment and Reporting System (PARS II)	2,000	2,000	2,000	2,000	0
Project Management Cost Estimating Improvement	3,600	3,600	3,600	3,600	0
	157	157	157		0
Other Support Services				157	
Total, Support Services	8,889	8,889	8,889	10,058	+1,169
Other Related Expenses					
Training	20	20	20	20	0
Energy IT Services	108	108	108	150	+42
Working Capital Fund (WCF)	1,200	1,200	600	856	+256
Total, Other Related Expenses	1,328	1,328	728	1,026	+298

Program Direction
Funding (\$K)

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$15,192,000	\$18,000,000	+\$2,808,000
Salaries and Benefits \$5,300,000	\$6,708,000	+\$1,408,000
Funding in support of 34 FTEs. Funding provides for salaries/benefits, overtime, lump sum leave, and performance awards.	A continuation of FY16 activities and funding to support 37 FTEs.	Funding is required to support the new function of EM Project Peer Reviews (PPRs) and increase in FTEs.
Travel \$275,000	\$208,000	-\$67,000
Funding in support of PM staff travel. Travel is necessary to support review activities (excluding ICEs, ICRs, RFC, and recertification) of program/ project activities in the field.	A continuation of FY16 activities.	Funding level supports anticipated level of travel needed.
Support Services \$8,889,000	\$10,058,000	+\$1,169,000
Funding in support of contractual requirements, including External Independent Reviews (EIRs), EVMS, PARS II, Cost Estimating/Cost Analysis; Project Assessments; and other support services..	A continuation of FY16 activities. More detail provided in following sections.	Funding is required to support the new function of EM PPRs.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
External Independent Reviews (EIRs) \$2,203,000 Finances EIRs, which provide assurance that projects can be executed at the proposed performance baseline (scope, cost, and schedule). EIRs are conducted for projects greater than \$100,000,000 for major programs and greater than \$10,000,000 for others lacking Project Management Support Offices.	External Independent Reviews (EIRs) \$1,872,000 A continuation of FY16 activities with a reduction in the projected number of reviews.	-\$331,000 Funding realigned to fully fund Earned Value Management System.
Earned Value Management System (EVMS) Certification \$429,000 Finances certification and surveillance reviews to ensure contractor EVMS comply with industry standards. Ensures contractors are EVMS compliant for capital asset projects. EVMS is an industry-accepted process to ensure that projects are completed on cost, schedule, and within scope against a baseline. EVMS enables trend analysis and evaluation of estimated cost at completion and provides a sound basis for problem identification, corrective actions, and management re-planning.	Earned Value Management System (EVMS) Certification \$1,929,000 A continuation of FY16 activities with an increase in projected surveillance reviews.	+\$1,500,000 Increase in projected surveillance reviews.
Project Assessment \$500,000 Beginning in FY 2016, the project assessment/review function for EM capital asset projects that are \$100,000,000 or greater transferred from EM to PM. Funding is required to provide independent oversight of EM capital asset projects, including activities involved with cost, schedule, technical and management status reviews of the projects.	Project Assessment \$500,000 A continuation of FY16 activities.	\$0 No change other than PM's activities were funded by MA in FY 2016.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Project Assessment and Reporting System (PARS II) \$2,000,000 PARS II is the Department's central repository for project documentation and performance reporting. It provides project status and assessment information for senior management and other stakeholders. Current funding will be used to provide operations and maintenance for the existing system. This system is critical to enable appropriate project execution oversight, accurate monthly project assessments, and recommendations for senior management decision-making.	Project Assessment and Reporting System (PARS II) \$2,000,000 A continuation of FY16 activities.	\$0 No change other than PM's activities were funded by MA in FY 2016.
Project Management Cost Estimating Improvement \$3,600,000 Funds ongoing efforts in cost estimating and schedule analysis capability; provides a standardized Work Breakdown Structure (WBS) cost and schedule data extractor; provides for an Information Technology (IT) tool that automates schedule integrity and critical path analysis. Funds continuing education and professional development courses such as project controls, cost estimating and schedule analysis. Enables the enhancement of the Department's project assessment and reporting system to provide data-driven cost analysis capabilities and schedule analysis functionality.	Project Management Cost Estimating Improvement \$3,600,000 A continuation of FY16 activities.	\$0 No change other than PM's activities were funded by MA in FY2016.
Other Support Services \$157,000 Other related expenses to cover training, workshops, and other services.	Other Support Services \$157,000 Other related expenses to cover training, workshops, and other services.	\$0 No change other than PM's activities were funded by MA in FY 2016.
Other Related Expenses \$728,000 Other related expenses to cover Energy IT Services (EITS), Working Capital Fund (WCF) and other services.	Other Related Expenses \$1,026,000 Other related expenses to cover Energy IT Services (EITS), Working Capital Fund (WCF) and other services.	+\$298,000 Funding is required to cover anticipated increases to the WCF.

**Cost Estimating and Program Evaluation-DOE
Program Direction**

Overview

The 2017 Budget proposes to establish a statutory, DOE-wide Office of Cost Estimating and Program Evaluation (CEPE-DOE) in recognition of a gap in DOE's capacity to independently determine accurate costs of programs and acquisitions within DOE.

This proposal advances the Secretary's ongoing efforts to improve DOE project management, a key component of which is to adopt best practices equivalent to those implemented by the Department of Defense (DOD). Legislation will be provided modeled on the authorities, responsibilities, requirements and accountability of the DOD Cost Assessment and Program Evaluation (CAPE).

This proposal also complements, but is not duplicative of, NNSA's Office of Cost Estimating and Program Evaluation (CEPE) established by the 2014 National Defense Authorization Act (50 USC 2411). CEPE-DOE will provide independent analytic advice on all aspects of DOE programs, including cost-effectiveness, and the development and evaluation of program alternatives. CEPE-DOE will develop cost estimating policy and practices, provide timely and unbiased analysis and perform independent cost estimation for the Department. CEPE-DOE will ensure that the Department's cost estimation and cost analysis processes provide accurate information and realistic estimates of cost for the Department's programs and acquisitions.

This new function would report to the Office of the Secretary to ensure consistent policy, procedures and practices across the Department, formalize program management practices for cost estimation and review to improve outcomes, accountability and efficiency. It would serve as the single agency point of contact on all matters related to cost estimation, program evaluation and management.

As an independent advisor to the Office of the Secretary, the head of CEPE-DOE would lead analyses to answer the critical questions needed to shape and implement the Secretary of Energy's priorities and direction. Toward that end, CEPE-DOE would lead the necessary and challenging task of optimizing the energy portfolio to meet the goals and objectives set for the Department by the President and Congress.

Highlights of the FY 2017 Budget Request

The Department requests \$5,000,000 in FY 2017 for CEPE-DOE to build the organizational structure, staff, analytical methods, and data for cost analysis and program evaluation to make these assessments more efficient, effective, and accurate.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Washington Headquarters					
Salaries and Benefits	0	0	0	3,600	+3,600
Travel	0	0	0	200	+200
Support Services	0	0	0	210	+210
Other Related Expenses	0	0	0	990	+990
Total, Program	0	0	0	5,000	+5,000
Federal FTEs	0	0	0	18	+18
Support Services					
Cost Estimating	0	0	0	210	+210
Other Support Services	0	0	0	0	+0
Total, Support Services	0	0	0	210	+210
Other Related Expenses					
Training	0	0	0	30	+30
Energy IT Services	0	0	0	60	+60
Working Capital Fund (WCF)	0	0	0	900	+900
Total, Other Related Expenses	0	0	0	990	+990

Program Direction Funding (\$K)		
Activities and Explanation of Changes		
FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$0	\$5,000,000	+\$5,000,000
Salaries and Benefits \$0	\$3,600,000	+\$3,600,000
No request. Office not established.	Funding in support of 18 FTEs. Funding provides for salaries/benefits, overtime, lump sum leave, and performance awards.	Funding is required to support the newly established CEPE-DOE.
Travel \$0	\$200,000	+\$200,000
No request. Office not established.	Funding in support of CEPE-DOE staff travel. Travel is necessary to support review activities of program activities in the field.	Funding is required to support the travel of newly established CEPE-DOE.
Support Services \$0	\$210,000	+\$210,000
Cost Estimating \$0	Cost Estimating \$210,000	Funding is required to support the newly established CEPE-DOE.
No request. Office not established.	Funding is required to provide independent oversight of DOE's programs and acquisitions.	
Other Related Expenses \$0	\$990,000	+\$990,000
No request. Office not established.	Other related expenses to cover Energy IT Services (EITS), Working Capital Fund (WCF), training, workshops, and other services.	Funding is required to support the newly established CEPE-DOE.

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Departmental Administration			
Chicago Operations Office			
Cost of Work for Others			
Cost of Work for Others	400	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	200	13,200
Total, Chicago Operations Office	400	200	13,200
Idaho Operations Office			
Cost of Work for Others			
Cost of Work for Others	1,000	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	1,000	1,000
Total, Idaho Operations Office	1,000	1,000	1,000
Lawrence Berkeley National Laboratory			
Cost of Work for Others			
Cost of Work for Others	1,392	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	4,634	1,415
Total, Lawrence Berkeley National Laboratory	1,392	4,634	1,415
National Energy Technology Lab			
Chief Financial Officer			
Program Direction	285	285	285
Cost of Work for Others			
Cost of Work for Others	150	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	150	100
Total, National Energy Technology Lab	435	435	385
National Renewable Energy Laboratory			
Cost of Work for Others			
Cost of Work for Others	360	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	510	200
Total, National Renewable Energy Laboratory	360	510	200
New Brunswick Laboratory			
Cost of Work for Others			
Cost of Work for Others	0	0	0
Total, New Brunswick Laboratory	0	0	0

Department Of Energy
FY 2017 Congressional Budget
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(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Departmental Administration			
NNSA Albuquerque Complex			
Chief Information Officer			
Cybersecurity and Secure Management	2,700	0	0
Cost of Work for Others			
Cost of Work for Others	9,330	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	6,630	7,221
Total, NNSA Albuquerque Complex	12,030	6,630	7,221
Oak Ridge National Laboratory			
Cost of Work for Others			
Cost of Work for Others	14,768	0	0
Total, Oak Ridge National Laboratory	14,768	0	0
Oak Ridge Office			
Strategic Partnership Projects			
Strategic Partnership Projects	0	8,968	7,567
Total, Oak Ridge Office	0	8,968	7,567
Pacific Northwest National Laboratory			
Cost of Work for Others			
Cost of Work for Others	9,000	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	10,000	10,000
Total, Pacific Northwest National Laboratory	9,000	10,000	10,000
Richland Operations Office			
Chief Information Officer			
Cybersecurity and Secure Management	5,900	0	0
Cost of Work for Others			
Cost of Work for Others	100	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	100	100
Total, Richland Operations Office	6,000	100	100
Savannah River Operations Office			
Cost of Work for Others			
Cost of Work for Others	5,500	0	0
Strategic Partnership Projects			
Strategic Partnership Projects	0	6,700	6,700
Total, Savannah River Operations Office	5,500	6,700	6,700

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Departmental Administration			
Washington Headquarters			
Chief Financial Officer			
Program Direction	46,715	46,739	52,799
Chief Information Officer			
Program Direction	33,188	31,988	35,770
Digital Service Team - CIO	0	0	4,000
Cybersecurity and Secure Management	12,764	21,006	20,026
Corporate IT Program Support	19,612	20,224	33,278
Total, Chief Information Officer	65,564	73,218	93,074
Congressional, and Intergovernmental Affairs			
Program Direction	5,846	6,300	6,200
Economic Impact & Diversity			
Program Direction	8,800	10,000	11,319
Energy Policy and Systems Analysis			
Energy Policy and Systems Analysis	31,181	31,297	31,000
General Counsel			
Program Direction	32,554	33,000	33,000
International Affairs			
Program Direction	24,943	18,000	19,107
Program Direction			
Program Direction	24,500	24,500	25,424
Management			
Program Direction	62,946	65,000	59,114
Small and Disadvantaged Business Utilization			
Program Direction	2,253	3,000	3,300
Energy Jobs Development			
Energy Jobs Development	0	0	3,700
Office of the Secretary			
Program Direction	5,008	5,008	5,300
Public Affairs			
Program Direction	3,231	3,431	3,431
Strategic Partnership Projects			
Strategic Partnership Projects	0	1,108	0
Total, Washington Headquarters	313,541	320,601	346,768
Total, Departmental Administration	364,426	359,778	394,556

Inspector General

Inspector General

**Office of Inspector General
Proposed Appropriation Language**

For necessary expenses of the Office of Inspector General in carrying out the provisions of the Inspector General Act of 1978, [~~\$46,424,000~~] \$44,424,000 to remain available until September 30, [2017]2018.

Explanation of Changes

No change.

Public Law Authorizations

- Public Law 103-356, "Government Management Reform Act (GMRA) of 1994"
- Public Law 106-531, "Reports Consolidation Act of 2000"
- Public Law 107-347, "Federal Information Security Modernization Act (FISMA) of 2014"
- Public Law 111-5, "American Recovery & Reinvestment Act (ARRA) of 2009"
- Public Law 112-194, "Government Charge Card Abuse Prevention Act of 2012"
- Public Law 112-199, "Whistleblower Protection Enhancement Act of 2012"
- Public Law 112-239, "National Defense Authorization Act for Fiscal Year 2013"

Office of Inspector General (\$K)			
FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
40,500	40,500	46,424	44,424

Overview

The Office of the Inspector General is dedicated to its mission to strengthen the integrity, economy and efficiency of the Department's programs and operations. The OIG is able to accomplish its mission effectively, in part, because it has the authority to inquire into all Department programs and activities as well as the related activities of persons or parties associated with Department grants, contracts, or other agreements. As a result of its work, the OIG has consistently provided a positive return on its investment. The Office of Inspector General's (OIG's) average Return on Investment (ROI) is \$12.92 for every dollar appropriated.

The OIG focuses its efforts to enhance the efficiency and effectiveness of the 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 \$3,500,000,000 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 \$6,378,491,000, including the \$690,000,000 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 \$24,000,000,000 in contracts.
- **Recovery Act.** The Department awarded \$30,000,000,000 under the Recovery Act and the OIG continues to expend resources to ensure that the funds were used appropriately.

Highlights of the FY 2017 Budget Request

The requested level for FY 2017 will ensure that the OIG can continue to operate at current levels and review the Department's efforts in the following critical areas:

- Project management;
- Cybersecurity;
- Nuclear life extension projects;
- Weapons complex modernization efforts; and
- Cost reduction efforts.

	Program Direction Funding (\$K)				
	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Program Direction Summary					
Washington Headquarters					
Salaries and Benefits	40,690	40,690	37,963	41,094	+3,131
Travel	1,690	1,690	1,690	1,706	+16
Support Services	758	758	765	500	-265
Other Related Expenses	7,150	7,150	6,006	5,392	-614
Subtotal, Program Direction	50,288	50,288	46,424	48,692	+2,268
Use of Prior Year Balances	-9,788	-9,788	0	-4,268	-4,268
Total, Program Direction	40,500	40,500	46,424	44,424	-2,000
Federal FTEs	279	279	279	279	0
Support Services and Other Related Expenses					
Support Services					
Management Support	758	758	765	500	-265
Federal Information Security Modernization Act (FISMA)					
Total, Support Services	758	758	765	500	-265
Other Related Expenses					
Council of the Inspectors General on Integrity and Efficiency (CIGIE)	423	423	125	135	+10
Information Technology	1,543	1,543	1,000	600	-400
Training	420	420	420	555	+135
Working Capital Fund	3,090	3,090	3,172	3,166	-6
Other Related Expenses	1,674	1,674	1,289	936	-353
Total, Other Related Expenses	7,150	7,150	6,006	5,392	-614

Program Direction

Activities and Explanation of Changes

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
Program Direction \$46,424,000	\$44,424,000	-\$2,000,000
Salaries and Benefits \$37,963,000	\$41,094,000	+\$3,131,000
Funding supports Federal staff with specialized skill sets (e.g., Certified Public Accountants, Technology Crime Investigators, Certified Fraud Examiners) who identify significant Departmental program and operational challenges.	Continue to identify significant Departmental challenges.	The funding increase reflects the OIG goal to increase its FTE usage to authorized levels and to perform a portion of the required FISMA work using OIG FTEs rather than contractors. OIG will use a risk-based approach to focus resources on areas within DOE that have the greatest impact on the security and prosperity of the country.
Travel \$1,690,000	\$1,706,000	+\$16,000
Funding supports travel to provide oversight at DOE's 25 geographically dispersed facilities.	Continue to perform audit, inspections, and investigations across the DOE complex.	The funding increase reflects the rising cost of travel and is sufficient to maintain current levels of operations.
Support Services \$765,000	\$500,000	-\$265,000
Funding supports required FISMA work for DOE and FERC.	Continue performing FISMA work for DOE and FERC.	The funding decrease reflects an OIG decision to perform a portion of the FISMA work using OIG FTEs.
Other Related Expenses \$6,006,000	\$5,392,000	-\$614,000
This funding includes training, which is critical for OIG staff to maintain required levels of proficiency and comply with the Inspector General Act. Funding also supports forensic hardware and software requirements needed to accomplish investigative responsibilities. Funds are included for mandatory support for Council of the CIGIE and to fund OIG's share of the DOE Working Capital Fund and Energy IT Services.	Continue to support training, information technology needs, and other requirements in the performance of OIG duties.	The funding decrease reflects a decrease in CIGIE support and Energy IT Services costs. The OIG expects to have sufficient funds to support the training efforts of 279 FTE.

Department Of Energy
FY 2017 Congressional Budget
Funding By Appropriation By Site

(\$K)

Office of the Inspector General

Washington Headquarters

Office of the Inspector General

Office of the Inspector General

Total, Washington Headquarters

Total, Office of the Inspector General

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
Office of the Inspector General	40,500	46,424	44,424
Total, Washington Headquarters	40,500	46,424	44,424
Total, Office of the Inspector General	40,500	46,424	44,424

Working Capital Fund

Working Capital Fund

**Working Capital Fund
Program Mission**

(\$K)		
FY 2015 Current	FY 2016 Estimate	FY 2017 Estimate
288,056	281,534	300,882

The Working Capital Fund (WCF or Fund) is a financial management tool for improving the financing and delivery of a range of common administrative services. Service delivery is assigned to business-line service managers; financial responsibility resides in a Fund Manager and individual Business-line Managers are responsible for billing and funds control. The Fund creates a framework for business-like organization of support functions and market-like incentives for both customers and suppliers. The objectives of the Fund include:

- Improve the efficiency of administrative services by providing managers with the opportunity and responsibility to make choices on the amount, priority, and sources of administrative services used by their programs;
- Ensure that program mission budgets include a fair allocation of the costs of common administrative services; and
- Expand the flexibility of the Department's budget structure to permit service providers to respond to customer needs.

Fund businesses maintain performance-based plans that inform the budget and alert the Fund Manager of the need to change pricing policies. Each quarter the Fund Manager reviews financial and business performance. These reviews culminate in an Annual Report that includes analysis of financial measures, including each business' performance against its standards.

This budget charges full cost recovery for each business in its budget and program billings. Full costs in Fund prices improve cost accounting for WCF activities, support improved decision-making for business-line operations and program spending, and allow the Fund Manager to benchmark against other federal agency equivalent costs. Good budgeting practice incorporates-full costing, as laid out in OMB Circular A-94, to promote efficient resource allocation through well-informed decision-making, that incorporates societal costs and benefits, by the Federal Government

This information will allow the Department to improve the efficiency of WCF service offerings. The Fund Manager has created controls to satisfy oversight requirements, including regular budget reports on spending. This is consistent with other agency WCFs and satisfies the need to recover costs in reimbursable activities.

WCF Business-line Accomplishments

WCF operations are valued by customers, serve the Department, and remain within the fiscal and policy guidelines established by the Department and by Congressional Committees. The Fund experienced an under-recovery of -\$4,600,000 for its FY 2015 operations; and, for the first 19 years of operations reported a positive result of \$43,400,000 (1.8% of customer billings). Although net earnings for individual business-lines have fluctuated between positive and negative net position over the years, DOE is achieving its goal of sustained break-even operations.

The Department continues to examine ways to use the Fund to gain greater management efficiencies. The Fund has reported efficiency and effectiveness performance metrics since its inception and documents continuous improvement efforts to provide program customers with the best goods and services possible in accordance with other statutory requirements. Performance baselines include data recorded before the inception of the Fund. In addition to specific goals, the businesses describe strategies to improve resource utilization and accomplish objectives.

The Fund continues to help Departmental management with emerging priorities such as financing cybersecurity; DOE's procurement system; corporate business systems, the DOE-wide area network and cloud services; building modernization and safety improvements; project management training; computer-based learning; and the shift away from paper intensive

systems. At the same time, the Fund has allowed businesses to close, including the Executive Information System and Desktop businesses.

Other accomplishments include:

- Building Business:
 - Completed a Utility Energy Services Contract (UESC) Feasibility Study in FY 2015 for the DOE HQ Germantown Facility. The Feasibility Study is a required milestone in the formal UESC process. The study identified and analyzed multiple initiatives that will not only save energy but also greatly improve facility operations and/or maintenance activities. These measures include replacing the Germantown boiler plant, recommissioning the air handling system, replacing interior and exterior lighting with LED lights, and others. The completed Feasibility Study serves as the scope and investment grade audit for designing and constructing these measures which are expected to begin in FY 2016.
- Telecommunication Business:
 - Trusted Internet Connectivity (Internet) Availability at 99.0%
 - Wide Area Network (DOEnet) Availability at 99.9%
 - Metropolitan Network (Germantown – Forrestal) Availability at 99.5%
 - Local Area Network (within buildings) Availability at 99.5%
 - Remote Access Availability (Workplace/VDI) at 99.5%
 - Availability results take into account planned outages and outages that are beyond EITS control (carrier outages).
- Corporate Business Systems (formerly iManage) Business:
 - Uptime - 95% (Met)
 - STARS - Month-end closing by 3rd workday (Met); 98% of invoices paid on time - (Met)
 - STRIPES – Average cost associated with handling Tier 1 help desk incidents is less than \$88/ticket (Met)
 - STARS/STRIPES – Internal Controls Statement of Assurance with no material issues (Met)
 - STARS – Unqualified Audit Opinion (Met)
- Procurement Management:
 - Contract Closeout – Retired 100% of targeted instruments
 - Data Mining – Data Mined 100% of purchase card transactions through Intellilink's programmed analytics to flag questionable transactions. Through the programmed analytics, success is measured by DOE receiving little to no findings of fraud, misuse, or abuse during program reviews. At no cost to DOE, created two new rules for analytics. The first rule detects all purchases made online, and the second detects any transaction that may be related to services.
 - Participating in DCAA Low Risk Incurred Cost Initiative aimed at reducing the backlog of audits of contractors and subcontractors under DOE prime contracts. Reduced backlog of audits identified as priority by DOE field sites in FY 2015 by 30 percent. Through the use of Interagency Agreements, provided audit support such as provisional billing rates, financial capability determinations, contractor's business systems, incurred costs claims, cost accounting standards compliances, forward pricing rate agreements, progress payments and establishing final indirect rates.
- Project Management Career Development Program (PMCDP):
 - PMCDP supports 330 federal project directors to attain and maintain certifications by delivering 34 classroom training and development opportunities. To increase training delivery and reduce travel costs, the Program converted 25% of its training to delivery platforms that were online training or virtual delivery to the desktop.

Working Capital Fund: Business-line Budgets

Table 1 summarizes projected customer billings by business-line. These billings are the result of established pricing policies, which, together with service level agreements, provide the basis for programs to manage their utilization of the WCF and control their budgets. FY 2017 guidance from the Chief Financial Officer (CFO) is that program office customers may utilize Program funding (as available and appropriate) for costs related to the CyberOne Business-line and the DCAA Audits

segment (under the Procurement Management Business-line); Program Direction funding is to be utilized for all other WCF business-lines and segments. Changes to WCF business-line amounts compared to the FY 2016 submission total \$19,347,000 due to: increases in Corporate Business Systems (formerly iManage) (+\$9,509,000), Building Occupancy (+\$4,581,000), Interagency Transfers (+\$4,400,000) Printing and Graphics (+\$905,000) Supplies (+\$824,000), Copy Services (+\$537,000), Telecommunications (+\$458,000) and other (+\$455,000); offset by decreases in Procurement Management (-\$1,981,000), Corporate Training Services (-\$268,000 million) and other (-\$73,000). Table 2 summarizes projected customer billings by business-line and by customer program office. Further descriptions of these changes are included in the individual business-line sections that follow.

Table 1
Working Capital Fund Budget Business-lines^a
($\$K$)

	FY 2015 Current	FY 2016 Estimate	FY 2017 Estimate
A-123/Internal Controls (Financial Reporting Control Assessment)	1,692	1,674	1,673
Building Occupancy	102,081	102,535	107,116
Copy Services	3,490	3,541	4,078
Corporate Business Systems (formerly iManage)	38,368	38,424	47,933
Corporate Training Services	3,373	3,367	3,099
CyberOne	40,000	32,980	32,981
Financial Statement Audits	11,759	11,767	12,185
Health Services	1,700	1,700	1,700
Interagency Transfers	6,000	6,500	10,900
Mail and Transportation Services	4,145	4,204	4,146
Overseas Presence	16,855	16,402	16,388
Pension Studies	600	710	735
Printing and Graphics	4,284	3,623	4,528
Procurement Management	17,934	18,294	16,313
Project Management Career Development Program (PMCDP)	1,627	1,621	1,632
Supplies	2,437	2,436	3,260
Telecommunications	31,710	31,756	32,214
Total, Working Capital Fund	288,055	281,534	300,882

^aNumbers may not add due to rounding.

Table 2
Working Capital Fund Budget Business-lines by Customer Program Office^a
(\$K)

ORG CODE	A-123/INT CNTRL	BLDG OCCUP	COPY SVCS	CORPORATE BUSINESS SYSTEMS (INMANAGE)	CORP TRNG SVCS	CYBERONE	FIN STMT AUDITS	HEALTH SVCS	INTER-AGENCY TRANS	MAIL & TRANSP	OVERSEAS PRESENCE	PENSION STUDIES	PMCDP	PRINT & GRAPH	PROC MGMT	SUPPLY	TELECOM	TOTAL ALL ACTIVITIES	
AR	\$ 17	\$ 3,197	\$ 33	\$ 444	\$ 6	\$ 344	\$ 127	\$ 13	\$ 76	\$ 22	\$ -	\$ -	\$ -	\$ 18	\$ 31	\$ 0	\$ 419	\$ 4,749	
AU	\$ 11	\$ 8,015	\$ 496	\$ 502	\$ 142	\$ 218	\$ 81	\$ 79	\$ 103	\$ 177	\$ -	\$ -	\$ 2	\$ 74	\$ 51	\$ 223	\$ 1,312	\$ 11,485	
BPA	\$ -	\$ 118	\$ -	\$ 80	\$ 448	\$ -	\$ -	\$ 89	\$ 228	\$ 22	\$ -	\$ -	\$ -	\$ 5	\$ -	\$ 1	\$ 59	\$ 1,051	
CF	\$ 3	\$ 4,106	\$ 135	\$ 474	\$ 47	\$ 56	\$ 21	\$ 56	\$ 29	\$ 108	\$ -	\$ -	\$ -	\$ 120	\$ 26	\$ 92	\$ 981	\$ 6,254	
CI	\$ 0	\$ 643	\$ 9	\$ 47	\$ 6	\$ 6	\$ 2	\$ 10	\$ 2	\$ 47	\$ -	\$ -	\$ -	\$ 14	\$ -	\$ 15	\$ 127	\$ 928	
EA	\$ 4	\$ 1,918	\$ 44	\$ 163	\$ 41	\$ 79	\$ 29	\$ 23	\$ 31	\$ 72	\$ -	\$ -	\$ -	\$ 24	\$ 7	\$ 59	\$ 224	\$ 2,719	
ED	\$ 1	\$ 576	\$ 78	\$ 74	\$ 3	\$ 10	\$ 4	\$ 7	\$ 4	\$ 45	\$ -	\$ -	\$ -	\$ 53	\$ 10	\$ 21	\$ 196	\$ 1,083	
EE	\$ 127	\$ 11,246	\$ 507	\$ 3,758	\$ 157	\$ 2,511	\$ 928	\$ 130	\$ 565	\$ 356	\$ 655	\$ 16	\$ 26	\$ 2,098	\$ 997	\$ 444	\$ 3,805	\$ 28,326	
EI	\$ 7	\$ 7,296	\$ 123	\$ 816	\$ 117	\$ 142	\$ 52	\$ 115	\$ 50	\$ 132	\$ -	\$ -	\$ -	\$ 85	\$ 58	\$ 112	\$ 762	\$ 9,868	
EM	\$ 345	\$ 7,139	\$ 338	\$ 8,688	\$ 280	\$ 6,805	\$ 2,514	\$ 128	\$ 2,033	\$ 199	\$ 328	\$ 125	\$ 758	\$ 164	\$ 5,107	\$ 270	\$ 2,099	\$ 37,318	
EPSA	\$ 2	\$ 1,176	\$ 45	\$ 132	\$ 8	\$ 33	\$ 12	\$ 16	\$ 9	\$ 62	\$ -	\$ -	\$ -	\$ 46	\$ 5	\$ 59	\$ 311	\$ 1,917	
FE	\$ 47	\$ 3,192	\$ 91	\$ 2,491	\$ 253	\$ 934	\$ 345	\$ 62	\$ 300	\$ 126	\$ 328	\$ -	\$ 71	\$ 125	\$ 1,676	\$ 112	\$ 1,372	\$ 11,527	
GC	\$ 2	\$ 4,516	\$ 170	\$ 360	\$ 42	\$ 37	\$ 14	\$ 58	\$ 18	\$ 71	\$ -	\$ -	\$ -	\$ 161	\$ 5	\$ 104	\$ 797	\$ 6,356	
HC	\$ 1	\$ 2,160	\$ 75	\$ 299	\$ 51	\$ 29	\$ 11	\$ 42	\$ 15	\$ 95	\$ -	\$ -	\$ -	\$ 113	\$ 21	\$ 68	\$ 677	\$ 3,656	
HG	\$ 0	\$ 1,069	\$ 15	\$ 93	\$ 3	\$ 6	\$ 2	\$ 6	\$ 2	\$ 29	\$ -	\$ -	\$ -	\$ 49	\$ -	\$ 6	\$ 75	\$ 1,355	
IA	\$ 1	\$ 1,506	\$ 34	\$ 128	\$ 29	\$ 20	\$ 8	\$ 24	\$ 11	\$ 73	\$ 655	\$ -	\$ -	\$ 41	\$ 8	\$ 47	\$ 654	\$ 3,238	
IE	\$ 1	\$ 97	\$ 5	\$ 17	\$ 3	\$ 15	\$ 6	\$ 1	\$ 3	\$ 19	\$ -	\$ -	\$ -	\$ 5	\$ -	\$ 12	\$ 25	\$ 208	
IG	\$ 3	\$ 2,006	\$ 23	\$ 350	\$ 52	\$ 50	\$ 19	\$ 35	\$ 26	\$ 78	\$ -	\$ -	\$ -	\$ 29	\$ 6	\$ 45	\$ 374	\$ 3,096	
IM	\$ 5	\$ 6,138	\$ 144	\$ 404	\$ 73	\$ 92	\$ 34	\$ 36	\$ 58	\$ 232	\$ -	\$ -	\$ 2	\$ 60	\$ 34	\$ 187	\$ 2,713	\$ 10,211	
SSA	\$ 12	\$ 4,901	\$ 83	\$ 640	\$ 142	\$ 244	\$ 90	\$ 51	\$ 65	\$ 250	\$ -	\$ -	\$ -	\$ 2	\$ 55	\$ 8	\$ 154	\$ 680	\$ 7,375
LM	\$ 10	\$ 402	\$ 13	\$ 269	\$ 11	\$ 201	\$ 74	\$ 7	\$ 53	\$ 21	\$ -	\$ 31	\$ 23	\$ 21	\$ 26	\$ 23	\$ 576	\$ 1,762	
LP	\$ 1	\$ 2,359	\$ 67	\$ 189	\$ 30	\$ 20	\$ 7	\$ 28	\$ 14	\$ 120	\$ -	\$ -	\$ -	\$ 51	\$ -	\$ 67	\$ 555	\$ 3,509	
MA	\$ 4	\$ 5,782	\$ 262	\$ 681	\$ 103	\$ 76	\$ 28	\$ 82	\$ 60	\$ 372	\$ -	\$ -	\$ -	\$ 259	\$ 264	\$ 183	\$ 1,583	\$ 9,739	
NA	\$ 620	\$ 14,719	\$ 883	\$ 13,518	\$ 443	\$ 12,226	\$ 4,517	\$ 242	\$ 4,658	\$ 713	\$ 11,333	\$ 487	\$ 368	\$ 332	\$ 3,592	\$ 460	\$ 7,902	\$ 77,012	
NE	\$ 52	\$ 2,293	\$ 53	\$ 1,500	\$ 115	\$ 1,018	\$ 376	\$ 60	\$ 410	\$ 85	\$ 2,434	\$ 11	\$ 101	\$ 65	\$ 68	\$ 90	\$ 844	\$ 9,575	
NR	\$ 73	\$ -	\$ -	\$ 1,223	\$ 35	\$ 1,442	\$ 533	\$ 35	\$ 297	\$ 1	\$ -	\$ -	\$ -	\$ 3	\$ -	\$ 77	\$ 3,718		
OE	\$ 11	\$ 1,938	\$ 65	\$ 522	\$ 24	\$ 218	\$ 81	\$ 31	\$ 52	\$ 90	\$ 328	\$ -	\$ -	\$ 99	\$ 6	\$ 73	\$ 468	\$ 4,006	
PA	\$ 0	\$ 361	\$ 31	\$ 61	\$ 3	\$ 4	\$ 2	\$ 7	\$ 2	\$ 21	\$ -	\$ -	\$ -	\$ 46	\$ 3	\$ 14	\$ 118	\$ 674	
S	\$ 0	\$ 1,498	\$ 146	\$ 53	\$ 8	\$ 6	\$ 2	\$ 14	\$ 3	\$ 286	\$ -	\$ -	\$ -	\$ 114	\$ -	\$ 76	\$ 438	\$ 2,644	
SB	\$ 0	\$ 130	\$ 25	\$ 25	\$ 1	\$ 3	\$ 1	\$ 2	\$ 1	\$ 27	\$ -	\$ -	\$ -	\$ 10	\$ -	\$ 8	\$ 33	\$ 267	
SC	\$ 306	\$ 6,508	\$ 85	\$ 7,725	\$ 196	\$ 6,039	\$ 2,231	\$ 166	\$ 1,590	\$ 182	\$ 328	\$ 64	\$ 273	\$ 109	\$ 4,259	\$ 236	\$ 1,596	\$ 31,893	
WAPA	\$ 5	\$ 113	\$ -	\$ 2,209	\$ 226	\$ 96	\$ 36	\$ 45	\$ 128	\$ 15	\$ -	\$ -	\$ -	\$ 5	\$ 80	\$ 43	\$ 1	\$ 363	\$ 3,364
TOTAL	\$ 1,673	\$107,116	\$ 4,078	\$ 47,933	\$ 3,099	\$ 32,981	\$ 12,185	\$ 1,700	\$10,900	\$ 4,146	\$ 16,388	\$ 735	\$ 1,632	\$ 4,528	\$16,313	\$ 3,260	\$ 32,214	\$ 300,882	

The following section includes a description of each business-line, along with pricing policy and selected performance measures.

A-123/Internal Controls (formally Financial Reporting Control Assessment)

Description

The OMB Circular A-123, *Management's Responsibility for Internal Control* and Federal Managers' Financial Integrity Act (FMFIA), define management's responsibility for internal control and include guidance for management to assess the effectiveness of internal control.

Financial Reporting Control Assessment will ensure the Department meets the intent of the Congress and the Executive Branch for internal control of financial reporting and has appropriate support for the Secretary's annual assurance statement, included as part of the Agency Financial Report. Because the requirements of OMB Circular A-123 apply to the Agency as a whole, each benefiting program must share the cost. In addition, DOE pricing policy incorporates the full costing requirements laid out in OMB Circular A-94 to promote efficient resource allocation through well-informed decision-making by the Federal Government for evaluating societal costs and benefits.

In order to support these goals, the business-line will develop, provide, and maintain the capabilities needed to implement a comprehensive Department-wide evaluation of internal controls over financial reporting. The technical support resources to maintain and support the evaluation data collection tools are currently not fully available in-house. Furthermore, the Department's internal controls over financial reporting are examined during our yearly external Financial Statement audit, requiring as-needed technical support to document some Financial Statement related internal control processes with DOE-wide impact.

Pricing Policy

The A-123/Internal Controls (formerly Financial Reporting Control Assessment) charges customers a pro rata allocation of costs based on percentage share of three prior fiscal years' combined budget shares, using the Congressional request of the most recent year. FY 2017 estimates reflect the three years (FYs 2014-2016) in the Department's FY 2016 Budget request to Congress. Departmental programs that use proprietary financial systems, for example, Federal Energy Regulatory Commission (FERC) and the Power Marketing Administrations (PMA's) will be excluded from billing for this business.

Building Occupancy

Description

The core services in the Building Occupancy Business-line include space management (rent), utilities such as heat and electricity, cleaning services, snow removal, facility operation and preventive and restorative maintenance, pest control, trash removal, and waste recycling. Engineering and facilities services include drafting of construction documents, developing scopes of work, construction management and inspection, value engineering, leasehold administration, lock repair and key management, safety and occupational health, moving and warehousing services, and conference support. This business also provides electronic services, which involve audio/visual meeting and conferencing support, as well as repair and maintenance of Headquarters radio communications and electronic equipment. Approved improvements to the Headquarters complex are also included.

Pricing Policy

Policy is based on direct costs and allocations in the following manner:

- Each year, organizations sign occupancy agreements that define the space to be assigned to them.
- On a building-by-building basis, direct rental value of the space assigned to each organization is calculated, based on rent charged to the Department by the General Services Administration (GSA). Customer rent costs are based on areas assigned to each organization at the start of each fiscal year.
- Common use space costs in each building are divided among the tenants of that building based on their proportional shares of direct rental costs.
- Certain additional costs, such as common area improvements and health and life safety programs, are allocated as a pro rata addition to the building-by-building charges described above.
- Electronic Services charges are allocated according to direct building occupancy costs.
- In addition, tenants may arrange, at their own cost, alterations of office space.
- Charges related to property management are allocated based on program usage during the prior fiscal year.
- FY 2017 estimates reflect historical costs for utilities as well as information provided by GSA as to the anticipated rent for future years, and projections of space usage in future years based on input from customer organizations, historical information, space availability, and Departmental objectives.

Budget increase is attributed to increases in fuel, utilities and GSA rent charges.

Copy Services

Description

This business provides the following services:

- Staffed photocopy centers at Forrestal and Germantown capable of reproducing 25,000 impressions per document;
- Centralized (walk-up) photocopy rooms;
- Dedicated (customer-assigned) photocopiers, including needs assessment analysis to determine workload and most appropriate equipment;
- Digital document management, including optical scanning of paper copy documents and storage on disk; and
- Digital news clips to programs based on subscriptions. (Note: News clips were previously provided as hard-copy documents prepared in the copy business.)

In FY 1996, before creation of the Fund, DOE Headquarters made over 100 million copies. The number of copies declined rapidly after creation of the Fund and has continued to decline. Currently, DOE Headquarters photocopies at an annual rate of 16 million copies.

Pricing Policy

Each office pays the full cost to maintain and supply its assigned dedicated photocopiers. For walk-up and staffed photocopiers, a cost per photocopy is calculated and programs are charged based on the number of photocopies made by program staff. The digitization pricing policy is to charge on a per-page basis to cover the costs of this business segment. FY 2017 estimates reflect amounts based on usage from the year prior to formulation (FY 2014).

Budget increase is attributed to demand of dedicated (customer-assigned) network photocopiers/printers (customers are reducing desktop printers).

Corporate Business Systems (formerly iManage)

Description

Corporate Business Systems (CBS) is the Department's solution for managing enterprise-wide systems and data. CBS is consolidating and streamlining Department-wide systems and business processes to integrate financial, budgetary, procurement, personnel, program, and performance information. CBS is supported at the core by a central data warehouse/portal that links common data elements from each of the Department's business systems and supports both external and internal reporting.

Consolidation of Payroll and CHRIS businesses into CBS was approved in 2008. Consolidation provides efficiencies in its administration and result in a single, senior business manager.

Standard Accounting and Reporting System (STARS) Segment provides the Department with a modern, comprehensive, and responsive financial management system that records and processes accounting transactions for general accounting, payments, receivables, purchasing including obligations and reservations, accruals, plant and capital equipment, nuclear materials accounting, and many other functions. STARS is also used for financial reporting including GTAS, Standard Form (SF) 220.9, SF 224, and the Department's financial statements. Costs include all operations and maintenance support, including the Chief Information Officer's Application Hosting and annual Oracle Software licensing.

Strategic Integrated Procurement Enterprise System (STRIPES) Segment replaced and consolidated federal corporate, regional and local procurement-related systems across the Department. STRIPES automates all procurement and contract activities required or directly associated with planning, awarding, and administering various unclassified acquisition and financial assistance instruments; thereby, increasing the internal efficiency of the Department. STRIPES is also fully integrated with STARS, creating efficiency between the two systems and improving the accuracy and timeliness of funding commitments and obligations. Costs include all operations and maintenance support, including the Chief Information Officer's Application Hosting and the annual Compusearch subscription fees.

iBudget Segment is a budget formulation solution that will support the collection and management of budget formulation data for OMB and Congressional budget submissions and provide a capability to automate the budget publication. Costs will include the operations and maintenance support provided by Treasury. Short and long-term enhancements are also being considered for the funds distribution process, currently supported by the Funds Distribution System (FDS) and the field budget systems (BEARS/FCDS).

iPortal/Information Data Warehouse Segment is the CBS face to its customers. It provides the gateway into all CBS applications and services. The Information Data Warehouse (IDW) provides capability to integrate and store data from various corporate and/or program systems for reporting using Business Intelligence reporting tools. The CBS iPortal/IDW provides many services that connect our people, simplify our work, and liberate our data. Costs will include the operations and maintenance of the technical infrastructure, consisting mostly of Application Hosting and annual software licensing fees.

Oak Ridge Financial Service Center (ORFSC) Segment completes over 140,000 payments annually and payment services are provided for all DOE programs, including, but not limited to: NNSA, EM, FE, SC and EE.

Corporate Human Resource Information System (CHRIS) Segment is a nation-wide operational portfolio of systems within the Department that serves as the official system of record for human resource management information for all employees.

CHRIS supports the Administration's strategic human capital management initiative and expands e-government within DOE, combining electronic workflow and other best practices in work processes with a web-based IT architecture and suite of software applications based on off-the-shelf products (PeopleSoft and Monster Government Solutions), and the legacy Employee Self-Service. This budget also funds Jobs One-Portal (J1P), recruitment using social media, and specific recruiting efforts to reach veterans and disabled veterans. In addition, costs for inter-agency contributions for electronic benefits are financed in WCF.

Digital Media Segment rationalizes hundreds of websites and streamline web operations, reducing duplicative spending, and improving overall digital communications. Costs will include the operations and maintenance of the technical infrastructure, consisting mostly of application hosting, iterative development, and platform upgrades to meet ongoing scale and usage demands.

Payroll Services Segment encompasses three areas: Payroll, Flexible Spending Account (FSA) administrative fees, and Transit Subsidy (SEET). Civilian payrolls are prepared based on authenticated documentation. Through the Defense Finance and Service (DFAS) this segment: computes, deposits, and reports Federal, State, and local income taxes; maintains employee records related to Civil Service and Federal Employees Retirement Systems (CSRS and FERS); reports retirement information to the Office of Personnel Management (OPM); and performs reconciliation of account balances with DFAS, OPM and Treasury. Accounts for and reports employee's health benefit coverage, thrift savings plans, transit subsidies (SEET), and unemployment compensation, among other non-salary employee payments. Processes donated leave into the Defense Civilian Pay System. Maintains and operates the Department's system of allocating payroll costs to the proper appropriation.

Pricing Policy

CBS activities charge programs a pro-rata allocation of costs based on percentage share of three prior fiscal years' combined budget shares, using the Congressional request of the most recent year. FY 2017 estimates reflect the three years (FYs 2014-2016) in the Department's FY 2016 Budget request to Congress. Exceptions to this pricing policy include:

- STRIPES charges based on the number of 1102 series system users recorded during the fiscal year prior to formulation (for FY 2017 this is FY 2014).
- ORFSC charges programs based on a pro-rata share of processed transactions during the fiscal year prior to formulation (for FY 2017 this is FY 2014).
- CHRIS and Payroll charges programs based on an allocation of Federal employment on-board by organization at the beginning of the formulation year (for FY 2017 this is FY 2015).
- SEET and FSA are charged to programs based on actual usage during the fiscal year prior to formulation (for FY 2017 this is FY 2014).

Budget increases are attributed to escalation rates in contracts and software licensing, hosting cost increases, purchase of additional hardware to support vendor platform changes, increased program demand to meet new financial reporting requirements and support of the corporate funds distribution solution which is going into production in FY 2016.

Corporate Training Services

Description

The Corporate Training Services (CTS) business-line combines Training Delivery and Services (TDS), Online Learning Center (OLC), SES 360 Assessments and National Defense University (NDU) business segments to deliver courses which support the Department's mission at competitive pricing and fee for service pricing.

Energy Online Learning Center (OLC) Segment is a web-based commercial off-the-shelf training system that provides access to online learning and training. The goal of this business segment is to use technology to deliver learning activities to the desktop where such delivery can be demonstrated to improve learning outcomes and reduce costs independently

or in combination with other training methods. The overall vision of the OLC program is to provide the capability for all DOE federal employees to have access to web-based training via the desktop. The OLC has been structured to meet DOE needs with a customized access process and DOE-specific information (including DOE-mandated training).

Training Delivery and Services (TDS) Segment includes the design, development, and delivery of competency-based courses to meet critical skills development needs in Project Management, Program Management, and Acquisition and Assistance Management.

A series of Continuing Education courses has been added to present new topics and refresher training. Program offerings include modular course design and customized training for on-site and centralized delivery. The TDS Program has a 20-year track record of providing professional training and training services throughout the DOE complex. The training management services are offered to customers on a negotiated basis only.

Senior Executive Service 360 Degree Assessments (SES 360) Segment provides services through an agency Agreement with the Office of Personnel Management. DOE's program is part of a larger effort to change the leadership culture throughout the agency. By administering leadership behavior assessments and simple, but targeted, evaluations of leadership training efforts, the Department can track changes in the perception of leadership behaviors over time and assess the effectiveness of leadership training. Participants are rated by people of varying relationships to the participant (e.g., peer, subordinate/direct report, and supervisor). Assessments will focus on leadership competencies most relevant to DOE's current strategic plan, and include items related to personal training experiences and the effectiveness of those experiences.

National Defense University (NDU) Segment provides services through an Interagency Agreement with the National Defense University (NDU/DOD) for DOE participation at the National Defense University (National War College) for Energy Master/Certificate Programs and the Advanced Management Program.

Pricing Policy

Pricing policy for Corporate Training Services business-line is as follows:

- OLC - Participating DOE organizations pay for OLC access through a fixed annual fee per student and allocation of administrative costs, based on number of employees per program.
- TDS - Participating DOE organizations in the TDS pay \$250/day for each employee enrolled in professional skills training course.
- SES 360 - Participation in the SES 360 Assessments is financed by the benefitting program; fees per person are based upon specific assessment options.
- NDU - Participation in the NDU is financed by the benefitting program; fees per person are based upon the specific training program.
- Federal staff support consists of program management, developing curriculum, contractor oversight of distance learning, and managing classroom delivery by contractor staff.
- FY 2017 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2014), except OLC, which is based on an allocation of the number of employees on-board by organization at the beginning of the formulation year (FY 2015).

Budget decrease is due to the removal of SES Candidate Development Program; if a new class is proposed in the future, inclusion in the budget will be revisited.

CyberOne

Background

The CyberOne Business-line consists of two Enterprise-wide capabilities to include: (1) Identity Credentialing and Access Management, \$4,046,035; and (2) Incident Response (IR) and Recovery \$28,934,804. IR and Recovery consists of multiple cybersecurity enterprise services implemented through the DOE Joint Cybersecurity Coordination Center (JC3).

Below is a list of statutory and regulatory drivers for DOE's Cybersecurity Program:

- Executive Order (EO) 13636: Improving Critical Infrastructure Cybersecurity, February 12, 2013, <https://www.whitehouse.gov/the-press-office/2013/02/12/executive-order-improving-critical-infrastructure-cybersecurity>
- Cybersecurity Information Sharing Act of 2015, <https://cdt.org/files/2015/08/EAS15A35.pdf>
- EO 13691: Promoting Private Sector Cybersecurity Information Sharing, February 13, 2015, <https://www.whitehouse.gov/the-press-office/2015/02/13/executive-order-promoting-private-sector-cybersecurity-information-shari>
- EO 13587: Structural Reforms to Improve the Security of Classified Networks and the Responsible Sharing and Safeguarding of Classified Information, October 7, 2011, <https://www.whitehouse.gov/the-press-office/2011/10/07/executive-order-13587-structural-reforms-improve-security-classified-net>
- National Strategy For Information Sharing and Safeguarding, December 2012, https://www.whitehouse.gov/sites/default/files/docs/2012sharingstrategy_1.pdf

Additionally, the DOE Chief Information Officer (CIO) advised by the cybersecurity program managers within the Department governs the CyberOne Business-line. The CIO via the Office of the Chief Information Security Officer (CISO) manages the CyberOne line of business.

Description

Identity, Credential and Access Management (ICAM): The DOE ICAM program transforms Identity, Credential, and Access Management (ICAM) from a system or facility effort to an enterprise strategic resource for leveraging the enhancement of cybersecurity and the improvement of efficiency of business processes in each DOE Element. The ICAM program develops a comprehensive, enterprise solution that is in compliance with legislative and regulatory requirements (i.e. FISMA 2002, Office of Management and Budget (OMB) M-05-24, OMB M-04-04, OMB M-11-11, etc.) as well as positions the Department to face today's ever increasing and complex security threat environment. The strategic goals for ICAM include:

- Increase security, which correlates directly to increased Personally Identifiable Information (PII) protection and minimize the number and impact of data breaches and trust violations.
- Achieve high degree of interoperability within the Department and with other Federal Agencies, thereby reducing the cost of ownership for application owners and utilizing new Cloud capabilities.
- Establish an enterprise and interoperable access management approach linking DOE Physical Access Control Systems (PACS) and Logical Access Control Systems (LACS) into a federated access management infrastructure.
- Foster an enterprise view of digital identity that facilitates the sharing of digital identity data across DOE Organizations, as well as with external DOE entities.
- Implement identity credentials at all Levels of Assurance, as defined in the OMB Memorandum 04-04, based upon a risk management approach and DOE Organization requirements.
- Foster a system-of-system approach where the DOE Organizations collaborate and cooperate in implementing ICAM, identifying mission needs and managing associated risks.

The Working Capital Fund (WCF) will supports two services:

- **PKI-to-cloud** service to establish an enterprise Public Key Infrastructure (PKI) that is on the Federal Bridge and provides PKI certificates for interoperable and secure information exchange internal and external to DOE. Support for removing local certificates to comply with the Federal Bridge.
- **Personal Identity Verification (PIV)** enablement in support the Homeland Security Presidential Directive (HSPD)-12 directive and Cross-Agency Priority (CAP) goal of strong authentication through issuance of PIV cards.

Incident Response and Recovery: In July 2013, the Deputy Secretary assigned governance, management, and operations of the JC3 to the DOE Office of the Chief Information Officer (OCIO).

The DOE CISO is responsible for program management of the JC3. The CISO will partner and coordinate with other Department-wide cybersecurity program managers to meet service level and performance measure requirements.

Under Secretaries and line managers remain accountable for the security of the information and information systems under their purview and ensure Federal and contractor network and security operations centers cooperate fully with the JC3 while executing local organization or site cybersecurity activities. The cybersecurity program managers are responsible to their line management for coordinating Enterprise-wide cybersecurity requirements with the DOE CISO.

The Department's IR and Decontamination capability aligns DOE's cybersecurity efforts with the Administration's twelve Comprehensive National Cybersecurity Initiative (CNCI) efforts. DOE's JC3 enables IR and Decontamination through the coordinated actions of the field site cybersecurity centers. To accomplish enterprise coordination, the JC3 employs enterprise tools and services. Two of the most significant services in the JC3 portfolio are the Cooperative Protection Program (CPP), which provides cyber situational awareness, and the Cyber Fed Model (CFM), which enables cyber information sharing.

The JC3 provides Departmental, enterprise level, situational awareness in a rapidly increasing threat environment. At its core, JC3 facilitates the aggregation, correlation, and de-confliction of enterprise-deployed sensor inputs like those provided by the CPP and other data sources; provides threat analysis in coordination with DOE laboratories; conducts attack trending and tracking of advanced persistent threats; and distributes threat information and indicators of compromise to DOE entities in an automated manner. The JC3 provides cybersecurity enterprise services and tools to customers Department-wide and facilitates enterprise cybersecurity training for the Department.

The six primary functions of the JC3 in support of the DOE Enterprise are:

- Enterprise Monitoring (Department-wide) and Information Collection
- Advanced Cyber Analytics
- Enterprise Incident Management and Response
- Collaboration and Advisory Support
- Information Sharing and Reporting
- JC3 Program Management and Support Activities

The JC3 integrates Departmental Incident Management capabilities and coordinates all enterprise activities including prevention, detection, containment, and recovery for all DOE Elements. This includes activities on both unclassified and classified networks through partnerships with DOE Programs with direct support to classified networks through the National Nuclear Security Administration (NNSA) and the DOE Office of Intelligence and Counterintelligence (IN). The JC3 also coordinates communications on behalf of the DOE for cybersecurity events and cyber emergency response with United States Computer Emergency Response Team (US-CERT) and other agency partners.

As mentioned, the JC3 employs enterprise services as key components on delivery enterprise coordination for the Departments IR. The CPP designs, operates, and enhances a system that collects high quality, information rich network data sets, enabling a more robust defense against adversaries targeting DOE assets. CPP maintains a cooperative partnership between DOE Headquarters Elements, the participating sites, and the analysis centers to provide the most effective use of the CPP collected data. Network sensors are capable of monitoring 10 Gigabit network links existing at over 90 DOE government and contractor facilities examining about 36 Terabytes/Day of raw network traffic, and generating over 1.4 Terabytes/Month processed data. This data is used by cybersecurity analysts to gain insights into the motives of our adversaries and enables a rapid response to emerging threats. CPP collaborates with other US Government agencies, commercial companies, and the open source community to continually enhance system sensing capabilities.

CFM is a JC3 service that has driven machine-to-machine sharing of cyber threat intelligence, speeding up proactive defense, and distributed detection for the Department's National Laboratories and site offices. CFM began with a pilot in FY 2004 and entered production status in FY 2009 and has distributed over seven million bad actor addresses to date. In FY 2014, over 1.5 million bad actor addresses were distributed with an average of five thousand per day. In many cyber incidents, timely sharing of information is often a second thought and CFM allows for the cyber systems to share, act and provide a coordinated defense 24x7x365 with minimal human interaction. CFM supports the Deputy Secretary's direction to operate at machine speed in responding to cybersecurity threats and incidents. Flexible and customizable, CFM integrates the latest advancements and technologies developed by its project team members and partners. CFM can deliver signatures and indicators of compromise to automatically update cyber defenses, such as intrusion detection systems, intrusion prevention systems, and firewalls.

Pricing Policy

CyberOne charges programs a pro rata allocation of costs based on percentage share of three prior fiscal years' combined budget shares, using the Congressional request of the most recent year. FY 2017 estimates reflect the three years (FYs 2014-2016) in the Department's FY 2016 budget request to Congress.

Financial Statement Audits

Description

Support services relating to the audit contract are required to attain contractor expertise, needed primarily for financial statement audits required by the Government Management Reform Act (GMRA) (e.g., actuaries, petroleum engineers, and information technology support personnel).

Pricing Policy

The business-line charges customers a pro-rata allocation of costs based on percentage share of three prior fiscal years' combined budget shares, using the Congressional request of the most recent year. FY 2017 estimates reflect the three years (FYs 2014-2016) in the Department's FY 2016 Budget request to Congress. Departmental programs that use proprietary financial systems (e.g., the FERC and the PMA's) will be excluded from billing for this business.

Budget increase is due to contract escalation in audit costs.

Health Services

Description

The Health Services business-line provides common administrative services to the DOE Headquarters community. These services include Headquarters health centers, a drug testing program, an employee assistance program, and disability services. The Department's analysis shows cost reductions will result from consolidating these activities under one enterprise with a focus on program demand for these services.

Health Center Segment consists of two HQ facilities: one at Forrestal and one at the Germantown. Services provided include: emergency response; travel immunizations; fitness-for-duty and pre-employment physical exams; annual influenza vaccinations; and general occupational health concerns. The health center is operated under an Interagency Agreement with the Department of Health & Human Services, Federal Occupational Health (HHS/FOH) to provide packaged services, which reduces costs and DOE resource needs.

Drug Testing Program Segment, a DOE-wide program, provides for collection, testing, and medical review of alcohol and drug testing. This activity supports testing of DOE positions for fitness-for-duty, pre-employment, and random drug testing and positions which require a clearance (e.g., security, technical, and/or executive positions) in line with Federal mandates (Executive Order 12564; Department of Transportation Regulations; and 49 Code of Federal Regulations Part 40). The Department has an existing Interagency Agreement with Department of the Interior to utilize their contracts, which reduces costs and saves DOE resources.

Employee Assistance Program (EAP) at Headquarters finances professional EAP counselors to offer assistance to DOE federal employees for family, work, health, and other concerns (work-life) in line with Federal mandates (Executive Order 12564; Public Law 79-658; Public Law 99-570 (5 U.S.C. §§7361 and 7362); Public Law 98-24 (42 U.S.C. §290dd-1); Public Law 96-24 (42 U.S.C. §290ee-1); Sec. 7361 and Sec. 7362 of Public Law 99-570; and the Public Health Services Act).

Disability Services coordinates contract vendors to provide sign language interpreting services for deaf and hard-of-hearing federal employees at Headquarters in line with Federal mandates (Rehabilitation Act of 1973, as amended).

Pricing Policy

Charges for Health Services are allocated to each program on the basis of their Headquarters employment levels at the beginning of the current fiscal year. Charges for the Drug Testing segment are allocated to each program on the basis of their DOE-wide employment levels at the beginning of the current fiscal year. FY 2017 estimates reflect amounts based on an allocation of the number of Federal employees on-board by organization at the beginning of the formulation year (FY 2015).

Interagency Transfers

Description

Interagency transfers are necessary to finance National Archives and Records Administration (NARA) storage and management of critical DOE records and the Integrated Acquisition Environment. Other activities include E-Government initiatives, which consist of consolidation studies of lines of businesses, agency assessments and other intergovernmental procurement systems.

The DOE Records Management Program ensures compliance with the Federal Records Act of 1950, as amended, by promoting the management of records throughout their life cycle in an economical, efficient, and effective manner. DOE maintains an annual agreement with NARA on records storage costs and appropriate records management and disposition, consistent with approved records schedules.

Integrated Acquisition Environment (IAE) provides a secure business environment that facilitates and supports cost effective acquisition of goods and services in support of mission performance. To accomplish this mission, IAE focuses on the following goals:

- Create a simpler, common integrated business process for buyers and sellers that promotes competition, transparency and integrity. Increase data sharing to enable better business decisions in procurement, logistics, payment, and performance assessment.
- Take a unified approach to obtaining modern tools to leverage investment costs for business-related processes.

IAE is operated under an Interagency Agreement with General Services Administration (GSA) to provide packaged services, reduce costs, and save DOE resources by leveraging economy of services. GSA is charged with the fiduciary responsibility to work across government to provide acquisition services to support agency missions by delivering timely acquisition tools and services, including but not limited to, the Central Contractor Registration, excluded parties list, electronic subcontracting reporting, federal business opportunities, federal procurement data, wage determinations, and others, as business requirements are identified by the acquisition community.

Per Office of Personnel Management (OPM), agencies will need to contribute funding to cover credit monitoring and related services/benefits for the OPM cybersecurity incidents affecting Federal and contract employees. Coverage will include a suite of services (e.g., credit monitoring, call center/support services, and identity theft protection). Beginning in FY 2017, Interagency Transfers budget estimates include funding for OPM Credit Monitoring.

Pricing Policy

E-Gov and NARA - these activities will be charged to programs on a pro rata allocation of costs based on percentage share of three prior fiscal years' combined budget shares, using the Congressional request of the most recent year. FY 2017 estimates reflect the three years (FYs 2014-2016) in the Department's FY 2016 Budget request to Congress.

OPM Credit Monitoring - Program office cost shares are based on an allocation of HQ and Field credential numbers by organization from the formulation year (for FY 2017 this is FY 2015).

Mail and Transportation Services

Description

The Mail Center provides a variety of mail services for all official and other authorized mail for DOE and its employees. Services include the processing of all incoming postal mail, outgoing official mail, internal mail processing, accountable mail processing, pouch mail, a variety of overnight express mail services, messenger services, directory services, and pick-up and delivery services. In response to the risk of terrorism, the business-line has implemented various processes for sanitizing and testing mail against bio-terrorist attacks.

The Transportation Service includes shuttle bus operations, Headquarters executive transportation, motor vehicle fleet administration, and courier service. The shuttle bus operates between DOE Headquarter facilities; utilizing two bio-diesel

buses. Executive transportation is provided to Headquarters executive staff for official business required to further the mission of the Department of Energy. Motor vehicle fleet administration includes fleet maintenance, monitoring and tracking fleet activity, conducting fleet management activities, and the vehicle maintenance program. Courier service is for the delivery and pick-up of sensitive and non-sensitive material within the Washington Metropolitan area.

Pricing Policy

Mail and transportation pricing has multiple components:

- Offices pay the actual dollar cost for outgoing United States Postal Service (USPS) mail and for Federal Express or other special mail services. Offices pay for internal mail distribution based on the number of mail stops.
- Offices pay for Mail Security based on their percentage of incoming USPS mail over the preceding six-month period.
- Offices pay for Express Mail labor based on their percentage of the total volume of incoming and outgoing special mail during the preceding six-month period.
- Offices pay for USPS Outgoing labor based on their percentage of actual outgoing mail for the preceding six months.
- Offices pay for specified special services on a negotiated basis.
- Programs pay for shuttle bus services based on their prior year usage.
- Programs pay for courier and messenger services based on their prior year usage.
- Programs pay for Headquarters executive transportation services based on their prior year usage.
- FY 2017 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2014)

Overseas Presence

Description

The Department has a long standing presence in several foreign capitals; this enables the Department to promote American trade and support critical treaties with our allies.

DOE funds 22 federal employees and 27 locally employed staff in ten countries that support the Secretary and, by extension, the entire Department. The business-line provides administrative and operational support service to Departmental personnel traveling overseas for mission programs.

The budget finances federal salaries, overseas operating costs, and International Cooperative Administrative Support Services (ICASS) and Capital Security Cost Sharing (CSCS) programs. The Department utilizes State Department resources as shared services to ensure that costs are minimized.

Pricing Policy

Charges for Overseas Presence are based on actual usage of these services by program offices. The annual bill for these charges will cover the fixed cost of the program and be allocated to programs based on the previous year's actual usage. FY 2017 estimates reflect allocations determined by the Overseas Presence Advisory Board based on negotiations with related programs.

Pension Studies

Description

Pension Studies provide program offices with an independent measure of contractor benefits and compare each contractor to both an internal and external benchmark. Program offices use the results of these studies in discussions with contractors regarding the need for reducing costs associated with contractor employee benefits. Results can be measured by the changes made to contractor employee benefit plans.

Pension Studies require access to actuarial expertise that is essential to understanding the implications on federal budgets of potential pension liabilities. Factors that impact pensions are dynamic and include: volatility of contributions, inflation, provisions in benefit plans, workforce restructuring, and pension legislation. These studies support the Department's budget projections, financial statements analysis, Office of General Counsel, and pension management plan.

Under the terms of the contracts that the Department has with each of its management and operations (M&O) contracts, the Department reimburses the contractors for reasonable costs associated with fulfilling their duties under the terms of the contract. These reasonable costs include costs associated with providing benefits to the contractors' employees. Beginning in 2009, the Department increased its oversight of these benefits and began annual reporting on the expected reimbursements for pension plans. DOE also reports on expected reimbursements for other postretirement benefits (primarily medical).

A key goal of this oversight is to improve transparency among the contractors with respect to the benefits being provided to the contractors' employees, as well as the associated annual cost per employee. The collection and analysis of this data requires a great deal of personnel, including the use of external actuarial services. However, publicizing the results of the survey has exerted pressure on the contractors to address the costs associated with their benefit plans. In addition, the Department has relied on external actuarial services to assist in the analysis of the information provided during the annual pension management review process, as well as in analyzing the impact of various proposals for cost reduction in the benefits provided by the different contractors. Given that there are approximately 50 pension plans and a similar number of postretirement benefit plans, analysis across the entire complex requires a significant amount of resources.

Pricing Policy

Programs will be charged based on each program's sites' ratio of the total pension and post-retirement reimbursements reported in the April Report to Congress for the prior fiscal year. FY 2017 estimates reflect allocations included in the 2015 Report to Congress.

Printing and Graphics

Description

The Printing and Graphics Business-line provides procurement and liaison services with commercial printers through the Government Printing Office. It also provides design and development of pre-press graphics, electronic forms and exhibits, and court reporting services. Contractor staff distributes materials produced in-house as well as materials produced by other government agencies. This business-line also provides professional photography, lab technicians, portrait studio operations, graphics, visual aids, and presentation materials. Centralized visual archives are provided through a repository of general interest photos.

Pricing Policy

Organizations pay direct costs for printing, printed products, Federal Register publications, and some graphics services. Additionally, programs pay maintenance costs on graphics equipment and graphics supplies as a percentage allocation of costs incurred in the previous fiscal year. FY 2017 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2014).

Budget increase is due to demand for goods and services by the program office customers.

Procurement Management

Description

Audit Services, Contract Closeout, and Purchase Card Surveillance business segments work together to help validate compliance with procedures and improve the internal controls of the Department. These segments also respond to specific issues raised by the Inspector General. Ultimately, savings to programs are realized by preventing fraud, waste, and abuse.

Audit Services Segment of the business actually represents funding to various federal audit agencies; however, the majority of the funding is provided to the Defense Contract Audit Agency (DCAA). DCAA and the Department of Health and Human Services (HHS) provide audit services to the Department's program offices and contracting officers in support of their acquisition activities. These services benefit the contracting officers in supporting their determination for reasonableness and realism of the contractor's proposed rates.

Contract Closeout Segment of the business is the final stage in contract administration support for DOE Headquarters elements. Services include ensuring that all contracted products and services have been delivered, final releases are obtained, final invoices and vouchers are processed for payment, and any remaining unexpended funds under the contract are released. Since FY 1996, the universe of contract instruments ready for closeout has been reduced from nearly three thousand to approximately two thousand instruments. Over \$144 million has been de-obligated from expired contracts in the 18 years this activity has been operating as a Fund business. During FY 2015 the return on investment calculation shows that for every one dollar invested in the contract closeout activity, \$24 of uncotted funding was de-obligated from expired instruments. As a result of the American Recovery and Reinvestment Act of 2009, it is anticipated that there will be a substantial increase in the number of financial assistance awards that will require closeout.

Purchase Card Data Mining segment monitors purchase card usage within the Department. DOE purchase cards are issued under a task order through the SmartPay2 program administered by GSA. Funding for this effort is derived from rebates DOE elements receive, based upon the dollar volume of purchases. The vendor provides a version of the data mining system, entitled to DOE at no cost for the basic version. This business unit will detect patterns, trends, and/or anomalies for use in risk management, spend patterns, and other areas of analysis.

Pricing Policy

Procurement Management pricing has multiple components:

- Closeout - each Headquarters element pays the actual contract closeout cost, determined by the unit price of each contract type and negotiated level of service.
- Purchase Card Data Mining costs are allocated based on the distribution of refunds resulting from the DOE purchase card program.
- DCAA audits are charged to programs based on actual usage from the previous fiscal year.
- FY 2017 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2014).

The budget decrease is due to DCAA audits activity level.

Project Management Career Development Program

Description

The Project Management Career Development Program (PMCDP) provides a wide range of developmental, mentoring, training, and rotational activities which lead to project management certification. Project management certification under the program is based upon the requirements for training, developmental activities, and experience outlined in the certification standard contained in DOE Order 361.1B, Chapter IV, and meets the certification requirements of the Federal Acquisition Certification for Program and Project Managers defined in [OMB OFPP Policy Memo dated December 16 2013](#). PMCDP defines necessary DOE project management knowledge, skills and abilities, as well as DOE training course requirements. Components of PMCDP also include a DOE career development tracking system and a DOE project management certification program.

Pricing Policy

In FY 2017, the business-line will continue to assess programs based on the number of projects, the amount of projects in the portfolio, and the number of incumbent project directors or potential project directors identified by the programs. Fixed costs related to the PMCDP will be charged to programs based on their pro-rata share of the number of projects and the value of those projects in the Project Assessment and Reporting System (PARS II). The variable costs of delivering courses will be charged to programs based on their pro-rata share of targeted participants. FY 2017 estimates reflect amounts based on programmatic statistics reported in PARS II and PMCDP Program participant profile data. This data includes estimates of present and forecasted needs that include number of projects, portfolio value of projects, and the number of incumbent and candidate project directors.

In addition, we expect some programs outside of the assessment pool to desire participation in the training offered. In those cases, the business will allocate a certain number of slots, on a space-available basis, at the rate of \$200 per day. These charges will offset other development costs and future charges to the programs.

Supplies

Description

This business-line operates two self-service stores, which carry a wide variety of consumable office products. At customers' request, it acquires specialty items, not stocked in the stores. Products carried are based on review of equipment in the agency inventory and customer input and suggestions. This business operates the supply stores as a commercial operation, which is paid only for the supplies purchased by DOE employees. In support of federal green purchasing Executive Orders and statutory mandates, the Headquarters supply stores (located in Forrestal and Germantown) offer a wide range of environmentally-friendly supplies that are energy efficient or contain post-consumer waste (recycled) materials, bio-based materials (biological, agricultural or forestry-based), and biodegradable materials (decompose easily).

Pricing Policy

Each organization pays for supplies purchased by its employees. FY 2017 estimates reflect amounts based on usage from the 12-month period prior to formulation (FY 2014-15); extraordinary or unusual changes in usage patterns are not anticipated in the Fund's estimates.

Telecommunications

Description

The Telecommunications Business-line consists of two comprehensive enterprise activities: Voice Services and Network Services.

Voice Services Segment: Comprises an infrastructure connecting two main Headquarters buildings and satellite buildings for internal dialing and basic line service. The infrastructure includes communication networks, installed telephone processing switching equipment, and trained technical personnel. Telephone service includes local, long distance, and international dialing; specialized services such as operator-assisted conference calls, voice mail, call forwarding, automatic ring-back, and custom calling cards; and trained technical personnel to install, repair and operate the system. There are 11,726 telephone connections at DOE Headquarters. This segment also includes wireless communications and there are 4,255 wireless devices supported by the business line. The wireless device costs are monitored regularly and carrier plans are centrally adjusted to attain maximum savings. Note: all statistics are as of August 2015.

Pricing Policy

Telephone system costs are allocated to Headquarters offices based upon four categories:

- Headquarters telephone system infrastructure costs, which are composed of: (a) the cost of the leased telecommunications circuits connecting the Headquarters buildings to the internal telephone system; (b) the cost of leased telecommunications circuits that support local, long distance and international calling; and (c) the cost of the technical staff who operate the Headquarters telephone switches, and install and repair the telephone wiring plant. Since the Fund's inception, program customers have been validating and reducing the number of active phone lines.
- The costs of dedicated communication circuits are allocated to organizations requesting installation of such lines.
- All long distance, local, and international calls at Headquarters are allocated to the originating telephones and thus to programs based on the actual billing information.
- All recurring wireless communication devices (smart phones, pagers, blackberries, tablets, etc.) service contract costs and equipment purchases are charged to programs based on actual usage.

FY 2017 estimates reflect amounts based on usage from the 12-month period prior to formulation (FY 2014-15); extraordinary or unusual changes in usage patterns as well as purchases of new equipment, outside of the approved and budgeted refresh program, are not anticipated in the Fund's estimates.

Network Services Segment: Provides connectivity for DOE Headquarters and Field operations through Local and Wide Area Networks. This connectivity provides interoperability for 86 organizational Local Area Network (LAN) segments in two main Headquarters and associated satellite buildings; and connectivity to the Headquarters application host systems. There are 10,506 LAN connections at DOE Headquarters and 2,935 Field LAN connections. LAN connections provide access to and cybersecurity for the internet, electronic mail, and other applications for information processing and sharing through infrastructure. It also provides connectivity to the entire national complex through DOEnet, which is a centrally managed

DOE-wide area network designed to support DOE corporate systems and carry business sensitive data to users at 42 DOE sites. Note: all statistics are as of August 2015.

Pricing Policy

Networking charges represent infrastructure costs which are composed of: (1) the cost of leased telecommunications circuits; (2) the cost of maintaining common network infrastructure components (routers, switches, etc.) and upgrades where needed; and (3) the cost of providing technical staff to install and repair network connections and monitor/operate the various common network components. These charges will be allocated among program organizations based on the number of active LAN connections, as a monthly charge. Since the Fund's inception, program customers have been validating the number of these connections. DOEnet costs are allocated to participating sites based on the costs associated with providing the service – circuit costs, hardware and maintenance costs, and the cost of providing technical staff.

FY 2017 estimates reflect amounts based on usage from the 12-month period prior to formulation (FY 2014-15); extraordinary or unusual changes in usage patterns as well as purchases of new equipment, outside of the approved and budgeted refresh program, are not anticipated in the Fund's estimates.

Crosscutting Activities

Crosscutting Activities

Energy-Water Nexus
(\$K)

FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
15,575	15,085	34,250	96,100

Overview

The FY 2017 Budget Request for the Energy-Water Nexus (EWN) crosscut is an integrated set of cross-program collaborations 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 research, development, demonstration and deployment 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 coupled energy-water systems. The EWN Request outlined here draws on ideas presented in DOE's report, *The Water-Energy Nexus: Challenges and Opportunities* (June 2014). This publication represents the culmination of an intense two-year effort that engaged DOE's sister agencies, national laboratories, state and local governments, utilities, industry, the broader science community, and others. In FY 2015, Secretary of Energy Moniz launched a series of Energy-Water Nexus roundtables to gain insights and feedback on our current plans, to build collaborations and alliances, and to leverage DOE's capabilities and those of related regional entities. In addition to a capstone event touching on general aspects of the energy-water nexus and chaired by the Secretary, DOE conducted topic-specific roundtables on fuels, the electricity sector, water infrastructure, and systems integration. This extensive stakeholder outreach has helped to inform and fine-tune this FY 2017 crosscutting initiative. The 2015 DOE Quadrennial Technology Review (QTR), released on September 10, 2015, highlights several areas where technology advances could positively impact the challenges faced in the energy-water nexus, including desalination. Additionally, in FY 2015, DOE established a crosscutting, domestic energy and water research investment as part of a bilateral collaboration with China. In this latter initiative, U.S. scientists receive funding to conduct research on a set of coordinated topics and common Nexus challenges. Ultimately, activities in FY 2017 continue to build on these foundational investments while introducing a number of strategically important new initiatives with the goal of accelerating the science, analytic capabilities, technology innovations, policy insight, and outreach for the most pressing challenges at the Nexus.

Present day water and energy systems are interdependent. From providing cooling to power plants to irrigating crops for biofuels, multiple phases of energy production and electricity generation use water. Conversely, extracting, conveying, and delivering water of appropriate quality for diverse human uses requires energy, and treating wastewaters prior to their return to the environment requires even more. Historically, interactions between energy and water have been considered on a regional or technology-by-technology basis. Despite their interdependency, energy and water systems have been developed, managed, and regulated independently.

Several current trends are increasing the urgency to address the energy-water nexus in an integrated way. First, precipitation and temperature patterns across the United States are undergoing rapid change with increasing frequency and intensity of extreme events. Already stressed by competing demands and interdependencies, record droughts (e.g., California), heat waves, floods, tropical storms, and winter storms have had significant effect on infrastructure, regional economies, and productivity in various parts of the U.S. Few communities have escaped these trends. Many of these challenges, either individually or oftentimes complicated by simultaneous occurrence, pose extreme challenges at the Nexus. Second, recent scientific evidence points to the accelerated drawdown of some critically important U.S. groundwater supplies, typically serving as the "backup plan" for insufficient or intermittent surface water supplies for energy and other uses. Third, U.S. population growth and regional migration trends indicate that the population in arid areas such as the Southwest is likely to continue to increase, further impacting the management of both energy and water systems. More generally throughout the country, migration patterns continue to feed the growth of densely populated settlements and the associated drivers for concentrated, connected infrastructure. These shifts bring their own set of unique challenges owing to the rapid growth in service demands, constraints posed by existing designs and land-use allocations, and the increased criticality of service reliability. Finally, introduction of new technologies in the energy and water domains could shift water and energy demands, potentially in disruptive ways if interdependencies are not explicitly addressed. Policy developments addressing water impacts of energy production are introducing an additional layer of complexity for decision making.

The overarching goal of this initiative is to assist the nation in moving towards resilient and sustainable coupled energy-water systems. Success will be measured through DOE's ability to:

- Optimize the freshwater efficiency of energy production, electricity generation, and end use systems.
- Optimize the energy efficiency of water management, treatment, distribution, and end use systems.
- Enhance the reliability and resilience of energy and water systems.
- Increase safe and productive use of nontraditional water sources.
- Promote responsible energy operations with respect to water quality, ecosystem, and seismic impacts.
- Exploit productive synergies among water and energy systems.

While several federal agencies have missions that touch on the water side of the energy-water nexus, DOE's focus on the energy side is essential if the Nation is to realize meaningful solutions. The complexity at the energy-water nexus also demands a coordinated and integrated DOE approach, one that leverages the full range of Departmental assets, from basic science to applied research, policy, and, ultimately, outreach. This Crosscut, now in its first year (FY 2016) of funding as a coordinated set of investments, has been years in planning and preparation. At the most fundamental level, it intends to improve understanding of vulnerabilities and opportunities as they evolve over time, offer new solutions through knowledge and technology creation, and accelerate change through policy and stakeholder engagement.

This FY 2017 crosscut is responsive to a variety of Congressional and stakeholder directives and requests. Section 979 of the Energy Policy Act of 2005 directed the DOE to carry out a program addressing energy-related issues associated with the provision of water and water-related issues associated with the provision of energy. Since that time, the Government Accountability Office (GAO) has issued a series of reports calling for improved DOE information and coordination at the energy-water nexus, including improving federal data for power plant water use (2009), improving information on water produced during oil and gas production (2012), and increasing federal coordination to better manage energy and water tradeoffs (2012).

Highlights and Major Changes in the FY 2017 Budget Request

In FY 2016, DOE manages its EWN activities as a coordinated set of programmatic efforts included within the enacted budgets for six major programs: the offices of Energy Efficiency and Renewable Energy (EERE), Energy Policy and Systems Analysis (EPSA), Fossil Energy (FE), International Affairs (IA), Indian Energy (IE), and Science (SC). FY 2017 activities are organized around the four major pillars, noted below, and continue and expand, strategically, into areas as noted.

1. **Data, Modeling, and Analysis (DMA)** helps to understand current energy system vulnerabilities while exploring complex systems dynamics for subsequent applications in planning the resilient, efficient, and competitive energy-water systems of the future. DOE's efforts will advance foundational models, produce and analyze modeled output, and integrate data sets at spatial and temporal scales that matter to decision-makers at Federal, regional, state, and municipal levels. Improving capabilities will provide insights into technology RDD&D opportunities. The work outlined here builds on a DOE Office of Science workshop addressing modeling and long term predictions of the integrated water cycle. DMA work focuses on the following four sub-pillars:
 - a. *Layered Energy Resilience Data-Knowledge System* will fill key data gaps, identify scope, prepare a preliminary design, and begin development of an integrated data analytic system at the energy-water nexus. Efforts will initially emphasize work around the vast data inventories and capabilities distributed throughout DOE. FY 2016 funds are predominantly for scoping, planning, conceptual design, and expanding interagency engagement. FY 2017 supports the first phase of system build-out.
 - b. *Integrated Multi-System, Multi-Scale Modeling Framework and Impact, Adaptation, and Vulnerability Model Development* will improve interoperability and process representations across a range of major modeling platforms that require integration to enable coupled simulations at the energy-water nexus. FY 2017 continues support for this foundational modeling capability with the goal of advancing both an advanced multi-model predictive system and an innovative suite of use-inspired multi-model tools.
 - c. *Impacts, Adaptation, and Vulnerability Strategic Research and Analysis* will deliver a broad range of energy-water analyses, tools, and research insights to address priority needs of decision-makers and the research community.

- d. *Regional-Scale Data, Modeling, and Analysis Test Beds*, new in FY 2017, will design and begin deployment of three regional-scale data, modeling, and analysis test beds. Major objectives of the test beds are to accelerate development and synthesis of integrated toolsets in diverse, contextualized environments; test the predictive limits and identify gaps of current and evolving capabilities on priority topics at the Nexus; identify and capitalize on unique topical and place-based DMA resources; and, ultimately, explore complex systems dynamics and the interaction of stressors at sub-regional and trans-regional scales.
2. **Technology Research Development, Demonstration, and Deployment (RDD&D)** produces technology solutions and infrastructure options to address vulnerabilities and increase resilience, and it offers the possibility of efficiency improvements and cost reductions to facilitate accelerated technology deployment. Technology RDD&D priorities are those opportunities with potential for highest impact as identified in energy-water flow analyses presented in the June 2014 report. The FY 2017 Request features a low-carbon, low-energy, low-cost desalination innovation hub as well as complementary investments in other technology areas.
- a. *A low-carbon, low-energy, low-cost desalination energy innovation hub* will serve as a center of research focused on developing integrated technological system solutions and enabling technologies for de-energizing, de-carbonizing, and reducing the cost of desalination. While preliminary research is currently underway on these topics, the proposed effort will serve as a significant and necessary first-of-a-kind focused critical mass R&D effort on new technologies for cost-effective desalination. It will establish a central pillar in DOE and the nation's RD&D efforts in this critically important and highly multi-disciplinary field. This Hub will examine low-carbon, low-energy, low-cost desalination approaches that will support production of municipal drinking water, production of agricultural water supplies and treatment of nontraditional water sources, such as produced water from oil and gas extraction.
 - b. *Energy-Optimized Treatment, Management, and Beneficial Use of Non-Traditional Water* will complement the hub, advancing targeted treatment technologies and low carbon energy sources to address treatment of non-traditional waters for projected beneficial uses.
 - c. *Sustainable Low Energy Water Utilities* will pursue processes, technologies, and systems that increase energy efficiency and energy recovery in water and wastewater treatment and conveyance.
 - d. *Water-Efficient Cooling for Electricity Generation* will pursue increased efficiency in heat exchangers and cooling systems to reduce the need for water for cooling in thermoelectric power plants. In addition, reduction of water use in thermoelectric generation connects to the Supercritical CO₂ budget crosscut: the investments in the highly efficient supercritical CO₂ Brayton cycle presented in the Supercritical CO₂ budget crosscut have the potential to reduce the water requirements for thermoelectric cooling.
3. **Policy analysis** informs understanding of the motivation and barriers to addressing vulnerability and resilience that can impact diverse regional, national, and global stakeholders. Work in FY 2017 will continue to characterize federal and state policies, economics, and other factors that impact the use of water in energy systems and the use of energy in water systems. This analysis will also help identify prioritization questions to be examined through DMA and identify technology deployment barriers and opportunities. By identifying policy factors influencing the deployment of key cooling, water treatment, and other technologies, the analysis will help to catalyze the timely and efficient transformation of the national energy-water systems to ensure that the U.S. industry remains at the forefront of clean and sustainable energy production and use.
4. **Outreach and stakeholder engagement** strengthens this overall collection of proposed activities by sharpening understanding of end-user needs, regional considerations, and other data sets, while helping to identify pathways and potential partners for deployment and implementation.

Overall, the FY 2017 Request features an investment portfolio that is balanced, integrated, and strategically aligned, while simultaneously preserving the unique mission imperatives of the individual programs. The integration occurs across the four pillars outlined above. For example, performance and cost specifications from technology RDD&D can feed both DMA and policy analysis. Policy analysis informs understanding of technology deployment barriers and opportunities. In addition to being broadly useful to the R&D community, DMA produces analytical tools, forecasts, and datasets and can help to identify technology opportunity.

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: Program Direction	2,550	2,550	2,550	2,600	+50
International Affairs: Program Direction	---	---	300	400	+100
Total, Departmental Administration	2,550	2,550	2,850	3,000	+150
Energy Efficiency & Renewable Energy					
Advanced Manufacturing: Advanced Manufacturing R&D Facilities	---	---	---	25,000	+25,000
Advanced Manufacturing: Advanced Manufacturing R&D Projects	---	---	2,300	---	-2,300
Advanced Manufacturing: Industrial Technical Assistance	---	---	2,000	---	-2,000
Bioenergy Technologies: Conversion Technologies	---	---	---	4,000	+4,000
Geothermal Technologies: Low Temperature and Coproduced Resources	1,045	1,045	2,000	2,000	---
Geothermal Technologies: Systems Analyses	180	---	---	---	---
Solar Energy: Concentrating Solar Power	---	---	---	15,000	+15,000
Water Power: Hydropower Technologies	---	---	600	6,000	+5,400
Total, Energy Efficiency & Renewable Energy	1,225	1,045	6,900	52,000	+45,100
Fossil Energy Research & Development					
Crosscutting Research and Analysis: Water Management R&D	7,000	6,783	6,000	15,800	+9,800
Fuel Supply Impact Mitigation: Environmentally Prudent Development	3,000	0	0	---	---
Total, Fossil Energy Research & Development	10,000	6,783	6,000	15,800	+3,800
Office of Indian Energy Policy and Programs					
Tribal Energy Program: Tribal Energy Grant Program	---	---	500	1,000	+500
Tribal Energy Program: Technical Assistance	---	---	200	---	-200
Total, Office of Indian Energy Policy and Programs	---	---	700	1,000	+300
Science					
Biological and Environmental Research: Climate and Environmental Sciences	1,800	1,800	11,800	24,300	+12,500
Total, Energy-Water Nexus	15,575	12,178	28,250	96,100	+67,850

Energy-Water Nexus
FY 2017 Funding by Pillar (\$K)

	Data, Modeling, and Analysis	Technology Research Development, Demonstration, and Deployment	Policy Analysis	Outreach and Stakeholder Engagement	Total
Departmental Administration					
Energy Policy and Systems Analysis: Program Direction	1,500	---	1,000	100	2,600
International Affairs: Program Direction	300	---	---	100	400
Departmental Administration Total	1,800	---	1,000	200	3,000
Energy Efficiency & Renewable Energy					
Advanced Manufacturing: Advanced Manufacturing R&D Facilities	---	25,000	---	---	25,000
Bioenergy Technologies: Conversion Technologies	---	4,000	---	---	4,000
Geothermal Technologies: Low Temperature and Coproduced Resources	---	2,000	---	---	2,000
Solar Energy: Concentrating Solar Power	---	15,000	---	---	15,000
Water Power: Hydropower Technologies	1,000	5,000	---	---	6,000
Total, Energy Efficiency & Renewable Energy	1,000	51,000	---	---	52,000
Fossil Energy Research & Development					
Crosscutting Research and Analysis: Water Management R&D	1,000	14,800	---	---	15,800
Total, Fossil Energy Research & Development	1,000	14,800	---	---	15,800
Office of Indian Energy Policy and Programs					
Tribal Energy Program: Tribal Energy Grant Program	---	1,000	---	---	1,000
Science					
Biological and Environmental Research: Climate and Environmental Sciences	24,300	---	---	---	24,300
Total, Energy-Water Nexus	28,100	66,800	1,000	200	96,100

Program Roles

Departmental Collaboration

The interaction of the four elements proposed under the crosscut—DMA, RDD&D, Policy Analysis, and Outreach and Stakeholder Engagement—cuts across six DOE offices: EERE, EPSA, FE, IA, IE, and SC. The bulk of the DMA investment comes from SC, with cross-office shared funding and/or collaboration spanning all of the major focus areas, including the Layered Energy Resilience Data-Knowledge System and the Regional-Scale Data, Modeling, and Analysis Test Beds. Technology RDD&D is primarily supported by FE and EERE and benefits from cross-office collaboration. Policy analysis is contributed by EPSA. Crosscutting outreach and stakeholder engagement is contributed by EPSA and IA.

Data, Modeling, and Analysis (DMA)

DMA – Layered Energy Resilience Data-Knowledge System

SC: BER (\$3.0M)

SC efforts will focus on methodologies for exploring inter-layer correlations and interdependencies through time; observation-model data fusion; scalable analytics; distributed data methods; advanced algorithms for pattern recognition and identification of emergent behaviors; distributed data retrieval and data preparation and conditioning for a broad range of IAM, IAV, and Earth System Modeling domains.

FE: Crosscutting Research and Analysis (\$1.0M)

FE data, modeling, and analysis (DMA) will gather and analyze data in identified gaps to characterize energy-water relationships on a state level in coordination with other offices within DOE.

EPSA (\$500K)

EPSA will focus on data scoping elements and capabilities aligned with potential use for the data system in multiple domains addressing a broad range of analysis, planning, and evaluation needs. In addition, EPSA will fill data gaps and align current and historical data sets in areas such as thermoelectric cooling, produced water, and water sector energy use.

DMA – Integrated Multi-System, Multi-Scale Modeling Framework and Impact, Adaptation, Vulnerability (IAV) Modeling

SC: BER (\$7.8M)

BER will focus on modeling efforts to improve understanding of complex systems dynamics and to enable next generation simulations at the energy-water nexus. BER will develop and test a model integration framework to enhance model interoperability, linking models such as Integrated Assessment Models (IAMs) and energy and other infrastructure models, including the Connected Infrastructure Dynamics Model (CIDM). Efforts will focus on the development and implementation of model couplers, coupling strategies, and scale matching challenges. There will be a major emphasis on improving spatial and temporal scales of the various component models, with a goal of adaptive resolution capabilities to increase computational efficiencies. Fine scale representations are critically important for exploring regional and local stressors, responses, and coupled behaviors at the energy-water nexus. Impacts, adaptations, and vulnerabilities modeling at the nexus requires accompanying expansions of process representations and data sets. Efforts will be designed to accommodate both changing baseline conditions and characteristics of extreme events (e.g., droughts, floods, heat waves). Improvements will enhance insights into coupled system thresholds and tipping points. Thermoelectric system dependencies on cooling water will serve as one initial focus for the IAV work and deeper model development. Broader enhancements will seek to strengthen land representations within IAMs, for example in the Global Change Assessment Model (GCAM). Land cover and land use have critical bearings on energy and water supply and use. The objective will be to take into account a wider range of variables (soils, latitude, topography, etc.).

EERE: Water Power (\$1.0M)

Understanding how reservoirs and water releases through hydropower facilities and other major dams affect water quality in downstream rivers is extremely complicated, but very necessary for modeling the linkages between the nation's energy and water systems, simulating water dependencies and the implications of extreme meteorological events, and identifying potential tipping points or vulnerabilities. There are thousands of hydropower plants and other major dams within the U.S.,

and these facilities can have significant effects on water quality, which in turn can affect aquatic ecosystems and the operations of other energy facilities (like coal and nuclear thermal generating plants). Some effects of hydropower operations can be negative, such as inadequate dissolved oxygen or alterations to the natural pattern of water temperature fluctuations in streams. Other effects of hydropower operations are beneficial, such as the management of reservoir storage to maximize the supply of cool water during hot, dry extremes. Improvements in operational water-quality models can help minimize impacts and could potentially allow hydropower facilities to improve water quality management. All of these issues become more complicated as precipitation, runoff, and temperature patterns change, further affecting generation capacity and power system flexibility. In FY 2017, the Water Program will build on its work in FY 2016 to improve accurate representation of hydropower systems in integrated energy assessment models, with the aim of identifying any significant future water and energy systems-level risks. This work will be closely coordinated with SC and other offices to improve integrated assessment and vulnerability models.

DMA-IAV Strategic Research and Analysis

SC: BER (\$3.5M)

SC will pursue scientific analyses and supporting analytic methodologies to improve understanding of the complex forces that influence and shape evolution of the energy-water system. Forces include land use and land cover change, population/migration, regional economics, evolution of settlements (the built environment and connected infrastructures), energy and related technology developments and deployments, and changes in weather patterns and extremes.

Complementary efforts will focus on development of scenario methodologies. Emphasis will be directed toward multi-scale challenges (e.g., global, national, and regional nesting of scenarios) and techniques for developing consistent, integrated scenarios that take into account the combined forces/factors identified above. SC will also advance regional climate, multi-model inter-comparison methods and downscaling capabilities in coordination with other research agencies, focusing on precipitation and other parameters of particular interest at the nexus. Modest funding will also support research analytic efforts for DOE's role in Interagency Working Groups of the U.S. Global Change Research Program that are presently engaged or seeking to engage in research at the energy-water nexus and on impacts of water cycle extremes.

IA (\$300K)

In collaboration with other nations, IA will pursue a platform incorporating modeling and analysis that enables nations to better understand the effects of water stress on energy systems at multiple scales and the energy footprint of water systems.

DMA-Regional-Scale Data, Modeling, and Analysis Test Beds

SC: BER (\$10.0M)

In FY 2017, SC will design and deploy three regional-scale data, modeling, and analysis test beds. These test beds will accelerate the synthesis of integrated toolsets, identify and capitalize on diverse topical and place-based DMA capabilities, and explore predictive limits and gaps in DMA capabilities for a set of regions and predictive challenges at the energy-water nexus. DOE laboratory-led research teams will be tailored to the unique DMA challenges of each test bed and corresponding set of topics and systems configurations. Each team will include participation from one to several national laboratories and engage and support strategic collaborations with universities. In general, the approach will build on DOE capabilities and leverage, as appropriate, additional assets/capabilities at the federal, state, and local levels. Informed by science community workshops and recent reports that highlight opportunities for test bed designs, selection of topics and regions will focus on water stressed regions and/or areas undergoing rapid change that can benefit from and "stress test" multi-model frameworks built around regional-scale integrated assessment models; multi-sector impact, adaptation, and vulnerability (IAV) models; and connected infrastructure dynamics models. Moreover, the test beds will seek to illuminate various current and possible future mixes of energy supply and demand and the implications of "water for energy" (e.g., thermoelectric cooling) and energy for water (e.g., pumping and treatment); issues surrounding predominantly mountain-fed versus intermittent rain-fed water supplies and co-dependencies and vulnerabilities with groundwater; implications of changing weather patterns and extremes; changing technology insertion opportunities; and implications and challenges for dense settlements (e.g. urban) versus distributed settlements and associated connected infrastructures. The selection of three test beds provides the necessary and sufficient basis to explore different types of integrated systems configurations and sub-regional processes, heterogeneity in regional-scale DMA resources/capabilities, and the analysis of trans-regional intersects, for example involving the electricity grid, oil and natural gas supplies and distribution, watersheds, population

migration, etc. One of the test beds will be designed and developed to be more detailed and robust, paving the way for growth into an Integrated Field Laboratory (IFL) that incorporates observatories and data networks as determined necessary through the initial DMA-focused efforts. This latter test bed, and ultimately the IFL, will serve as a flagship, providing the deepest scientific insights while serving as the central node for the others. As such, it will lead methodology development, for example in integrated test bed design, uncertainty quantification, scenario development, and testing and evaluation.

EPSA (\$1.0M)

EPSA will develop a suite of policy and systems analysis questions underlying, use-inspired dimensions of the testbeds, thereby complementing the basic research focus and questions posed by SC. Topics that will be pursued include 1) the exploration of the interaction among climate regimes, water variability, grid operations, and water utility operations under different carbon emissions pathways and strategies, and the relation to reliability and resilience; 2) resilience and risk reduction options for energy infrastructure under extreme events; 3) impact of water constraints on energy facility siting decisions; 4) the interaction of evolving energy and water markets; and 5) systemic energy implications of emerging strategies to deliver water in water-stressed regions. EPSA will augment the science-driven risk and uncertainty visualization methods developed by SC for its mission-focused applications. In addition, EPSA will develop, test, and apply uncertainty and risk communication methods with testbed communities to support integrated decision-making at the Nexus.

Technology Research, Development, Demonstration, and Deployment (Technology RDD&D)

Technology RDD&D -- Low-Carbon, low-energy, low-cost desalination energy innovation hub

The Department proposes to establish a low-carbon, low-energy, low-cost Desalination Energy Innovation Hub focused on RD&D on new technologies to dramatically lower the cost, energy use, and carbon footprint of water desalination. The Hub will be supported and managed by EERE's Advanced Manufacturing Office (AMO). Next generation desalination is high impact, energy-related RD&D which, if addressed, would provide the technical foundation for significant benefit for society grappling with sustained drought, groundwater depletion, and saltwater intrusion. The Desal Hub will pursue "pipe-parity" with existing water sources and/or treatment and disposal options and will address multiple water uses, including for drinking water and agriculture and multiple water sources such as produced water from oil and gas. Consistent with the criteria for a hub published by DOE's Science Advisory Board, the work within the Hub will span across disciplines and from basic and applied research to development and demonstration. The Hub will provide shared resources for development of foundational scientific understanding, enabling technologies, and testbeds of sufficient scale to demonstrate the technical potential of new desalination technology approaches. Establishment of the Hub will provide a public-private partnership framework for the subsequent scaling of individual desalination technologies. The Hub will also provide a connection point for researchers working on related technologies in water infrastructure, including others supported by complementary investments in DOE. A workshop was held in the fall of 2015 to begin to refine the technical scope for a future Hub through dialog with stakeholders from industry, academic researchers and national laboratories.

EERE: Advanced Manufacturing (\$25.0M)

Through its management of the Hub, the Advanced Manufacturing program will support technical areas such as high-thermal flux and high corrosion resistance heat exchangers from low-cost materials (for example, based on polymers rather than metal alloys); high-volume production of membranes with low cost/area, long lifetimes (>15 years), low propensity for fouling (biological or non-biological), controlled thermal properties (both high and low thermal conductivity), superior transport properties (high flux, high selectivity, low cross-over) and robust chemical and mechanical stability; fabrication of complex flow-field structures for mass transfer with low boundary layer resistance; and materials and structures that cost-effectively enable higher distillation temperatures and therefore more efficient heat utilization while preventing chemical scaling in thermal technologies (currently caused primarily by dissolved calcium and magnesium salts).

Technology RDD&D – Energy-Optimized Treatment, Management, and Beneficial Use of Non-Traditional Waters

EERE: Geothermal Technologies (\$2.0M)

In FY 2017, the Geothermal Technologies program plans to complete prototypes of technologies and processes for low temperature geothermal water desalination in preparation for field demonstration.

EERE: Solar Energy (\$15.0M)

In FY 2017, the Solar Energy program will support applied R&D for the use of low temperature concentrating solar power for desalination.

FE: Crosscutting Research and Analysis (\$9.15M)

In FY 2017, FE Crosscutting Research and Analysis will field test promising technologies and processes for treating water produced by injection of carbon dioxide in deep saline aquifers through a Brine Extraction Storage Test (BEST). This R&D will focus on innovative multi-stage filtration technologies including membrane-based, evaporative, chemical, electrochemical, and biological systems.

Technology RDD&D – Sustainable Low Energy Water Utilities***EERE: Bioenergy Technologies (\$4.0M)***

In FY 2017, the Bioenergy Technologies program will continue R&D for technologies that allow for the conversion of wet waste feedstocks. These technologies include: hydrothermal liquefaction to produce biofuels from biosolids in support of DOE's 2017 and 2022 goals, using biogas as a feedstock to make bioproduct precursors with carbon conversion efficiency above 50%, and exploring new alternatives processes to anaerobic digestion that produce longer chain hydrocarbons that are competitive with existing biopower applications.

EERE: Water Power (\$5.0M)

In FY 2017, the Water Power program will focus on a new initiative to develop and demonstrate innovative technology by investing in demonstrations and performance/reliability testing in partnership with water utilities. This effort will focus on small (i.e. kilowatt to megawatt scale), modular hydropower systems appropriate for recovering excess energy from the nation's thousands of municipal water supply and water treatment systems. National labs will be involved to validate and publish testing results, with the ultimate goal of increasing the confidence of water utility managers in the reliability and economic viability of these new technologies.

IE (\$1.0M)

The Office of Indian Energy Policy and Programs (IE) will work with tribal stakeholders and their utility service providers to identify priorities and provide technical assistance. The Office will convene collaborative processes aimed at integration of innovative technologies and approaches that improve energy efficiency of drinking water and waste water systems on tribal lands. The Office will also competitively fund a small number of demonstration projects.

Technology RDD&D –Water-Efficient Cooling for Electricity Generation***FE: Crosscutting Research and Analysis (\$5.65M)***

In FY 2017, FE will pursue research on increased efficiency in heat exchangers for plant cooling and support development of second-generation and transformational cooling systems.

Policy Analysis***EPSA (\$1.0M)***

EPSA's policy analysis will draw upon and inform work in DMA and Technology RDD&D. The foundation of the policy analysis is a set of systems analyses addressing water and energy flows, energy infrastructure and technology deployment, energy and water systems operations, market analysis and finance, and regulations at multiple scales. EPSA will continue to develop relevant and appropriate policy scenarios that bridge between energy and water domains at the federal and state level that incorporate potential energy technology deployment trajectories and societal developments. Additional efforts will analyze energy system resilience under water constraints and also examine key federal, state, and local policies that affect energy system resilience under variable water conditions. EPSA will continue to identify and implement opportunities to leverage existing energy and water infrastructure investment programs, such as State and Tribal Assistance Grants, State Energy Programs, and the Water Infrastructure Finance Center. Efforts will also be directed toward region-specific analyses of the regulatory, economic, and market aspects of thermoelectric cooling and sustainable water utilities. Similar efforts will

be devoted to the topics of desalination and treatment of produced water from oil, gas, geothermal, carbon underground storage, and other sources.

Outreach and Stakeholder Engagement

EPSA (\$100K)

Engaging with stakeholders of all types and at all levels is critical in understanding the relevant science, technology, business, and policy landscapes. Stakeholder engagement will inform and be informed by DMA, technology RDD&D, and policy analysis. EPSA's objectives in this area include 1) informing and effectively utilizing data, models, and analysis; 2) informing technology specifications and improving the direct impacts of potential RDD&D investments; 3) informing and communicating policy analysis and design; 4) developing collaborative relationships at the state, local, tribal, and private sector levels in order to achieve constructive results. The proposed work includes targeted workshops hosted collaboratively with universities, State Energy Offices, and regional stakeholders.

IA (\$100K)

IA will pursue strategic international collaborations balanced between targeted bilateral projects that connect to DOE's overall R&D agenda and multilateral initiatives. The collaborations will build on extensive relationships with international stakeholders in recognition that the energy-water nexus is a global issue with ubiquitous data, modeling and analysis; technology RDD&D; and policy analysis interests. Collaboration with other nations gives the U.S. the opportunity to share resources to address shared issues.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Convened a series of six Secretarial roundtables soliciting broad input on different aspects of the energy-water nexus, including fuels, water infrastructure, electricity, and systems integration. These roundtables have informed Departmental prioritization of current and future work.
- Created a new modeling capability to balance water supplies within the GCAM integrated assessment modeling framework. This capability allows analysis of how constraints on supplies will interact with evolving energy and agricultural demands.
- Made a major advance within the Integrated Global Systems Model to incorporate water quality, with important implications for projecting water temperature and its implications for power plant cooling.
- NREL has developed a series of maps highlighting geothermal resource quality and the availability of multiple types of water (fresh surface water, fresh groundwater, municipal wastewater, brackish groundwater) that could be used in geothermal operations at a high spatial resolution (USGS HUC-8 regions).
- In FY 2015, the Bioenergy Technologies program initiated a resource assessment to identify the availability and geographic distribution of wet waste streams, including biosolids, animal wastes, residential and commercial food wastes, organic industrial wastes and wastewaters, as well as biogas produced from any of these sources.

FY 2016 Planned Activities

- Convened workshop to begin scoping the Desalination Hub.
- Developments to tune temporal and spatial resolution of models including GCAM to better characterize water supply, water allocation and storage, linkage of land use to river basin characteristics, and water technology options.
- Conduct a series of interagency workshops to advance ideas and plans for a multi-scale, multi-sector modeling framework for the energy-water nexus and strongly coupled impacts, adaptations, and vulnerabilities.
- Develop the initial scope and conceptual design for the layered energy resilience data knowledge framework through an inter-laboratory development meeting and a subsequent workshop to assess the broader research and analytic needs of various user communities.
- Create a coordinated plan for the conceptual framework, criteria, and path forward for Regional-Scale Data, Modeling, and Analysis Test Beds, building around and synthesizing from foundational DMA FY 2016 funded focus areas and investments that lays the foundations for a competitive FOA.
- Develop the scientific foundations for a focused set of sub-regional scenarios of the United States, linking various data layers, including regional economics, demographics, land use and land cover, energy, and water.

- Complete initial studies on the implications of climate impacts on the resilience of the US power system due to changes in air and water temperatures and water availability using a reduced form power plant modeling capability.
- Develop technologies and processes for treating water produced by injection of carbon dioxide in deep saline aquifers.
- Incorporate results from ANL and NREL's integrated assessment and life cycle analysis of geothermal water use into the Geothermal Vision Study
- Field prototype of advanced energy-efficient hybrid membrane system for industrial water reuse.
- Build off of the Bioenergy Technologies program's workshop series from FY 2015 to produce a waste-to-energy (WTE) roadmap, including quantitative targets for at least two pathways, which will in turn inform R&D directions in FY 2017.

FY 2017 Key Objectives

- Launch Desalination Hub.
- Initiate build-out of the first stage of the layered energy resilience data-knowledge system focused initially on diverse DOE data layers and a small but critically important set of other agency data layers.
- Conduct initial evaluation of a leadership-class multi-system, multi-scale modeling framework for IAV modeling at the Nexus, working closely with a broad coalition of interagency partners led through a DOE initiated subgroup of the Interagency Group on Integrative Modeling.
- Reduce power plant consumption of water and provide options for use of nontraditional waters/fluids.
- Complete design, select topics and regions, engage various federal, state, and local research partners, and compete competitive awards to begin deployment of three to four regional-scale DMA test beds, including one leading test bed that can eventually evolve into an Integrated Field Laboratory.
- Complete testing of desalination prototypes at INL, LBNL, and NREL and prepare for field demonstrations.

Exascale Computing Initiative (ECI)
($\$K$)

FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
\$149,000	\$149,000	\$252,624	\$285,000

Overview

Since the beginning of the digital era, the U.S. federal government has made pivotal investments in the computer industry at critical times when progress was stagnating. We are once again at a critical turning point in high performance computing (HPC) technology, where industry innovations in hardware and software architectures are driving advances in computer performance, but those advances are not necessarily benefiting the DOE science and engineering application codes because the technological advances may not be optimized for low-volume HPC uses, which tend to be more floating-point and memory intensive than many high-volume commercial uses. Furthermore, 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 from other sources. Providing tools for solving these and future problems requires exascale capabilities.

Failure to engage industry in satisfying our science and big data needs will open the door to other nations with demonstrated commitment to HPC investment to take the lead not only in high-end computing but also eventually in science, national defense, and energy innovation, as well as in the commercial computing market. If the U.S. defers to other nations the lead in HPC technology, the risks could include being subject to potential export controls exerted by these nations, as well as unacceptable cyber-security and computer supply chain risks. To archive the exascale goal, the U.S. government must actively engage industry in HPC technology development, because the directions driven by market forces will not achieve all national goals. Past partnerships between the U.S. government and industry have led to the development of highly innovative, beneficial technologies and the incorporation of them into product lines in ways that adherence to solely market forces would have precluded.

On July 29, 2015, President Obama established the National Strategic Computing Initiative (NSCI) to maximize the benefits of HPC for U.S. economic competitiveness, scientific discovery, and national security. DOE will be a lead agency within NSCI, with the Office of Science (SC) and the National Nuclear Security Administration (NNSA) responsible for executing a joint program focused on advanced simulation through a capable exascale computing program, which will emphasize sustained performance and analytic computing to advance DOE missions. As a lead agency, DOE will also work with other agencies—some doing more foundational research, and others more purely application-oriented work—to support the objectives of the NSCI and address the wide variety of needs across the Federal Government. The NSCI objectives and the associated scientific grand challenges define a mission need for a computing capability of $2 - 10$ exaflops ($2 - 10 \times 10^{18}$ floating-point operations per second) in the mid-2020s.

Investment in exascale computing also supports the DOE Strategic Plan 2014-2018 Strategic 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. DOE will continue to pursue scientific discoveries that lay the technological foundation to extend our understanding of nature and create new technologies that support DOE’s energy, environment, and security missions. Areas of concentration include: Advanced scientific computing to analyze, model, simulate, and predict complex phenomena, including the scientific potential that exascale simulation and data will provide in the future.”

In the FY 2016 DOE Stockpile Stewardship Management Plan, Secretary of Energy Ernest Moniz declared that “joint investments by DOE’s Office of Science (SC) and NNSA in achieving exascale computing will directly support modeling and experiments as part of NNSA’s stockpile stewardship program, while helping to ensure continued U.S. leadership of this critical capability.” As such, SC and NNSA will jointly collaborate on the Exascale Computing Initiative (ECI), which is an important subset of the NSCI, involving close coordination of future and relevant existing programs. Through a coordinated pursuit by government, industry, and academia, the key exascale challenges are: parallelism, system reliability, energy

efficiency, and memory and storage. The ECI's goal is 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. The planned systems would provide a one-hundred-fold increase in sustained performance over today's computing capabilities and enabling applications to address next-generation science, engineering, and data problems in support of DOE missions.

Over the past several years, DOE has become aware that future-generation systems will require significant changes in how high performance computers are designed and developed. The new designs proposed by industry to address the growing need for energy efficiency will result in massive parallelism, down to the processor level, which the HPC user community has never experienced before. We have reached a point where the continued improvement in processing performance requires breakthroughs to resolve the Von Neumann memory bottleneck, reducing power consumption, and solving unique problems of computing at unprecedented scales. As a consequence, the Department's approach to overcoming HPC technology challenges is aimed not simply at realizing a single, albeit exceptional, computing performance objective, but rather at setting the U.S. on a new design trajectory to support a broad spectrum of capabilities over the succeeding years.

The business-as-usual investment pathway for developing the next-generation computers will not provide sufficient impetus to influence and steer U.S. industry through the impending inflection point on the pathway of increasing HPC computing power. The inflection is in the pace of HPC upgrade, which traditionally has been obtained in silicon technology at the pace of Moore's law. That pace is now scheduled to decrease because limits in silicon are now projected after exascale is achieved. Although the computing industry will respond to the challenges posed by this inflection point, its approach will be aimed at near-term solutions, which are inadequate to resolve the challenges DOE faces. Consequently, business-as-usual will contribute to the decline in U.S. leadership in this important area and hinder the nation's ability to advance its scientific, engineering, and national defense missions. Addressing this national challenge requires a significant investment by the Federal government involving strong leadership from Department headquarters and close coordination by government, national laboratories, industry, and academia.

Concurrent research and development in applications that will optimally exploit these emerging new exascale computing architectures is a critical component of a federally funded effort in exascale computing. These "extreme-scale" applications, i.e., applications enabled by exascale computing, must address the full spectrum of computing, including terascale and petascale as well as the targeted exascale applications. They should include those that support nuclear weapons stockpile stewardship, scientific discovery, energy technology innovation, renewable electrical generation and distribution, nuclear reactor design and longevity, data assimilation and analysis, and climate modeling. SC and NNSA have already initiated research and development (R&D) efforts in extreme-scale development of key mission applications. In FY 2017, these two offices will pursue greater engagement with the applied energy offices, to provide leadership and assist with the enabling of the next generation of important applications for applied energy problems.

The exascale development plan is organized around four technical focus areas: 1) Application Development, which will target specific R&D activities and outcomes that address critical DOE missions applications; 2) Software Technology, with efforts that span low-level operational software to high-level applications software development environments, including the software infrastructure to support large data management and workflows; 3) Hardware Technology, which supports vendor-based R&D efforts; and 4) Exascale Systems, which includes activities needed to support final advanced system engineering development and the acquisition and deployment of prototypes. Efforts in the latter focus area will not begin until FY 2018.

Highlights and Major Changes in the FY 2017 Budget Request

In FY 2017, DOE proposes to expand significantly its efforts in the first three technical focus areas:

Focus Area 1: Application Development

- Exascale Co-Design Centers, exploratory research to co-design, with industry, hardware and software architectures for a set of DOE mission-relevant applications;
- Readiness to Utilize "Capable" Exascale Systems, initiating the development of a suite of exascale applications software packages to ensure maximal scientific and engineering impact of the exascale systems. Three application development efforts that will be continued in FY 2017 are: Stockpile Simulation, Climate Modeling and next-generation software for simulations of Functional Materials.

Focus Area 2: Software Technology

- Software Technology Research and Development, aimed at developing the many necessary, complex exascale software technologies, including programming environments, scientific data management, software productivity and resilience, libraries and frameworks.

Focus Area 3: Hardware Technology

- Hardware Research and Development, to be conducted by computer vendors, aimed at developing exascale node and system architectures.

In FY 2017, the Office of Science portion of the ECI is segregated into the Office of Science Exascale Computing Project (SC-ECP) within a new Exascale Computing subprogram in ASCR and the domain-specific software development in the Biological and Environmental Research and Basic Energy Sciences programs. The SC-ECP funding supports only those activities required for the delivery of exascale computers and associated crosscutting applications.

**Exascale Computing
Funding by Appropriation and Program
(\$K)**

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

**Exascale Computing Initiative
FY 2017 Funding by Focus Area
(\$K)**

	Focus Area 1: Application Development	Focus Area 2: Software Technology	Focus Area 3: Hardware Technology	Focus Area 4: Exascale Systems	Total
Science					
Advanced Scientific Computing Research (SC-ECP)					
Basic Energy Sciences	31,000	54,000	69,000	---	154,000
Biological and Environmental Research	26,000	---	---	---	26,000
Total, Science	67,000	54,000	69,000	---	190,000
NNSA					
Advanced Simulation and Computing: Advanced Technology Development and Mitigation	31,000	34,000	30,000	---	95,000

Total, Exascale Computing Initiative	98,000	88,000	99,000	---	285,000
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Program Roles

Departmental Collaboration

SC and NNSA have a long track record of successfully executing large, technically complex scientific projects. The ECI will be organized as a project and will be executed within a tailored framework that follows DOE Order 413.3B, which defines critical decision points, overall project management, and requirements for control of a baselined schedule and cost. A single federal official will have overall responsibility for execution of the project, will report to the cognizant DOE Headquarters program offices (SC and NNSA), and will be accountable to an Acquisition Executive, as defined in 413.3B. Project execution will be governed by a baselined schedule and cost envelope, and will follow the defined processes for change control and management of contingency once the performance baseline for ECI is established.

Because of the breadth and complexity of the research and development of the applications, software environment and hardware technologies, along with the deployment of usable exascale computers for DOE, an Integrated Project Team (IPT) will be established through an IPT charter with defined roles and responsibilities. The IPT will support the federal official, who will lead the IPT through the lifetime of the project.

Focus Area 1: Exascale Application Development

SC: ASCR (\$31M)

As part of the SC-ECP project, ASCR will leverage its existing programs to develop applications in this focus area. ASCR has ongoing programs in applied mathematics and computer science, expertise in algorithms and methods, and scientific software tools and libraries to advance scientific discovery through modeling and simulation. The development of these tools and resources by ASCR supports applications on computational systems, such as those existing and planned for at the Oak Ridge and Argonne Leadership Computing Facilities, and the National Energy Research Scientific Computing Center.

SC: BES (\$26M)

BES will be responsible for determining the scope and management of the development of next-generation software for Functional Materials that is included in this focus area. The Computational Materials Science and Chemistry workshop, conducted in July 2010, identified a number of materials science challenges for future exascale computing resources, including: 1) new catalysts to improve the efficiency of industrial processes, make effective use of bioenergy, and drive energy conversion and environment mitigation processes; and 2) developing better models of photovoltaic processes and improving the efficiency of photovoltaic devices. While the U.S. is a leader in the development of computational chemistry codes such as GAUSSIAN, GAMESS, and NWChem, the transition to predominantly massively-parallel computer platform challenges U.S. leadership in this area. Through its Computational Chemical Sciences program, BES will develop open-source modular software tools that can be reused as plug-and-compute tools for the basic energy science community to predict, model and solve complex chemical problems. The best chemical simulation codes are currently unable to efficiently use more than one percent of the processors available on existing leadership computers for quantum chemical calculations. Advances in computational methods are particularly important to the chemistry-based energy sciences, as such systems form the molecular building blocks for catalysts, gas-separation technologies, and natural and artificial photosynthesis.

SC: BER (\$10M)

BER will be responsible for determining the scope and management of next-generation Climate Modeling software that is included in this focus area. Climate modeling science requires resolution of atmospheric and terrestrial processes across multiple time and length scales to predict how phenomena such as aerosols, clouds, precipitation, ecosystems, and Arctic tundra will shift with climate. Energy and infrastructure planning will require precise projection of temperature exceedances, water availability, sea-level rise, storm likelihood, and crop potentials. The Extreme Challenges workshop series and the July 2007 Advanced Scientific Computing Advisory Committee Subcommittee report on Exascale climate science articulated the need to understand the dynamic ecological and chemical evolution of the climate system, with quantification of the uncertainties in the impacts on regional and decadal scales.

NNSA: ASC (\$31M)

NNSA will be responsible for determining the scope and management of the Stockpile Simulation application development that is included in this focus area. Confidence in the safety and reliability of the nuclear weapons stockpile relies on high-fidelity simulations of all of the physical processes occurring within a nuclear weapon and the processes that support the design, production, maintenance, and evaluation of the nuclear arsenal, including life extension programs and weapons dismantlement. The ASC integrated design codes (IDCs) model various aspects of nuclear weapons and each have several million lines of code to accurately reflect the multi-scale, multi-physics phenomena occurring in a nuclear weapon. The accuracy of these IDCs underpins confidence in the U.S. nuclear deterrent and must be improved to ensure continued future confidence in the nation's stockpile. Exploiting the multi-level parallelism demanded by emerging architectures leading to exascale requires significant investment for new stockpile simulation code development over the next 7-10 years. This funding will extend the development of next-generation integrated weapons design codes and the full basis set of codes to include needs for specific materials, high explosives, and for inertial-confinement-fusion and equations-of-state data. These activities will require support for additional co-design teams, as well as increased support for the existing teams that currently conduct annual assessment activities for the suite of nuclear weapons missions.

Focus Area 2: Software Technology

SC: ASCR (\$54M)

As part of the SC-ECP project, ASCR will focus on developing and implementing an expanded and vertically integrated software stack to achieve the planned ECI objectives that provide advanced programming models and extreme-scale system management for use with the new exascale architectures. The Software Technology focus area will provide the required software that effectively bridges between the other focus areas of the ECI. The Software Technology focus area is divided into five subcomponents: programming and system software, data management and workflows, libraries and frameworks, data analytics and visualization, and resilience and integrity. Within the first four years of the SC-ECP, which formally starts in FY 2016, the software technology effort will identify and support the research and development needed to either extend current technologies or conceive new approaches necessary to allow application developers to develop next-generation highly parallel applications that can fully utilize exascale architectures and that are resilient to hardware faults. The following approximately six years will be devoted to development, testing, and production hardening of these software technologies for use in the delivered exascale systems.

NNSA: ASC (\$34M)

Since the late 1990s, NNSA has a track record of successfully executing large, technically complex computational projects. The ASC program office will apply its management and technical expertise to the exascale computing challenge. Where appropriate, ASC will make strategic investments to directly support its stockpile stewardship code development requirements. Funding will support development of math libraries for the NNSA suite of integrated design codes that are aligned with the algorithms and approaches used in the codes. This focused research is needed to optimize the performance of the algorithms within the overall simulations that are the most time demanding or require highest control of precision in numerical approximations.

Focus Area 3: Hardware Technology

SC: ASCR (\$69M)

As part of the SC-ECP project, ASCR will support the Hardware Technology focus area, providing funds to support research and development to deliver node-level and system-level hardware architectures through targeted investments in advancing vendor-based technologies. The role of the hardware technology effort within ECI is to both advance promising off-roadmap technology options and to generate quantitative information about performance and cost trade-offs to support decisions by application development teams and the vendors' development for the future exascale systems. The Hardware Technology activity will invest in multiple vendors' node and system architecture research and development to ensure that DOE application requirements are factored into the design of the future computing components and exascale system and to reduce project risk by ensuring architectural diversity in the final exascale systems. SC and NNSA will jointly determine which projects will be funded under this focus area and will select the performers best capable to deliver. Enabling DOE to overcome the identified exascale barriers and to ensure that the computer industry can provide exascale computer systems by the mid-2020s requires this significant investment.

NNSA: ASC (\$30M)

NNSA has a long track record of successfully executing large, technically complex computational projects. The ASC program office will apply its management and technical expertise to the exascale computing challenge. SC and NNSA will jointly determine which projects will be funded under this focus area and select the performers. Where appropriate, ASC will make strategic investments to directly support its stockpile stewardship code development requirements, such as scalable and high-performance interconnect technologies, memory hierarchies and burst buffers.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Released the document, “Preliminary Conceptual Design for an Exascale Computing Initiative”.
- Initiated the DesignForward2 program. The goal of this program is to fund computer vendors to develop conceptual designs for an exascale computer, including modeling of important system characteristics.
- Initiated a program to perform research on Resilience for Extreme-Scale Supercomputing Systems.
- Completed the ECI performance baseline.
- Announced the ANL system under the CORAL procurement.
- Developed and initiated a plan to gather detailed hardware and software requirements for SC program offices for future computing resources.
- Continued application portability activities to prepare for FY 2016-FY2017 planned upgrades to SC facilities.

2016 Planned Activities

- Formally start the DOE Exascale Computing Initiative.
- Initiate the first set of ECI projects in the areas of software technologies, vendor R&D and co-design centers.
- Initiate the first set of ECI Application Development projects.
- Initiate greater engagement with the applied energy offices.
- Initiate interaction with other U.S. agencies to establish co-design centers for their application areas of interest.
- Complete requirements gathering activities with SC program offices.
- Deploy Cray/Intel upgrade at LBNL and at ANL
- Achieve approval of Mission Need statement at Critical Decision 0;
- Achieve approval of the Exascale Computing project acquisition strategy, alternatives analysis and the next version of the Conceptual Design at Critical Decision – 1.

FY 2017 Key Objectives

- Initiate the additional ECI projects in the areas of software technologies, vendor R&D and co-design centers.
- Initiate the additional ECI application development projects.
- Finalize site preparations activities for CORAL upgrades.

Grid Modernization Initiative

(\$K)			
FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
190,144	185,852	295,447	378,530

Overarching Goal Statement

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.

Objectives

The grid of the future must have the following attributes:

- Resilient - Quick recovery from any situation or power outage;
- Reliable - Improves power quality and fewer power outages;
- Secure - Increases protection to our critical infrastructure;
- Sustainable - Facilitates broader deployment of clean generation and efficient end use technologies;
- Flexible – Responds to the variability and uncertainty of conditions at one or more timescales; and
- Affordable – Maintains reasonable costs to consumers.

Program Areas

The Grid Modernization Initiative (GMI) addresses three broad areas including:

1. **Technology (i.e., hardware):** Develop and demonstrate technologies for better measurement (e.g., sensors), integration (e.g., inverters), management and control of grid operations (e.g., transformers).
2. **Modeling and Analysis (i.e., software):** Develop and disseminate new and improved models for analysis, management, and optimization of grid performance (e.g., solar and wind prediction).
3. **Institutional and Business:** Develop the analytical methodologies and frameworks for improving business models that can deliver to consumers the value and benefits of grid modernization.

The Nation's electric grid is a broad patchwork of ownership, operation, and oversight:

- **Ownership:** Ownership of assets is distributed among Federal agencies (DOE's Power Marketing Administrations and the Tennessee Valley Authority); state, interstate, and municipal entities; customer-owned cooperatives; and investor-owned entities.
- **Operations:** Operations of the grid, including dispatch of generation, are managed by the owner entities of the grid individually or through regional transmission organizations (RTOs) and Independent System Operators (ISOs).
- **Services:** Terms and conditions of services, including wholesale pricing in interstate commerce, are regulated by the Federal government through the Federal Energy Regulatory Commission (FERC). Intrastate services are subject to state regulation (public utility commissions).
- **Reliability and Security:** The reliability and security of grid operations is overseen by FERC, through the National Electricity Reliability Organization (NERC), and regional reliability organizations.
- **Investment Planning:** Identification of new investment needs and planning for new asset investments involve all of the above entities as well as Federal and state environmental regulatory agencies that are responsible for ensuring that new investments meet environmental standards.

Need for Federal Role

The Federal Government has a critical role to play within this complex institutional framework. In particular, DOE plays a significant role in:

- Cost-sharing research, development, demonstration, and deployment (RDD&D) to accelerate the pace of technological innovation, especially where market fragmentation impedes the ability to individual entities to capture the value of investments.
- Providing technical assistance drawing upon unique technical capabilities of the National Laboratories.

- Overcoming information gaps and imperfections that otherwise cause market inefficiencies.
- Providing funding to states and multi-state entities to facilitate deployment of innovative grid technologies and strategies
- Convening stakeholders in unbiased and meaningful dialogue on key issues.
- Developing and advocating appropriate federal policies, working with FERC, other Federal agencies, the Administration, and Congress.

GMI Implementation Strategy

We will achieve these objectives through a broad array of interconnected actions including:

- Implementation of a comprehensive, multi-disciplinary R&D program managed through a consortium of the National Laboratories and cost-shared with non-Federal partners focused on six technical areas:
 - Institutional Support;
 - Design and Planning Tools;
 - System Operations, Power Flow, and Control;
 - Sensing and Measurement;
 - Devices and Integrated System Testing; and
 - Security and Resilience.
- Development of new models and analytical tools, working with the National laboratories, universities, and industry.
- Implementation of regional demonstration projects that apply new technologies and tools adapted to unique regional circumstances.
- A structured program of stakeholder engagement to disseminate information and share ideas.
- Participation as an expert advisor in various policy and regulatory fora.

Departmental Collaboration

DOE proposes to support grid modernization through a multi-year collaborative initiative involving public and private sector energy stakeholders including utilities, regulators, developers, NERC, the Electric Power Research Institute, and many others. This will be funded by the Offices of Electricity Delivery and Energy Reliability (OE), Energy Efficiency and Renewable Energy (EERE), and Indian Energy Policy and Programs (IE), and will be carefully coordinated with the Office of Energy Policy and Systems Analysis (EPSA).

- **OE** helps enable the grid to use all available energy sources to serve all loads while meeting climate, security, reliability, resiliency, safety, and affordability objectives, and provide overall management of DOE's Grid Modernization efforts.
- **EE** works to enable energy efficiency, renewable power, and sustainable transportation technologies to be integrated into the grid in a safe, reliable, and cost-effective manner.
- **IE** works with tribal stakeholders and their utility service providers to identify issues and priorities, provide technical assistance, convene collaborative processes aimed at integration of innovative technologies and approaches in grid modernization, and competitively fund a small number of demonstration projects.
- **EPSA** provides rigorous analysis, robust stakeholder engagement, and recommendations for policy options that support the public interest in efficient markets, clean reliable energy, and modernization of the Nation's energy systems.

Highlights and Major Changes in the FY 2017 Budget Request

There are significant changes in the Grid Modernization Initiative budget request. Each individual program budget has defined these, but those that most directly impact the grid crosscut and provide critical links to other program areas include jointly-funded topic areas and demonstrations.

Jointly-Funded Activity Topics: These are crosscutting projects that address priorities across multiple offices and address critical areas defined in the GMI Multi-Year Plan. Areas of focus across the six technical areas include:

Devices and Integrated System Testing

- Standards and Testing Procedures Development: Update and consolidate existing standards for interconnection and interoperability, and define testing procedures for each.
- Device Characterization for Cyber and Grid Services: Develop and publish consistent procedures for characterization of grid-connected generation, transmission, distribution, storage, and end use devices.

Sensing and Measurement

- Communications Strategy/Roadmap: Develop new methods for secure, interference-robust shared spectrum wireless communications technologies to accelerate the incorporation of low-cost wireless sensors.
- Multi-Scale Sensor Development: Develop and demonstrate the use of advanced low-cost sensors for buildings, distribution systems, and transmission assets that are reliable during transient and steady-state operations.
- Data Analytics for Grid Management: Develop real-time streaming analytics and machine learning paradigms that acquire heterogeneous sensor data and analyze and predict dynamic behavior for grid visibility.

System Operations, Power Flow, and Control

- Architecture and Control Theory: Develop a consensus-based grid system architecture framework that will reduce impediments to improving grid flexibility and resilience.
- Multi-Scale Integration of Control System Platforms (Energy Management System (EMS)/Demand Management System (DMS)/Building Management System (BMS)): Develop and validate open standards and to coordinate and integrate currently separated management systems for bulk power, distribution systems, and buildings.

Design and Planning Tools

- Coupled Dynamic Transmission, Distribution and Communications Platform: Develop integrated dynamic modeling and simulation tools across transmission, distribution, and communications for evaluation and design for system stability.
- HPC Platform Infrastructure: Create and distribute new scalable libraries of algorithms, solvers, statistical modules, and analytic applications to take advantage of new technologies such as cloud computing, high performance computers (HPCs), multi-core and graphical processing unit (GPU) processors, and data analytics architectures.

Institutional Support

- Technical Assistance to States: Provide technical support to states and regions including guidance on how to consider non-wires alternatives, distributed energy resources, and advanced grid components and systems.

Security and Resilience

- Establish security solutions that recognize, predict, isolate and respond to threats and hazards, regardless of cause, allowing the stabilization of disturbances and/or graceful degradation of non-critical functions at the local level while maintaining a global optimum in performance.

Demonstrations: The GMI effort will demonstrate clean, resilient distribution feeders; balancing areas with lean reserve margin grid operations; and improved planning tools. Demonstrations will be based on active regional engagement starting in FY 2015 and FY 2016 to ensure the demonstration projects will be address regional needs. Demonstration projects will co-optimize across multiple grid attributes including affordability, security, resilience, reliability, and integration of clean technologies. By their nature, demonstration projects will cut across all six technical areas.

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
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Departmental Administration

Energy Policy and Systems Analysis	---	---	1,000	1,000	---
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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	---		5,000	15,000	+10,000
National Electricity Delivery	6,000	6,000	7,500	6,500	-1,000
State Distribution-level Reform Program	---		---	15,000	+15,000
Electricity Delivery and Energy Reliability Total	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: Facilities Management	30,000	30,000	36,000	36,000	---
Hydrogen and Fuel Cell Technologies: Hydrogen Fuel R&D	---	---	3,000	5,000	+2,000
Hydrogen and Fuel Cell Technologies: Technology Validation	1,500	1,500	2,000	---	-2,000
Solar Energy: Systems Integration	27,894	27,086	52,447	83,000	+30,553
Solar Energy: Balance of Systems Soft Cost Reduction	---		---	10,000	+10,000
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
Energy Efficiency and Renewable Energy Total	76,444	75,226	124,947	189,730	+64,783

Indian Energy Policy and Programs

Tribal Energy Programs: Tribal Energy Grant Program	---	---	500	1,000	+500
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Grid Modernization Total	190,144	185,852	295,447	378,530	+83,083
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Grid Modernization
FY 2017 Funding by Pillar (\$K) (Base)

	Institutional Support	Technology Innovation				Security and Resilience	Total
		Design and Planning Tools	Systems Operations, Power Flow, and Control	Sensing and Measurement	Devices and Integrated System Testing		
Departmental Administration							
Energy Policy and Systems Analysis	1,000	---	---	---	---	---	1,000
Electricity Delivery and Energy Reliability							
Clean Energy Transmission and Reliability: Transmission Reliability	---	1,500	4,300	6,500	---	---	12,300
Clean Energy Transmission and Reliability: Advanced Model Grid Research	---	4,000	5,600	2,400	---	---	12,000
Clean Energy Transmission and Reliability: Energy Systems Risk and Predictive Capability	---	2,600	---	---	---	3,400	6,000
Smart Grid	2,550	10,950	9,400	---	6,100	1,000	30,000
Cybersecurity for Energy Delivery Systems	---	---	---	---	---	45,500	45,500
Energy Storage	2,600	5,900	14,800	---	21,200	---	44,500
Transformer Resilience and Advanced Components	---	---	8,000	2,000	2,000	3,000	15,000
National Electricity Delivery	6,500	---	---	---	---	---	6,500
State Distribution-level Reform Program	15,000	---	---	---	---	---	15,000
Electricity Delivery and Energy Reliability Total	26,650	24,950	42,100	10,900	29,300	52,900	186,800
Energy Efficiency and Renewable Energy							
Building Technologies: Emerging Technologies	3,434	2,534	2,533	4,533	9,533	2,433	25,000
Facilities and Infrastructure: Facilities Management	---	---	---	---	36,000	---	36,000
Hydrogen and Fuel Cell Technologies: H2 Fuel R&D	500	---	500	1,000	3,000	---	5,000
Solar Energy: Systems Integration	10,312	10,212	14,312	24,313	19,312	4,539	83,000
Solar Energy: Balance of System Soft Cost Reduction	10,000	---	---	---	---	---	10,000
Vehicle Technologies: Vehicle Systems	2,613	2,613	2,763	2,993	4,505	2,513	18,000
Wind Energy: Mitigate Market Barriers	1,630	2,300	3,000	1,500	2,300	2,000	12,730
Energy Efficiency and Renewable Energy Total	28,489	17,659	23,108	34,339	74,650	11,485	189,730
Indian Energy Policy and Programs							
Tribal Energy Programs: Tribal Energy Grant Program	1,000	---	---	---	---	---	1,000
Grid Modernization Total	57,139	42,609	65,208	45,239	103,950	64,385	378,530

Program Roles

Institutional Support

This technical area provides technical assistance to key decision-makers so they can address the high priority grid modernization challenges and needs identified by electric power industry stakeholders. It gives particular emphasis to working with state policymakers and regional planning organizations, with support for both analysis of issues and creation of information for stakeholders. Analytic, non-prescriptive workshops and facilitator-led dialogues among stakeholders can build agreement around the value of transforming the grid and the best ways to do that using technology, regulatory, and market tools that meets the unique needs of every region. DOE has already built strong relationships with many institutional leaders through two decades of investments in collaborative work on envisioning the future grid, developing regulatory and planning initiatives, coordinating national action plans for energy efficiency and demand response, and extensive efforts to create regional collaboratives for region-wide resource modeling and planning.

Specific activities include:

- Providing technical assistance to states and tribal governments
- Supporting regional planning and reliability organizations
- Developing methods and resources for assessing grid modernization: emerging technologies, valuation, and markets
- Conducting research in conjunction with states on future electric utility regulations

Energy Policy and Systems Analysis (\$1.0 million)

EPSA has ongoing projects that review and analyze electricity modernization initiatives across technology development, policy and institutional arrangements. These include, but are not limited to, assessments of the impacts of changing generating resource portfolios; trends in state and local policies for grid modernization; policy coordination across jurisdictional lines; transmission system operations and planning; and, distribution system evolution and its impact on system reliability/resilience, sustainability, competitiveness and valuation. EPSA further supports grid modernization initiatives by assessing the implications of technology and policy developments on network operations and resource integration.

Electricity Delivery and Energy Reliability

Smart Grid Research and Development (\$2.6 million)

- Conduct a series of multi-stakeholder workshops in support of the Grid Modernization Initiative's Multi-Year Program Plan, focused on understanding the technical challenges associated with emerging grid modernization policies.
- Facilitate cross-agency coordination and collaboration through the congressionally mandated Federal Smart Grid Task Force.
- Complete development of valuation framework for transactive energy services.

Energy Storage (\$2.6 million)

- The Energy Storage program will collaborate with utility regulators to develop analytic tools and uniform model standards for energy storage that can accommodate regional diversity.
- Analytical models will include risk attributes of energy storage along with primary, secondary, and tertiary value-stream recognition.
- In addition, the program will work with standards bodies to facilitate the adoption of energy storage codes and standards related to safety and performance.

National Energy Delivery (\$6.5 million)

- Focus on assistance to states, regions, and tribes providing analytical tool development for grid future scenarios as well as technical assistance.

State Distribution-level Reform Program (\$15.0 million)

- Provide technical assistance to the states that are currently leading the reform of the regulatory frameworks for their distribution sectors, and make such assistance available to other states that are considering whether, when, or in what manner to undertake similar reforms.

Energy Efficiency and Renewable Energy

Building Technologies Program (\$3.4 million)

- The Building Technologies Program will work in partnership with utilities and regulators to provide information on the deployment of technologies utilizing transactive energy.

Hydrogen and Fuel Cell Technologies Program (\$0.5 million)

- This Program will provide information to utilities and regulators regarding the impact of fuel cells and electrolyzers deployed on the grid.

Solar Energy Program (\$20.3 million)

- The Solar Energy Program will provide information to utilities and regulators regarding the impact of solar technologies deployed on the grid.
- Solar Market Pathways Funding Opportunity Announcement (FOA) targeting utility-government-business partnerships (\$10.0 million): Utilities and regulators impact every single solar deployment. Working in partnership to improve stakeholder economic analysis and business modeling tools for solar deployment ensures that they are well positioned to support the expanded deployment of solar in the near-and long-term.

Vehicle Technologies Program (\$2.6 million)

- The Vehicle Technologies Program will engage with utilities and other stakeholders to identify and value services Plug-in Electric Vehicles (PEVs) may provide to the electric grid.

Wind Energy Program (\$1.6 million)

- The Wind Energy Program will work in partnership with utilities, regulators, and other stakeholders to provide relevant information on the deployment of wind technologies.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Indian Energy Policy and Programs

Tribal Energy Grant Program (\$1.0 million)

- Indian Energy will support technical assistance and outreach to tribal entities, as well as small distributed and micro grid technology demonstrations that can be leveraged into tribal utilities and tribal community energy development efforts. Distributed and microgrid technologies have the potential to greatly increase resilience and reliability of tribal energy systems, especially for remote communities, and represent a high-impact, enabling investment for tribal utilities.

Design and Planning Tools

Sound long-term planning and design yields smart capital investment. Electric power grid modeling and simulation applications are fundamental to the successful design, planning, and secure operation of power systems with billions of dollars in capital investments and operations costs. However, existing planning and modeling tools have not kept pace with the complex technologies, policies, economics, and outcomes demanded for the electric grid.

This technical area develops the next generation of modeling and simulation tools needed for power system planning. These new tools will handle emerging needs driven by changing technologies and operational capabilities, larger and more complex models, more challenging forecasting, and new types and sources of data.

Specific activities include:

- Scaling tools for comprehensive economic assessment;
- Developing and adapting tools for improving reliance and reliability; and
- Building computation technologies and high performance computing capabilities to speed up analyses.

Electricity Delivery and Energy Reliability

Clean Energy Transmission & Reliability (CETR) (\$8.1 million)

- Apply a comprehensive optimal power flow simulation to optimize grid planning and operational planning, incorporating real-time data.
- Continue to expand open-source repository of algorithms and models for use on a variety of computational platforms. The repository will include methods for solving both stochastic and chance-constrained optimization problems, addressing both the variability and uncertainty associated with the emerging electric power system.

Smart Grid R&D (\$10.9 million)

- Support National Laboratories in developing enhanced capabilities for optimal design analysis for alternating current (AC) and direct current (DC) microgrids for cost-effective, off-grid applications in remote communities, allowing all critical loads to be served even after the loss of any single microgrid power system component; and conduct laboratory testing of a resilient distribution system design tool developed through the FY 2016 Grid Modernization Laboratory Consortium (GMLC) Research Call.
- Develop version 2.0 of the Smart Grid Technology Emissions Quantification Tool, which provides estimates on emissions reductions enabled by smart grid technology deployments.
- Continued improvement of the power distribution system simulation and analysis tool known as GridLab-D to support new applications that reflect the changing utility operations environment.
- Using a modeling and simulation toolset developed in FY 2016, develop and issue a FOA for candidate transactive control approaches from industry and academia for analysis and comparison.

Energy Storage (\$5.9 million)

- The Energy Storage program will collaborate with industry to evaluate economic use cases and develop optimized control strategies for previously deployed storage systems. In conjunction with these activities, the program will develop grid design tools/cost modeling necessary to effectively locate and value energy storage in the power grid in order to maximize renewable energy use and minimize disruptions in the distribution system.

Energy Efficiency and Renewable Energy

Building Technologies Program (\$2.5 million)

- Planning tools that allow buildings to forecast needs of the grid so buildings can potentially be ready to reduce demand, store energy, or balance the variability of renewables.

Solar Energy Program (\$10.2 million)

- The Solar Energy Program will work on developing state-of-the-art utility modeling, simulation, and analysis tools to address technical issues surrounding grid planning, reliability, and variable solar energy.

Vehicle Technologies Program (\$2.6 million)

- Development of grid interactive vehicle system simulation tools that help utilities and other stakeholders understand the impact of electric vehicles on the grid.

Wind Energy Program (\$2.3 million)

- The Wind Energy Program will be developing state-of-the-art utility modeling, simulation, and analysis tools to address technical issues surrounding grid planning, reliability, and variable wind energy.
- Develop transmission planning tools centered on the infrastructure needs of wind technologies.
- Develop regional system flexibility assessments.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Systems Operations, Power Flow, and Control

The existing grid control systems were developed over several decades using a set of 20th century design characteristics: centralized dispatchable generation connected to transmission, relatively slow system dynamics that permitted manual

control, no significant grid energy storage, passive loads, one-way flow of real power at the distribution level, operation for reliability, and generation-following load for balancing. Several of these design parameters have become outmoded by new technologies, changing economics, and shifting customer expectations.

This technical area focuses on new control technologies to support new generation, load, and storage technologies. This effort develops power flow controllers that will permit fine adjustment and multi-directional power flow as well as flow control devices that can optimize transmission flows. It will also develop system architecture and control theories, coordinated grid system controls, and improved analytics and computation for grid operations and control.

Specific activities include:

- Developing architecture and control theory;
- Developing coordinated system controls;
- Improving analytics and computation for grid operations and control; and
- Developing enhanced power flow control device hardware.

Electricity Delivery and Energy Reliability

Clean Energy Transmission & Reliability (\$9.9 million)

- Continue an initiative that supports National Laboratory and industry experts in working groups to develop and disseminate synchrophasor-based tools for grid measurement and control.
- Continue to integrate modeling and mathematical advancements into tools for grid operations, placing additional focus on identifying appropriate control actions. Activities will include algorithmic research in the area of control science and dynamic modeling of the actuators, especially power electronics devices. This will complement activities initiated in FY 2016 in the areas of dynamic system modeling, protection modeling, and dynamic load behavior modeling.

Smart Grid R&D (\$9.4 million)

- Conduct integration testing of distribution management systems with microgrid controllers and distributed energy resources management systems (DERMS) to meet functionality requirements defined in the FY 2015 Guideline document; conduct laboratory testing of a distribution system restoration tool developed through the FY 2016 GMLC Research Call.
- Develop the next generation Advanced Distribution Management System (ADMS) software platform integrating varying vendor systems to support the full suite of distribution management applications.
- Develop and issue a FOA to assess the suitability of various distributed control approaches to implement transactive control.

Energy Storage (\$14.8 million)

- The Energy Storage program will collaborate with states to locate, procure, commission, and deploy new energy storage assets. Highly leveraged cost-share demonstrations will be conducted with states and regional stakeholders having diverse application profiles including microgrids, resiliency, renewables integration, and small-scale distributed storage. Techno-economic analysis of installed systems will be conducted and provided to industry.

Transformer Resilience & Advanced Components (\$8.0 million)

- Support the development of next-generation transformers that are more resilient and adaptable to an evolving threat environment (e.g., EMP/GMD), including hybrid and solid-state concepts which can also enhance power flows.

Energy Efficiency and Renewable Energy

Building Technologies Program (\$2.5 million)

- Buildings will work on transactive control systems to holistically manage buildings loads and support to the grid.

Hydrogen and Fuel Cell Technologies Program (\$0.5 million)

- The Program will focus on developing controls and associated system architectures needed to manage a diverse set of resources and grid assets, including fuel cell technologies, electrolyzers, and energy storage across the distribution system.

Solar Energy Program (\$14.3 million)

- **Solar Forecasting:** Solar forecasting is a critical element in enabling solar energy to be ~~dis~~patchable. The SunShot Systems Integration program launched the Solar Forecasting FOA in 2012 to develop models for improved prediction of solar irradiance. These projects will graduate in 2016, and it is imperative to continue the efforts toward improving the accuracy of solar forecasting. With this objective, the proposed Forecasting FOA in FY 2017 will build upon the outcomes of the current Solar Forecasting FOA to develop and demonstrate dramatically improved solar forecasting tools for meeting the SunShot Systems Integration's target of < 3% variation in power output from solar plants. Also included under Sensing and Measurement.

Vehicle Technologies Program (\$2.8 million)

- The Program will quantify the multiple value streams electric vehicles can provide to the grid fully integrated with distributed solar generation, building energy management systems, and other smart grid technologies.

Wind Energy Program (\$3.0 million)

- The Wind Energy Program will work on developing control algorithms to manage congestion related to wind generation and provide system support to the grid including the development of wind forecast visualization tools and the incorporation of wind forecasting into Dynamic Line Rating.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Sensing and Measurement

Measuring and monitoring vital parameters throughout the electric power network is necessary to assess the health of the grid in real time, predict its behavior, and respond to events effectively. Lack of visibility and accurate device- or facility-level information makes it difficult to operate the electricity system efficiently and has contributed to large-scale power disruptions and outages. Additionally, next generation sensors will allow energy management systems to integrate buildings, electric vehicles, and distributed systems.

This technical area focuses on tools and strategies to determine the type, number, and placement of sensors to improve system visibility from individual devices to feeders, distribution systems, and regional transmission networks. This effort includes advanced methods to determine system states not directly accessible by measurement, and estimation methods for broad grid visibility. Finally, it develops frameworks to integrate sensors into grid systems to better determine and forecast solar irradiance and wind generation, integrate and estimate generation and load uses behind the meter, and monitor and predict interfacing infrastructures such as electrified transportation.

Specific activities include:

- Improving sensing for buildings and end-users;
- Enhancing sensing for distribution system;
- Enhancing sensing for the transmission system;
- Developing data analytic and visualization techniques; and
- Demonstrating a unified grid-communications network.

Electricity Delivery and Energy Reliability

Clean Energy Transmission & Reliability (\$8.9 million)

- Assess value and feasibility of deploying time-synchronized measurements on the distribution system that provide finer insight into the behavior of the distribution system and its effects on the transmission grid.
- Continue support for the National Science Foundation (NSF) Engineering Research Center (ERC) through co-funding of the “Center for Ultra-Wide-Area Resilient Electric Energy Transmission Networks” (CURENT), which is performing fundamental, component, and systems research in wide-area monitoring and sensing; communications and cybersecurity; computation and modeling; control and actuation; and economic analysis.

Transformer Resilience & Advanced Components (\$2.0 million)

- Support research and development of advanced monitoring and diagnostic technologies and methods to enhance transmission and distribution asset management.

Energy Efficiency and Renewable Energy

Buildings Technologies Office (\$4.5 million)

- Develop open architecture sensors and sensor systems that easily share data to enable building operators and owners to cost effectively capture energy and cost savings through the use of new and existing control system applications.

Hydrogen and Fuel Cell Technologies Program (\$1.0 million)

- The Program will focus on developing low-cost sensors to provide visibility to grid operators on what services reversible fuel cells and electrolyzers can provide to the grid.

Solar Energy Program (\$24.3 million)

- The Solar Energy Program will focus on developing new sensing technologies that provide visibility of the impact of solar technologies on the grid as well as the development of new solar forecasting tools.
- **Solar Power Electronics for Electricity Delivery (SPEED):** In support of the DOE Grid Modernization effort, this FOA will focus on advanced communication and controls of distributed energy resources using power electronic devices. This also falls into Devices and Integrated System Testing.
- **Solar Forecasting:** Solar forecasting is a critical element in enabling solar energy to be dispatchable. The SunShot Systems Integration program launched the Solar Forecasting FOA in 2012 to develop models for improved prediction of solar irradiance. These projects will graduate in 2016, and it is imperative to continue the efforts toward improving the accuracy of solar forecasting. With this objective, the proposed Forecasting FOA in FY 2017 will build upon the outcomes of the current Solar Forecasting FOA to develop and demonstrate dramatically improved solar forecasting tools for meeting the SunShot Systems Integration's target of < 3% variation in power output from solar plants. Also included under System Operations, Control, and Power Flow.

Vehicle Technologies Program (\$3.0 million)

- Develop low-cost sensors for vehicle electric vehicle supply equipment that is interactive with the grid and is supported by a Volttron platform.

Wind Energy Program (\$1.5 million)

- The Program will focus on the development of new wind forecasting tools.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Devices and Integrated System Testing

New distributed devices and systems will deliver much of the flexibility required by the future grid for managing variable generation and enhancing reliability and resiliency while keeping electricity affordable.

This technical area develops devices and integrated systems, coordinates integration standards and test procedures, and evaluates the grid characteristics of both individual devices and integrated systems to provide grid-friendly energy services. For example, the DOE-funded collaboration between the National Institute of Standards and Technology (NIST) and electric industry stakeholders in developing smart grid interoperability standards, begun in 2009, has laid the technical foundation for more effective grid investments today.

Specific activities include:

- Develop advanced storage systems, power electronics, and other grid devices;
- Develop standards and test procedures;
- Build capabilities and conduct device testing and validation; and
- Conduct multi-scale systems integration and testing.

Electricity Delivery and Energy Reliability

Smart Grid R&D (\$6.1 million)

- Competitively down-select projects, among the seven awarded through the FY 2014 FOA, to proceed into field demonstrations of microgrid system designs with advanced controllers.
- Develop an ADMS Test Bed for existing vendor software platforms to provide utilities and vendors the capability to evaluate functionality and new applications within a realistic, complex environment without effecting actual utility system operations.

Energy Storage (\$21.2 million)

The Energy Storage program will expand development and demonstration efforts to facilitate technical maturation of a number of promising novel energy storage systems.

- New aqueous soluble organic flow battery chemistries capable of delivering a 50% reduction in cost over current vanadium/vanadium (V/V) will be investigated and prototyped.
- With industry, commercial prototypes of intermediate temperature sodium metal halide, sodium ion, novel lithium-ion chemistries, and inexpensive membranes will be developed and demonstrated.
- Integrated system testing and evaluation of commercial stationary systems will be conducted.
- Energy storage systems based on advanced redox flow chemistries, advanced lead acid, and second use lithium ion batteries will be tested for both utility scale and behind the meter applications.
- In addition, the Energy Storage program will collaborate with industry to establish an Energy Storage Reliability and Safety Initiative to support acceleration testing, reliability analysis, and failure analysis of commercially relevant, grid-scale energy storage systems.

Transformer Resilience & Advanced Components (\$2.0 million)

- Support material and packaging innovations (e.g., magnetics and dielectrics) that are needed for the integration of advanced device technologies into next-generation components.

Energy Efficiency and Renewable Energy

Buildings Technologies Program (\$9.5 million)

- Developing technologies, national interoperability standards, and integrated system testing capabilities for buildings that enable seamless integration with the grid using open-source technologies such as Volttron.

Facilities and Infrastructure: Energy Systems Integration Facility (\$36.0 million)

- DOE has developed several facilities to address grid modernization across the national laboratory complex. DOE constructed the Energy Systems Integration Facility (ESIF) at the National Renewable Energy Laboratory (NREL), a state-of-the-art facility opened in 2013 that is designed for testing, simulation, data analysis, engineering, and evaluation techniques for addressing grid integration challenges. DOE will be providing \$36.0 million to support ESIF facilities and infrastructure in FY 2017.

Hydrogen and Fuel Cell Technologies Program (\$3.0 million)

- The Program will determine how reversible fuel cells and electrolyzers can provide flexibility to the grid.

Solar Energy Program (\$19.3 million)

- The Solar Energy Program will work on developing power electronics, energy storage, interoperability, interconnection, and integrated system testing.
- **Solar Power Electronics for Electricity Delivery (SPEED):** In support of the DOE Grid Modernization effort, this FOA will focus on advanced communication and controls of distributed energy resources using power electronic devices. This also falls into System Operations, Control, and Power Flow.

Vehicles Technologies Program (\$4.5 million)

- The Program will work on developing power electronics, standards for interoperability, and integrated system testing.

Wind Energy Program (\$2.3 million)

- The Program will work on the integration of distributed wind technologies, power electronics, device controls enhancing system stability, and hybrid energy storage systems.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Security and Resilience

There are ever-increasing natural and man-made threats to the electric grid, including high-impact and low-frequency events, severe storms, fuel delivery failures, and more frequent physical and cyber threats. This technical area aims to meet physical and cybersecurity challenges, analyze asset criticality, assess ways to minimize risk, address supply chain risks), and provide situational awareness and incident support during energy-related emergencies. New York State's leadership in *Superstorm Sandy* rebuilding and resilience efforts shows that grid modernization is pivotal for protecting citizens and the economy against natural and human attack.

Specific activities include:

- Improving abilities to identify threats and hazards;
- Increasing abilities to protect against threats and hazards;
- Increasing capabilities to detect potential threats and hazards;
- Improving abilities to respond to incidents; and
- Improving recovery capacity time.

Electricity Delivery and Energy Reliability

Clean Energy Transmission & Reliability (\$3.4 million)

- CETR's Energy Systems Risk and Predictive Capability (ESRPC) subprogram focused work in FY 2016 on Risk and Decision Science for Energy Systems.
- The FY 2016 Risk and Decision Sciences for Energy Systems focused on improving forecasts of electric outages and identification of infrastructure at risk for tropical cyclone events.
- In FY 2017, ESRPC will expand work in the area of Risk and Decision Science for Energy Systems to include a more comprehensive focus on interdependent energy systems and assets, and methods for mitigating risks.
- The focus of the ESRPC program in FY 2017 will shift risks to energy systems from Tropical Cyclones to more a general approach of all natural hazard events that have a wide-area impact on energy systems.

Smart Grid R&D (\$1.0 million)

- Administer the newly launched voluntary program for energy data privacy, Data Guard. This program establishes common practices that protect the access, use, and sharing of customers' energy usage and related data.

Cybersecurity for Energy Delivery Systems (CEDS) (\$45.5 million)

The CEDS program will continue a multi-faceted approach to preserving grid security.

- Researching, developing, and demonstrating cutting edge cybersecurity solutions in the energy sector.
- Expanding implementation of the Cybersecurity Capability Maturity Model and Risk Management Process for both the electricity and oil and natural gas sectors.
- Accelerating information sharing to enhance situational awareness in the energy sector.
- Exercising and refining the energy sector's cyber incident response capabilities.
- Establishing a Virtual Energy Sector Advanced Digital Forensics Analysis Platform.

Transformer Resilience and Advanced Components (\$3.0 million)

- Expand the testing, modeling, and evaluation of critical components to include assets other than transformers (e.g., circuit breakers) to increase understanding of system vulnerabilities.

Energy Efficiency and Renewable Energy

Building Technologies Program (\$2.4 million), Solar Energy Program (\$4.5 million), Vehicle Technologies Program (\$2.5 million), Wind Energy Program (\$2.0 million)

- Work with the OE to develop reliability and resiliency for generation and end-use technologies connected to the grid such as wind, solar, electric vehicles, and building loads.
- Incorporate reliability and resiliency into generation and end-use technologies into demonstrations projects.

All Five EERE Offices

- The demonstration projects will apply to all six technical areas.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Developed a Grid Modernization Laboratory Consortium consisting of 14 National Laboratories that work in concert to address grid modernization challenges across the Department.
- Conducted a comprehensive review of all DOE grid programs across the National Laboratory complex.
- Completed the Western Wind and Solar Integration Study III to investigate the impact of significant renewable penetration on large-scale system stability.
- Completed the analysis associated with Eastern Renewable Generation Integration Study which investigates how system operations could be impacted with significant renewable penetration on the Eastern Interconnection.
- Idaho National Laboratory, National Renewable Energy Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory developed a framework for federated testing and evaluation leveraging “best in class” physical and virtual assets for enhanced grid test and evaluation.
- Launched a direct current (DC) microgrid initiative to achieve climate-neutral buildings with awards for new industry and National Laboratory projects.
- Developed innovative cybersecurity technology to provide anomaly and intrusion detection for advanced metering infrastructure and distribution automation wireless mesh networks.
- Developed software to strengthen critical energy infrastructure cybersecurity by providing evidence of the secure functioning of energy delivery control system devices without requiring disclosure of the source code.
- Initiated research on emerging technologies such as non-aqueous redox battery and sodium-based inorganic and organic batteries with potential for lower cost storage systems.

FY 2016 Planned Accomplishments

- Execute the first year of the Grid Multi-Year Program Plan beginning with launch of a coordinated National Laboratory research program of up to \$220 million from FY 2016 through FY 2018.
- Develop a transactive energy approach as the basis for accomplishing grid integration and realizing the full potential of energy and grid related opportunities.
- Develop low-cost power, vehicle, and building sensors that rely on open source interoperability standards to provide visibility and understanding to grid operators on the status of these assets and their ability to provide grid services.
- Initiate multi-laboratory outreach to states and regions to provide a directed point of contact for all grid related activities at DOE.
- Develop tools and better probabilistic forecasts into the next-generation energy management system to create a simple environment for system operators to make decisions that account for high penetration of variable generation on their system. Expand mathematics and computational research to include uncertainty quantification, model formulation and reduction, and controls.
- Connect research data from the Transmission Reliability and Advanced Modeling Grid Research subprograms to the Energy Systems Risk and Predictive Capability analytical platform.
- Advance real-time predictive analytics to enhance Federal, state, local, and industry knowledge for event management.
- Develop the specifications for an open source ADMS platform for interconnection and interoperability with various systems and applications.
- Begin work on ADMS test cases and an ADMS test bed for evaluation under operating environments; begin testing of ADMS platform utilizing the test bed and test cases.

- Award new projects in networked microgrid R&D through a funding opportunity announcement to achieve full integration of a network of multiple microgrids with distribution systems.
- Issue a competitive solicitation under the Cybersecurity Risk Information Sharing Program (CRISP) to facilitate the timely sharing of cyber threat information and integrate situational awareness tools to enhance the energy sector's ability to identify, prioritize, and coordinate the protection of its critical infrastructure.
- Initiate the development of an independent virtual collaborative environment for conducting near real-time, advanced digital forensics analysis for the energy sector.

FY 2017 Key Objectives

- Develop demonstration projects that will co-optimize across multiple grid attributes including affordability, security, resilience, reliability, and integration of clean technologies.
- Develop integrated dynamic modeling and simulation tools across transmission, distribution and communications networks for evaluation and design improvements that enhance system stability.
- Develop and publish consistent procedures for characterization of grid-connected generation, transmission, distribution, storage, and end-use devices.
- Develop a consensus-based grid system architecture framework that will reduce impediments to improving grid flexibility and resilience.
- Establish security solutions that recognize, predict, isolate and respond to threats and hazards, regardless of cause, allowing the stabilization of disturbances and/or graceful degradation of non-critical functions at the local level while maintaining a global optimum in performance.
- Develop real-time streaming analytics and machine learning paradigms that acquire heterogeneous sensor data and analyze and predict dynamic behavior for grid visibility.
- Work with states to accelerate grid transformation through innovative policy and regulatory actions.
- Accelerate and expand efforts to strengthen the energy infrastructure against cyber threats and mitigate vulnerabilities.

Subsurface Science, Technology and Engineering RD&D

(**\$K**)

FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
168,000	164,699	207,180	258,315

Overview

Subsurface resources constitute the Nation's primary source of energy—providing more than 80 percent of U.S. energy needs today—and are critical to the Nation's low-carbon and secure energy future. For example, next generation advances in subsurface technologies could enable access to more than 100 gigawatt-electric (GWe) of clean, renewable geothermal energy, as well as safer and more sustainable development of domestic oil and natural gas supplies. In addition, the subsurface provides indefinite safe storage capacity for carbon dioxide (CO₂) and opportunities for environmentally responsible management and disposal of hazardous materials and other energy waste streams. The subsurface can also serve as a reservoir for energy storage for power produced from intermittent generation sources such as wind and solar. Clean energy deployment and CO₂ storage are critical components of the President's Climate Action Plan and are necessary to meet the Administration's target to reduce greenhouse gas (GHG) by 83 percent, from 2005 levels, by 2050. In addition, these efforts will support the President's Clean Power Plan goal of a 32 percent cut in power sector emissions by 2030 from 2005 levels. Discovering and effectively harnessing subsurface resources while mitigating impacts of their development and use are critical pieces of the Nation's energy strategy moving forward.

The ability to have real-time control or “mastery” of the subsurface can have a transformative effect on numerous industries and sectors, impacting the strategies deployed for subsurface energy production and storage. As such, the Subsurface Science, Technology and Engineering Research, Development and Demonstration (Subsurface) Crosscut, in collaboration with the Department of Energy (DOE) National Laboratories, in 2015 identified *Adaptive Control of Subsurface Fractures and Fluid Flow* as a key crosscutting technology challenge. Specifically, mastery of the subsurface requires efforts to address the following shared challenges in order to optimize energy production, energy/CO₂ storage, and waste storage/disposal:

- **Discovering, characterizing, and predicting:** Efficiently and accurately locating target subsurface geologic environments; quantitatively inferring their evolution under future engineered conditions; and characterizing the subsurface at a relevant scale;
- **Accessing:** Safe drilling or mining with properly managed reservoir integrity;
- **Engineering:** Creating the desired conditions in challenging high-pressure/high-temperature environments;
- **Sustaining:** Maintaining these conditions over long time frames throughout complex system evolution; and
- **Monitoring:** Improving observational methods and advancing understanding of the microscopic basis of macroscopic complexity throughout system lifetimes.

To address these challenges, the Subsurface Crosscut proposes initiatives for planning and implementing jointly-funded targeted research, development, and field demonstrations that emphasize the following four topic areas:

1. Wellbore Integrity
2. Subsurface Stress and Induced Seismicity
3. Permeability Manipulation
4. New Subsurface Signals

RD&D across these four topics will complement and be coordinated with ongoing program-specific subsurface-related R&D investments.

Highlights and Major Changes in the FY 2017 Budget Request

- In FY 2017, in addition to continuing competitive funding of R&D targeting the four pillars, the Subsurface Crosscut team will pursue R&D on a grand challenge topic on “Advanced imaging of geophysical and geochemical signals in the subsurface,” based on results of workshops held in FY 2015. Current limitations to fully exploiting our

subsurface energy resources in an environmentally responsible manner lie in the inadequate resolution attainable in seismic imaging, which investments related to this grand challenge would seek to address.

- In addition, in FY 2017, the Subsurface Crosscut initiative includes proposed investments in Risk Assessment Tools and Methodologies, which will leverage current risk assessment tools funded under the Office of Fossil Energy for broader application across the Subsurface Crosscut funded R&D.

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	2,000	2,000	2,000	2,000	---
Development and Deployment: Mission Support					
Idaho: Idaho Cleanup and Waste Disposition	---	3,000	3,000	3,000	---
Richland: Central Plateau Remediation	---	3,000	3,000	3,000	---
Total, Defense Environmental Cleanup	2,000	8,000	8,000	8,000	---
Energy Efficiency & 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 & Renewable Energy	45,000	43,516	49,930	80,640	+30,710
Fossil Energy Research & Development					
Carbon Storage	83,000	80,307	96,000	90,875	-5,125
Crosscutting Research and Analysis: Computational Sciences	---	---	4,750	---	-4,750
Fuel Supply Impact Mitigation: Environmentally Prudent Development	9,000	3,876	4,000	7,000	+3,000
Total, Fossil Energy Research & 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

Subsurface Science, Technology and Engineering RD&D
FY 2017 Funding by Focus Area (\$K)

	Wellbore Integrity	Subsurface Stress and Induced Seismicity	Permeability Manipulation	New Subsurface Signals	Risk Assessment Tools and Methodologies	Grand Challenge R&D	Ongoing Subsurface Related R&D	Total
Defense Environmental Cleanup								
Headquarters Operations: Technology	---	---	---	---	---	---	2,000	2,000
Development and Deployment: Mission Support								
Idaho: Idaho Cleanup and Waste Disposition	---	---	---	---	---	---	3,000	3,000
Richland: Central Plateau Remediation	---	---	---	---	---	---	3,000	3,000
Total, Defense Environmental Cleanup	---	---	---	---	---	---	8,000	8,000
Energy Efficiency & Renewable Energy								
Geothermal Technologies: Enhanced Geothermal Systems	---	---	---	---	---	---	40,600	40,600
Geothermal Technologies: Hydrothermal	8,000	9,000	4,000	4,000	---	8,000	7,040	40,040
Total, Energy Efficiency & Renewable Energy	8,000	9,000	4,000	4,000	---	8,000	47,640	80,640
Fossil Energy Research & Development								
Carbon Storage	5,000	13,000	---	10,000	13,000	---	49,875	90,875
Fuel Supply Impact Mitigation: Environmentally Prudent Development	---	---	---	---	---	---	7,000	7,000
Total, Fossil Energy Research & Development	5,000	13,000	---	10,000	13,000	---	56,875	97,875
Nuclear Energy								
Fuel Cycle R&D: Used Nuclear Fuel Disposition	4,200	---	---	---	---	---	26,300	30,500
Science								
Basic Energy Sciences: Chemical Sciences, Geosciences, and Biosciences	---	---	---	---	---	36,300	5,000	41,300
Total, Subsurface Science, Technology and Engineering RD&D	17,200	22,000	4,000	14,000	13,000	44,300	143,815	258,315

Program Roles

Departmental Collaboration

The Subsurface Crosscut is a DOE Crosscut that encompasses DOE offices involved in subsurface activities. Activities are aligned with renewable energy production (EERE/Geothermal Technologies Program), subsurface storage of energy and CO₂ (FE-CO₂ Storage), subsurface waste disposal and environmental remediation (FE-Oil and Gas, Environmental Management, Nuclear Energy), and policy or analysis associated with the subsurface. The Office of Science (SC) supports a broad spectrum of fundamental research in subsurface science, focusing on topics including geology, geophysics, and biogeochemistry, among others.

The Subsurface Crosscut provides a collaborative structure to identify scientific and technology challenges, efficiently leverage funding and expertise through multi-office collaborations, and avoid duplicative efforts. Roles of the DOE Subsurface Crosscut team include:

- Exchange details on current subsurface RD&D portfolios across DOE offices;
- Identify subsurface challenges and recommend and implement solutions;
- Assess DOE RD&D budgets, plans and priorities, and identify potential cross-cutting initiatives;
- Provide technical assistance as needed in support of relevant legislative or regulatory requirements;
- Facilitate intra-departmental and interagency collaboration of cross-cutting subsurface RD&D activities; and
- Establish partnerships with industry stakeholders operating in the subsurface.

Wellbore Integrity

Wellbore integrity is critical across all DOE programs focused on subsurface extraction of resources, energy storage, disposition of civilian and defense waste streams, and the remediation of sites contaminated from past endeavors. The need to reduce the risk of uncontrolled release of formation fluid or other materials throughout the lifecycle of a wellbore extends across a wide range of geologic environments and time-scales from weeks to eons.

Energy Efficiency & Renewable Energy

Geothermal Technologies: Wellbore integrity is critical for geothermal energy and is particularly challenging in the harsh subsurface environments surrounding geothermal wells. FY 2017 activities will focus on developing materials and sensors that can be embedded into casing and cement materials that can detect when and where a wellbore has been compromised. R&D will also be directed at new tools and technologies to access and remediate wellbore failure where it has occurred. Activities will also include R&D into new self-healing materials that can withstand a decades-long operational lifetime in a dynamic subsurface environment.

Fossil Energy Research & Development

Carbon Storage: Wellbore integrity is a key technology that addresses the need for stable wellbores to ensure safe and reliable injection operations, the long-term containment of CO₂ in the targeted reservoir, and protection of groundwater systems from subsurface actions. Wellbore materials must perform well over time in the chemical environment created by the injected fluids, they must be sufficiently strong to withstand mechanical stresses associated with injection and production, and they must have good cement bonds to ensure containment. FY 2017 R&D activities will focus on detecting and mitigating wellbore issues associated with short and long-term exposure to CO₂. These efforts will improve wellbore construction materials and technologies to ensure safe and reliable injection operations and long-term containment of CO₂ in subsurface reservoirs.

Nuclear Energy

Fuel Cycle R&D: The Office of Nuclear Energy will continue to conduct scientific research and technology development to enable storage, transportation, and disposal of used nuclear fuel (UNF) and nuclear waste. R&D of waste disposal in deep boreholes in crystalline basement rock as one alternative for disposal is a high priority for the Department, and activities and funding continue in FY 2017 at levels similar to those of FY 2016.

The borehole disposal concept is to drill a borehole (or array of boreholes) into crystalline basement rock to a depth below the surface of about 5,000 meters (greater than 3 miles). Waste canisters would be emplaced in the lower 2,000 meters of the borehole, with sealing of appropriate portions of the upper 3,000 meters of the borehole. In FY 2016, the Department will begin a field test that will include drilling a characterization borehole at a volunteer. The field test has three purposes:

evaluation of the capability for drilling and construction of deep, large-diameter boreholes; downhole scientific analyses to assess hydrogeochemical conditions that control waste stability and containment; and engineering analysis to assess the viability and safety of deep borehole canister emplacement. The engineering analysis will evaluate the feasibility of canister emplacement operations by determining performance envelopes for drilling, canister handling, and canister retrieval during emplacement. In addition, borehole sealing materials and designs will be examined through above-ground testing.

Subsurface Stress and Induced Seismicity

Knowledge of the subsurface stress state is required to predict and control the growth of hydraulically-induced fractures, re-opening of faults, and induced seismicity potentially associated with subsurface energy production, storage and waste disposal applications. Current capabilities to directly measure or infer the in-situ stress are inadequate to serve many public needs. This limitation leads to significant uncertainties and lost opportunities to take advantage of the subsurface for energy production and waste storage, and impacts public confidence in the subsurface energy sector.

Energy Efficiency & Renewable Energy

Geothermal Technologies: Improved methods to measure and manipulate subsurface stress are key technology pathways for interpreting the orientation of existing fracture networks, and engineering optimal fracture networks that can be used to mine heat from the Earth's subsurface. Proposed FY 2017 activities include continuing the development of tools and methodologies to measure stress in the subsurface. Prior year R&D efforts to establish baseline measurements will be leveraged in field testing of new methods. Activities will include R&D into methods for stress measurement from the borehole and from the surface. FY 2017 investments will also support the field testing of a high-resolution deployable surface and borehole seismometer array.

Fossil Energy Research & Development

Carbon Storage: Geomechanical deformation triggered by increased fluid pressure during injection operations could potentially result in faulting, fracturing, microseismicity, damage to the wellbore, and other types of elastic and inelastic deformation. Ideally, injection pressures are managed to optimize the system's performance, including minimization of geomechanical effects. Research has demonstrated that the hydrology and physical response of subsurface systems can be predicted and managed much better if characterization is accurate and the monitoring networks acutely tuned to the system. FY 2017 activities will develop technologies to better characterize and measure the stress state and induced seismicity associated with carbon storage operations. This includes research on plume behavior, stresses, and geomechanical deformation; advanced flow models to predict basin-scale impacts; pressure mitigation approaches; evaluation of mechanical and flow properties for reservoirs, seals, and fracture networks; and coupling of geochemical and geomechanical analyses.

Permeability Manipulation

The ability to adaptively manipulate permeability in the subsurface is a critical scientific and technical challenge. Current mathematical models for multi-phase flow in high permeability sandstones do not work for the nano-scale pores in low permeability rocks (i.e., shales and granite). If a marked improvement in mastery could be achieved beyond what has been developed up to this time after a century of drilling and fluid production/injection experience, there is the potential to radically transform multiple subsurface energy applications, most notably enhanced geothermal systems. The current lack of precise control over fracturing and fluid flow despite decades of industrial practice is testimony to the significant challenges involved, primarily related to the difficulty of characterizing the heterogeneous deep subsurface, and incomplete understanding of the coupled processes related to fluid flow, geomechanics and geochemistry over scales from nanometers to kilometers.

Energy Efficiency & Renewable Energy

Geothermal Technologies: Technologies to reliably manipulate permeability in the subsurface are critical to reducing risk in geothermal development, and to making enhanced geothermal systems a fully cost-competitive power generation technology. Of particular importance to advancing geothermal technologies is extending engineering capabilities into increasingly harsh, high temperature and pressure environments. FY 2017 R&D will include development of new stimulation technologies that uniformly enhance permeability in crystalline rocks. Activities proposed in FY 2017 for this pillar will also include field testing of new technologies to selectively impede flow developed in prior year R&D. Opportunities to utilize accessible subsurface mines to conduct innovative tests on fluid flow through fractures will be leveraged.

New Subsurface Signals

A major obstacle to adaptive control of subsurface fractures, reactions and flow is our inability to clearly characterize and monitor critical subsurface features. Although the energy industry has developed sophisticated tools to characterize the subsurface using both surface and wellbore methods, an entirely new class of capabilities is needed to characterize fractures and associated processes at sufficiently high spatial resolution and over large enough volumes to guide subsurface operations. The challenge is complicated by the range of relevant scales and the coupled nature of relevant thermal-hydrological-mechanical-chemical (THMC) processes. Success in addressing this challenge is needed to master the subsurface for identification and characterization of ideal sites for energy-related operations.

Energy Efficiency & Renewable Energy

Geothermal Technologies: Improved technologies and methods for imaging the subsurface are essential to reduce risk in geothermal development by providing greater information on the subsurface environment at early stages of development. FY 2017 proposed activities will focus on inversion of geophysical techniques for subsurface imaging. R&D will also be funded on new ways to integrate multiple types of data (e.g., geophysical and geochemical) in order to gain a better understanding of the subsurface for exploration and for subsurface operations. Planning and design will be initiated at field sites for strategic drilling to verify observations made from the surface.

Fossil Energy Research & Development

Carbon Storage: Uncertainty remains the largest single challenge in mastery of subsurface systems. Research has demonstrated that the hydrology and physical response of subsurface systems can be predicted and managed much better if the characterization is accurate and the monitoring networks are tuned to the system. Importantly, many of the tools used to monitor systems are used to characterize them. Technologies developed and validated collectively will increase confidence to stakeholders (e.g. operators, regulators and public) that monitoring technologies can monitor the transport and fate of CO₂. Robust technologies are necessary to address safety and environmental concerns; verify CO₂ migration to meet regulatory requirements; and account for greenhouse gas (GHG) emissions mitigation. New technologies improve our ability to monitor CO₂ at atmospheric, near-surface (including offshore water column) and subsurface levels for integration into an intelligent monitoring system. In FY 2017, research focuses on developing technologies such as advanced optical detection, remote sensing, and spatial averaging over large field areas; real-time monitoring; advanced geophysical techniques; and integrated autonomous intelligent monitoring systems. These technological advances improve our ability to ensure storage permanence and optimize storage capacity through higher resolution and more accurate mapping and characterization of fractures and faults. Additionally, R&D efforts will develop novel tools to quantify plume volume in the subsurface.

Imaging Geophysical and Geochemical Signals in the Subsurface

New in FY 2017, DOE proposes to pursue a coordinated grand challenge program in Subsurface Imaging. Research topics will include imaging fracture networks, associated fluid flow and reaction, gaps in fidelity, resolution, and conceptual understanding of subsurface imaging in hard-to-access environments. Current limitations to fully exploiting our subsurface energy resources in an environmentally responsible manner lie in the inadequate resolution attainable in seismic imaging, in traditional sampling techniques before and after injection that provide insufficient insight into fluid elements and isotopic composition over extended length and time scales, and in the effect of physical changes and concurrent geochemical processes in rock-fluid systems associated with subsurface and geological engineering.

Science

Basic Energy Sciences: BES plans to invest in up to five new Energy Frontier Research Centers (EFRC) targeted at three grand challenge subtopics recently identified in joint strategic planning activities: Imaging Subsurface Fractures and Flow (Natural and Induced); Detecting Changes in Fluid Composition; and Physical and Chemical Changes in Rock-Fluid Systems. Some of this research may include new sensors and adaptive materials as needed to ensure sustained integrity of the wellbore environment; physical and chemical changes associated with subsurface injection; the development of methods to enhance, impede, and eliminate fluid flow; and the integration of modeling and predictive tools, as well as the capability to describe heterogeneous time-dependent geologic systems.

Energy Efficiency & Renewable Energy

Geothermal Technologies: The request will fund a competitive solicitation to test innovative techniques and technologies using existing wells and field sites. Specifically, field-tested R&D will focus on high fidelity imaging and modeling using massive microseismic datasets. We will ensure a close communication between the EFRCs and other Subsurface Crosscut

R&D to ensure effective science-applied program interaction. We will additionally fund R&D targeting the grand challenge through a competitive solicitation targeting academic and DOE lab consortia.

Ongoing Subsurface-Related R&D

All of the Subsurface Crosscut offices also have significant ongoing investment in other activities not described above that directly address critical challenges related to subsurface engineering. The Subsurface Crosscut Team provides a valuable internal and outward-facing forum to share information regarding ongoing RD&D efforts, so that technology accomplishments of each office can be leveraged by the entire subsurface community. Below are summaries of the related program officebased budget activities in FY 2016.

Defense Environmental Cleanup

Headquarters Operations: Technology Development: The Office of Environmental Management (EM) conducts a wide range of applied research activities in subsurface science, including the development of technologies and approaches for subsurface characterization, monitoring, remediation, and waste disposal. EM is also developing advanced computer modeling capabilities to simulate and predict the behavior and evolution of complex natural and engineered subsurface environments over long time periods. EM will support several technology development activities that are highly relevant to the Subsurface Crosscut and that complement efforts in DOE's Office of Nuclear Energy and other DOE programs.

As part of its commitment to the Subsurface Crosscut, EM will focus on developing a universal canister for deep borehole waste disposal. Activities will include design, fabrication and performance testing of waste canisters; assessment of packaging, transportation, and disposal requirements; and development of sensors, detectors, and devices for measurement and imaging. Various radioactive waste forms will also be evaluated for possible deep borehole disposal.

Energy Efficiency & Renewable Energy

Geothermal Technologies: A major initiative that is closely aligned with the Subsurface Crosscut and that will benefit significantly from interactions with other sectors and offices is the Frontier Observatory for Geothermal Research (FORGE). In FY 2017 FORGE will continue with baseline characterization, drilling and O&M. Other activities in the geothermal technologies office include hydrothermal and resource confirmation R&D along with slimhole drilling confirmation efforts.

Fossil Energy Research & Development

Carbon Storage: Other major activities with the Carbon Storage subprogram that contribute to Subsurface Crosscut activities include the small- and large-scale characterization and field injection tests (such as the Regional Carbon Sequestration Partnerships), and fit-for-purpose research field activities. These field projects conduct regional and site-specific characterization and validation; simulation and risk assessment; and application of monitoring, verification, and accounting technologies for various storage reservoirs. They also validate technologies; improve our understanding of CO₂ injection, fluid flow and pressure migration; and geomechanical and geochemical impacts from CO₂ injection, and develop a "commercial toolbox" for cost-effective monitoring of CO₂ storage in all storage types. FY 2017 efforts build upon previous activities such as the large-scale field characterization activities that will address specific technical research and regional barriers to CCS deployment, offshore storage characterization in coordination with the Department of the Interior's Bureau of Ocean and Energy Management and projects that investigate active reservoir management as a method to better control or "steer" the CO₂ plume and pressure fronts within the reservoir. Funding also supports enhancement of the Energy Data Exchange (EDX), which coordinates historical and current data and information from a wide variety of sources to facilitate access to reliable information in support of science-based decision-making for carbon capture and storage.

Fuel Supply Impact Mitigation: The Fuel Supply Impact Mitigation program will continue RD&D activities that address and mitigate the risks associated with safe and environmentally sustainable unconventional oil and gas development. These research activities are being coordinated with EPA and USGS as part a multiagency research strategy, and are addressing issues in various topic areas including reducing the footprint of production, water quality, water availability, and induced seismicity. Specifically, these research activities involve: (a) assessing the location, physical characteristics, and potential size of different unconventional oil and gas (UOG) resources to understand the potential scale of development in different geographical areas and geologic settings; (b) quantitative understanding of water quality impacts over the entire cycle of UOG operations (site preparation, water acquisition, drilling, completion and fracturing, production, waste disposal, pipeline construction and site closure) and better understanding of how water quality impacts may vary over time and space and due to differences in UOG operations; (c) understanding of how UOG activities may impact both the quantity and availability of water required for hydraulic fracturing, and better understand the possible impacts of ground and surface waters

withdrawals on drinking water resources; and (d) collection and analysis of seismic hazard background data for multiple sites; and develop models for probabilistic hazards assessment that account for induced seismicity; and development and validation of models for assessing the likelihood of induced seismic events.

Nuclear Energy

Fuel Cycle R&D: Used Fuel Disposition R&D will continue characterization and performance of generic mined geologic repository media and concepts for disposal of high-level radioactive waste and spent nuclear fuel. Activities continue to further the understanding of long-term performance of disposal systems in three main geologic rock types: clay/shale, salt, and crystalline rock. These activities include collaborations with international partners to leverage and integrate applicable R&D being conducted by other countries into the U.S. disposal R&D portfolio.

Science

Basic Energy Sciences: Within the FY 2017 Budget Request, BES continues its ongoing support of the Department's Subsurface Crosscut. BES will support single investigator research on fundamental geochemistry and geophysics with an emphasis on subsurface fluid flow and complex chemistry on widely varying timescales from microseconds to millennia. This research is anticipated to have high relevance for oil and gas production, geothermal energy applications, carbon capture and storage, and nuclear waste disposal.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Office of Fossil Energy and Geothermal Technologies jointly funded \$7.3 million in competitive Subsurface Crosscut R&D to the DOE National Labs, for a total of nine new projects.
- Office of Science - Basic Energy Sciences held a strategic planning meeting that identified the grand challenge "advanced imaging of geophysical and geochemical signals in the subsurface."
- The Office of Science - Basic Energy Sciences, Fossil Energy and Geothermal Technologies held a joint workshop to develop a roadmap based on the BES grand challenge and identified research modalities to address three subtopics related to fracture networks, associated fluid flow and reaction, and the gaps in fidelity, resolution, and conceptual understanding of subsurface imaging in hard-to-access environments.
- Two Subsurface Crosscut Townhall Meetings were held at the American Geophysical Union (AGU) Annual Meeting and the American Association of Petroleum Geologists (AAPG) Annual Meeting to provide updates on Subsurface Crosscut activities.
- Office of Environmental Management sponsored a report that provides specifications for a canister-based system for the packaging and disposal of small waste forms in direct support of the Office of Nuclear Energy's deep borehole field test.

FY 2016 Planned Activities

- Continued funding and performance monitoring of Subsurface Crosscut National Lab R&D, with key interim results by end of the fiscal year.
- Stakeholder engagement with a series of public briefings including one at the Geological Society of America (GSA) Annual Fall Meeting, the Geothermal Resources Council (GRC) Annual Meeting and a Town Hall at the American Geophysical Union (AGU) Annual Fall Meeting. These engagements and internal coordination meetings are used to bring increased fidelity to the focus area structure and possible activities within each focus area.
- Keynote Speech at the National Academy of Engineering (NAE) Conference on Subsurface Engineering.
- In FY 2016, the Subsurface Crosscut Team will work with stakeholders to define an ambitious goal with quantifiable metrics and outyear targets to measure progress toward mastery of the subsurface.
- Commence Subsurface Crosscut competitive funding, specifically targeting academic and industry performers.

FY 2017 Key Objectives

- The Subsurface Crosscut will launch funding initiatives associated with the focus areas defined.
- Launch coordinated research activities in support of the grand challenge on advanced imaging of geophysical and geochemical signals in the subsurface.
- Refine roadmapping and goal setting to develop a portfolio of high impact RD&D projects.

Supercritical Carbon Dioxide (sCO₂)

(\$K)

FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
30,300	29,466	32,300	36,300

Overview

U.S. technological leadership enabling large-scale commercialization of the supercritical carbon dioxide (sCO₂) power cycle will lead to significant progress towards meeting national climate and energy goals. These goals include decreased greenhouse gas emissions, promoting domestic manufacturing and technology job creation, facilitating industrial competitiveness, maintaining U.S. technology leadership and providing the nation with cleaner electric power. Developing the sCO₂ power cycle supports the President's climate goals. Through this initiative, the U.S. has the unique opportunity to be positioned at the forefront of next generation power generation technology.

Power cycles based on sCO₂ as the working fluid, instead of steam, have the potential for higher thermal efficiencies with lower capital cost when compared to state of the art steam-based power cycles. Taken together, the unique features of sCO₂, which include having a small environmental footprint, lower water use, fuel/heat source flexibility, and the potential for lower capital cost – along with multiple performance benefits that result from higher efficiency (e.g. lower fuel use, reduced emissions, less cooling water) are creating broad interest in the sCO₂ power cycle. The DOE program offices of Fossil Energy (FE), Nuclear Energy (NE), and Energy Efficiency & Renewable Energy (EERE), have formed an sCO₂ crosscut initiative whose objective is to overcome technical barriers and reduce risk to commercialization of the sCO₂ power cycle.

The benefits of realizing this mission are significant. Thermodynamic modeling of sCO₂ power cycles (specifically the Recompression Brayton Cycle) at higher temperatures demonstrates the potential to reach thermal efficiencies in excess of 50%, significantly better than traditional steam-based Rankine cycle systems. The long standing steam-based Rankine cycle for stationary power generation has a demonstrated fleet averaged efficiency in the low-thirties. These same steam based cycles are used for roughly 80% of the world's electricity generation. The impact of thermal efficiencies of 50% or greater on cost of electricity would be transformative. Furthermore, the directly-fired sCO₂ cycle offers a pathway for making advanced power generation with carbon capture and storage (CCS) affordable. In addition, the broad application of the sCO₂ cycle and its unique features creates an attractive near term market for waste heat recovery, beyond large stationary power generation, further promoting industry interests.

The sCO₂ crosscut is structured around a common objective to establish a 10 MWe Supercritical Transformational Electric Power (STEP) pilot scale facility for evaluating power cycle and component performance over a range of operating conditions. Demonstrating favorable performance at this nominal scale is the next step required to address technical issues, reduce risk, and mature this promising technology. The 10 MWe facility will be developed through a competitive Funding Opportunity Announcement (FOA) that will be cost-shared with industry. This initiative builds upon existing research and development (R&D) portfolios that will continue within the three individual DOE program offices. This existing R&D is addressing application-specific technology development needs. DOE's national laboratories are also conducting considerable work on cycle operation, modeling, material evaluations and CO₂ fundamental property measurements. These ongoing activities are also required to support the sCO₂ crosscut.

The 10 MWe STEP facility will be constructed with the flexibility to test a variety of configurations. Since this will be the first integrated test of a system operating at this size and under these conditions, the first tests will be performed in the indirect-fired configuration. It is prudent to do so because this configuration eliminates the additional challenges related to a natural gas/sCO₂ turbine (e.g. water vapor/sCO₂ mix in the working fluid, sCO₂ bleed system, higher temperature components, oxygen/sCO₂ combustion, and others). However, once the indirect-fired cycle has successfully operated and tested through the necessary suite of transient and steady state conditions, we will begin the transition to testing key elements of the direct-fired sCO₂ power cycle. These include adding water vapor to the working fluid, which will simulate a direct-fire turbine and add corrosion issues, increasing the temperature range of the equipment, and on-site corrosion analyses capabilities. The direct-fire sCO₂ turbine could be available for integration into the STEP facility in the 2022 timeframe. The direct-fire supercritical CO₂ fuel cycle is the ultimate goal for FE because it can provide significant benefits for CCS by reducing the costs and parasitic load of carbon capture and CO₂ compression.

The Department will continue to gather information from the appropriate stakeholders with the goal of developing an effective solicitation for the public-private cost-shared 10 MWe STEP facility. As part of this engagement, contracts have been awarded for conceptual plans, technical approach, cost and schedule relevant to a 10 MWe facility. Information from these contracts will inform the solicitation for the design, construction and base operation of the STEP facility. The FOA to build the STEP facility is proposed to be issued and awarded by the end of FY 2016.

Highlights and Major Changes in the FY 2017 Budget Request

The FY 2017 Budget Request continues the Department's coordinated efforts in research, development, and demonstration of the transformative sCO₂ Brayton cycle energy conversion technology. Recognizing that the near-term deployment and potential market applications for commercial sCO₂ power cycles are primarily in the fossil energy area, the Department is requesting FY 2017 funding for the Supercritical Transformational Electric Power (STEP) pilot facility in the Office of Fossil Energy (FE). In FY 2017, FE will also develop a public program plan that lays out an R&D path for developing the directly-fired Brayton cycle by 2030.

In FY 2017, NE will continue to support stakeholder engagement with industry, utilities, technology vendors, and national laboratories to better understand the commercial deployment business case and the technical issues associated with maturing this technology for a variety of heat sources. Targeted research and technology development activities will be conducted to address critical risk areas and industry needs specifically related to the STEP pilot scale facility, as well as continuing R&D on nuclear applications of sCO₂ Brayton cycle energy conversion

There is no request for funding for sCO₂ in EERE in FY 2017. EERE will continue to support ongoing research and development activities that were funded under the Solar Energy program's Concentrating Solar Power subprogram with FY 2015 appropriations.

Supercritical Carbon Dioxide (sCO₂)
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 & Renewable Energy					
Solar Energy: Concentrating Solar Power	10,000	9,704	---	---	---
Total, Energy Efficiency & Renewable Energy	10,000	9,704	---	---	---
Fossil Energy Research & Development					
Advanced Energy Systems: Advanced Turbines	---	---	---	6,000	+6,000
Advanced Energy Systems: Supercritical Carbon Dioxide Technology ¹	10,000	9,690	15,000	24,300	+9,300
Cross-Cutting Research and Analysis: Extreme Environment Materials	2,000	1,937	9,000	---	-9,000
Total, Fossil Energy Research & 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
Supercritical Transformational Electric Power R&D	5,000	4,835	5,000	---	-5,000
Total, Nuclear Energy	8,300	8,135	8,300	6,000	-2,300
Total, Supercritical Carbon Dioxide (sCO₂)	30,300	29,466	32,300	36,300	+4,000

¹ In FY 2017 the Supercritical Carbon Dioxide Technology (STEP) budget line has been moved under the Advanced Energy Systems subprogram.

Program Roles

Departmental Collaboration

Prior to FY 2015, individual program offices promoting sCO₂ power cycles had focused on cycle evaluation at small-scales (< 250 kW), component development (turbine expanders and recuperators) at intermediate scales, and technology development pertinent to heat source-specific applications. The objective of the sCO₂ crosscut collaboration is to focus on the validation of the sCO₂ power cycle, a common goal of all three offices, through testing at and operation of the 10 MWe facility. Supporting R&D on materials, cycle modeling, fundamental properties of CO₂, etc., specific to the power cycle development, will be coordinated and funded by the individual programs through the sCO₂ crosscut. Heat source application specific technology development needs will continue to be funded by individual program offices as a complement to and in coordination with this sCO₂ collaboration. This will optimize the use of the 10 MWe facility and strengthen the collaboration. The overall collaboration and coordination of the sCO₂ initiative will be managed through regular meetings of the sCO₂ leadership team, with input from sCO₂ project review meetings, program reviews, third party peer reviews and industry outreach efforts. This process will optimize the use of department resources by directing funds to the common objective, focusing effort and identifying common technology needs.

Appropriations

Energy Efficiency & Renewable Energy

EERE's R&D efforts are focused on the development of sCO₂ power cycles that can improve the efficiency and reduce the cost of renewable energy technologies that rely on existing turbine technology for conversion of heat from renewable sources to electricity. The sCO₂ power cycle is a key development in achieving the SunShot mission of making Concentrating Solar Power (CSP) cost competitive with traditional forms of electricity generation by 2020. The CSP subprogram provided \$10.0 million of FY 2015 funding to support the sCO₂ crosscut. The FY 2015 funding supported 3 years' worth of effort for sCO₂ technologies related to CSP. The FY 2015 funding was targeted for research in the areas of corrosion, heat exchangers, receivers, and thermal energy storage and this work will continue throughout FY 2016 and FY 2017. Therefore, no funds are requested in FY 2017.

Fossil Energy Research & Development

The FER&D Program is working to develop sCO₂ power cycles for advanced coal and natural gas based power generation. The sCO₂ power cycle has broad application to advanced coal and natural gas based power systems providing efficiency benefits that will lead to lower cost of electricity while pursuing program objectives for fossil fuel based power generation with reduced CO₂ emissions. FE's ultimate goal is a directly-fired supercritical CO₂ fuel cycle which could also provide significant benefits for CCS by reducing the costs and parasitic load of carbon capture and CO₂ compression. The total FE investment in FY 2017 is split between two subprograms within Advanced Energy Systems:

Advanced Energy Systems: Advanced Turbines

FE's Advanced Energy Systems' Advanced Turbines activity supports the development of advanced stationary turbines and turbine components for fossil based power applications. In FY 2017, this subprogram will conduct R&D focused on technology development for direct-fired sCO₂ power cycles. (\$6.0 million in FY 2017)

Advanced Energy Systems: Supercritical Carbon Dioxide Technology (STEP)

FE's Advanced Energy Systems' STEP activity's funding in FY 2017 will be used to support the design, construction, and ordering of long lead time components for the 10 MWe STEP facility. (\$24.3 million in FY 2017)

Nuclear Energy

The Office of Nuclear Energy (NE) has been exploring sCO₂ power systems for over a decade. NE is working to develop sCO₂ Brayton Cycle technology for integration into advanced reactor systems with improved economics from lower capital cost and improved energy conversion that will improve the competitiveness of nuclear generated electricity.

Reactor Concepts Research, Development and Demonstration: Advanced Reactor Technologies (ART)

In 2017 support for STEP will be consolidated into the ART program. NE investments have culminated in a 250 kWe proof-of-principle Recompression Brayton Cycle test loop at Sandia National Laboratories. NE utilizes this test loop to develop and validate advanced models of sCO₂ Brayton cycle technology for advanced reactors and components, as well as for the development of system operating procedures. NE's efforts also examine liquid sodium/sCO₂ heat exchanger interactions and failure mechanisms. ART will support the STEP pilot-scale facility through engagement with industry and the broader stakeholder community to develop an effective public-private, cost-shared sCO₂ Brayton cycle pilot program, including identifying research and development for both sCO₂ technologies and STEP relating to nuclear energy integration. NE will continue to use expertise gained to previous SC02 work to support FE in the pilot project (\$6.0 million in FY 2017)

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Issued Request for Information (RFI) seeking information, comments, feedback, and recommendations from interested parties for either a commercial demonstration or test pilot-scale facility.
- Issued an FOA and awarded a cooperative agreement for the development and fabrication of an advanced recuperator for the STEP facility.
- Obtained independent cost estimates, on behalf of the government, for a 10 MWe scale sCO₂ test facility.
- Issued an RFP for conceptual plans and associated cost to support the site selection, design, construction, facility start-up and shakedown, and operation of a nominal 10 MWe STEP test facility.
- Participated in government hosted workshops to gather industry perspectives on sCO₂ technology development.

FY 2016 Planned Accomplishments

- Award RFP and receive reports for conceptual plans for technical approach, cost and schedule relevant to a 10 MWe facility.
- Fossil Energy R&D will issue Host Site FOA and award a cooperative agreement to design, build and operate the nominal 10 MWe STEP facility.
- Down-select advanced recuperator design concepts for STEP from the concepts evaluated within the advanced recuperator project awarded in FY 2015.

FY 2017 Key Objectives

- Initiate the design and construction of the STEP facility.

Cybersecurity (\$K)			
FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request
311,601	311,012	323,941	333,479

Overview

The Department of Energy (DOE) is engaged in cyber-related activities to protect the DOE enterprise, including government-owned, contractor-operated sites, from a range of cyber threats that can adversely impact mission capabilities; and activities to improve cybersecurity in the electric power subsector and the oil and natural gas subsector. Strengthening cybersecurity to protect the DOE enterprise requires bolstering the Department's cybersecurity functional capabilities to identify, protect, detect, respond, and recover from the increasing incidence of cyber-attacks. Towards this end, the Department has established a cybersecurity crosscut process to strengthen the coordination of budget activities related to cybersecurity so that cybersecurity is managed based on strategic priorities. 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 strong authentication (Identity, Credential, 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.

The FY 2017 strategic vision and implementation strategy of the DOE's cybersecurity goals are to:

- Protect the DOE Enterprise, including Government-owned, Contractor-operated sites, from a range of cybersecurity threats that can adversely impact mission capabilities; and
- Improve cybersecurity in the electric power sub-sector, and the oil and natural gas sub-sector.

In order to obtain maximum value from its holdings, DOE continuously seeks opportunities to improve how information is used and shared. The Department is committed to responsibly sharing information with authorized users and partners who have a need-to-know. Responsible sharing also requires information safeguards, which protect the networks, the systems, and the information itself by applying the strongest protections to the most sensitive and important information.

Highlights and Major Changes in the FY 2017 Budget Request

Funding for elements included in cyber-related activities increased overall by +\$9.5 million, or +2.9%, to \$333.5 million.

Funding for **Protecting the DOE Enterprise** in the cybersecurity domain increased by +\$23.0 million, or +8.8%, offset by a decrease in **Energy Sector Cybersecurity** of -\$13.5 million, or -21.8% due to the following changes:

- Overall funding for **Protecting the DOE Enterprise** elements increased by +\$23.0 million, with increases in Weapons Activities (+\$14.0 million), Defense Environmental Cleanup (+\$2.5 million), Nuclear Energy (+\$1.8 million), Fossil Energy research and Development (+\$3.1 million), Other Defense Activities (+\$1.7 million); and other offsetting changes as seen in the table below.
- Funding for **Energy Sector Cybersecurity** decreased by -\$13.5 million due to decreases in Electricity Delivery and Energy Reliability (OE) in the Virtual Energy Sector Advanced Digital Forensics Platform (-\$5.0 million); a decrease in the development of the industry-scale electric grid test bed (-\$5.0 million), which had its final funding in FY 2016; one-time funding in FY 2016 not being continued in FY 2017 (-\$5.0 million) for the development of cyber and cyber-physical solutions for advanced control concepts for distribution and municipal utility companies. These decreases in OE were offset by the addition of a \$3.0 million energy sector cybersecurity line in Nuclear Energy.

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	6,239	5,079	17,370	19,900	+2,530
Departmental Administration					
Chief Information Officer	21,364	21,364	21,006	20,026	-980
Electricity Delivery & Energy Reliability					
Cybersecurity for Energy Delivery Systems	45,999	44,756	62,000	45,500	-16,500
Energy Efficiency & Renewable Energy					
Facilities and Infrastructure	2,190	2,190	2,190	2,190	---
Energy Information Administration	837	837	851	865	+14
Fossil Energy R&D					
NETL Infrastructure	1,335	1,335	1,750	4,872	+3,122
Nuclear Energy					
Idaho Sitewide S&S	11,268	11,419	14,466	16,258	+1,792
Nuclear Energy Enabling Tech.	---	---	---	3,000	+3,000
Total, Nuclear Energy	11,268	11,419	14,466	19,258	+4,792
Other Defense Activities					
Enterprise Assessments	4,044	4,044	4,039	5,502	+1,463
Env., Health, Safety and Security	4,385	4,385	5,409	5,409	---
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	16,767	18,430	27,070	27,197	+127
Strategic Petroleum Reserve					
Facilities Development and Operations	1,464	1,464	1,299	2,047	+748
Weapons Activities					
IT and Cyber Security	154,805	154,805	132,588	146,592	+14,004
Working Capital Fund	40,000	40,000	32,981	32,981	---
Total, Cybersecurity	311,601	311,012	323,941	333,479	+9,538

Cybersecurity
FY 2017 Funding by Focus Area (\$K)

	Energy Sector Cybersecurity	Protecting the DOE Enterprise	Total
Defense Environmental Cleanup			
Safeguards and Security	---	19,900	19,900
Departmental Administration			
Chief Information Officer	---	20,026	20,026
Electricity Delivery & Energy Reliability			
Cybersecurity for Energy Delivery Systems	45,500	---	45,500
Energy Efficiency & Renewable Energy			
Facilities and Infrastructure (NREL O&M)	---	2,190	2,190
Energy Information Administration			
	---	865	865
Fossil Energy Research & Development			
NETL Infrastructure	---	4,872	4,872
Nuclear Energy			
Idaho Sitewide Safeguards & Security	---	16,258	16,258
Nuclear Energy Enabling Technologies	3,000	---	3,000
Total, Nuclear Energy	---	19,258	19,258
Other Defense Activities			
Enterprise Assessments	---	5,502	5,502
Environment, Health, Safety and Security	---	5,409	5,409
Legacy Management	---	1,140	1,140
Total, Other Defense Activities	---	12,051	12,051
Science			
Safeguards and Security	---	27,197	27,197
Strategic Petroleum Reserve			
Facilities Development and Operations	---	2,047	2,047
Weapons Activities			
Information Technology and Cyber Security	---	146,592	146,592
Working Capital Fund			
	---	32,981	32,981
Total, Cybersecurity	<hr/> 48,500	284,979	333,479

Program Roles

Protecting the DOE Enterprise (\$285 million)

DOE operates a number of networks that are frequently the target of sophisticated cyber attacks. The Department holds unique data stores in Research and Development (R&D), national security information, restricted data, and overall DOE operations. Strengthening cybersecurity in the DOE Enterprise requires continuing or bolstering the following functional capabilities and initiatives in FY 2017 to identify, protect, detect, respond, and recover from cyber incidents.

- **Enterprise Cybersecurity Programs** (administered by the Office of the Chief Information Officer)

The Department will continue to operate and enhance its cybersecurity policy and program oversight activities to meet mission objectives, improve centralized reporting and oversight, and support federal initiatives in cybersecurity. Key program activities include continuous diagnostics and monitoring, improving information sharing and safeguarding, implementing a centralized supply chain risk management program, and managing a cybersecurity workforce development program.

- **Enterprise Cybersecurity Situational Awareness and Incident Response.** (Working Capital Fund)

The Joint Cybersecurity Coordination Center (JC3) provides Departmental, enterprise-level cybersecurity threat and vulnerability information sharing, analysis, situational awareness, and incident response support and coordination. The JC3 also serves as the centralized incident reporting center and liaison with national cybersecurity centers such as the U.S. Computer Emergency Readiness Team, the National Cybersecurity & Communications Integration Center, and the Defense Cyber Crime Center.

- **Enterprise Identity Credential and Access Management (ICAM)** (Working Capital Fund)

The ICAM program implements strong authentication through enterprise identity credentialing and access management infrastructure and capabilities for unclassified and classified systems to streamline the provisioning of access to DOE systems and ensure that personnel have access to facilities and information to which they are entitled and only for the time period required. Local site ICAM capabilities and activities are synchronized with enterprise efforts to create a “One DOE” identity ecosystem.

- **Direct programmatic funding for program cybersecurity activities and contractor-operated site cybersecurity**

DOE’s cybersecurity policy establishes line management accountability for ensuring protection of information and information systems through senior DOE management, including the Department’s Under Secretaries. Departmental elements provide direct funding to (or contractually direct) DOE labs and sites to bolster cybersecurity and site-specific incident response capabilities.

- **Independent Oversight** (administered through the Office of Enterprise Assessments)

The Department will maintain strong independent oversight over the security of both classified and unclassified systems. Oversight will include announced internal and external network penetration testing as well as “red-team” cybersecurity assessments to provide an understanding of the Department’s cybersecurity protection posture.

Improving Cybersecurity in the Energy Sector (\$48.5 million)

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. Responsibilities include 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.

DOE Office of Electricity Delivery and Energy Reliability (OE) works with industry and other elements of the Federal Government. In FY 2017, OE will focus on the following areas:

- **Accelerating information sharing to enhance situational awareness**

In partnership with industry, OE is supporting the Cybersecurity Risk Information Sharing Program (CRISP), which is a collaborative effort with private energy sector partners. CRISP facilitates the timely sharing of threat information and the deployment of situational awareness tools to enhance the sector's ability to identify threats and coordinate the protection of critical infrastructure. In August 2014, NERC and the Electricity Subsector Coordinating Council (ESCC) agreed to manage CRISP for its sector. About 20 companies have signed contracts with NERC and 17 are sharing data. The FY 2017 Request would support the next CRISP operational pilot.

- **Expanding implementation of the Cybersecurity Capability Maturity Models and Risk Management**

DOE worked with the Department of Homeland Security (DHS), the National Institute of Standards and Technology (NIST), and industry to develop the Cybersecurity Capability Maturity Model (C2M2) to encourage adoption of best practices and to inform cybersecurity investment decisions. The Department also worked with industry on the creation of a Risk Management Process (RMP), which enables organizations to apply effective risk management processes and tailor them to meet their organizational requirements. The FY 2017 Request would support expanding the implementation of C2M2 and RMP.

- **Researching, developing, and demonstrating cutting-edge cybersecurity solutions**

The FY 2017 request would support a competitive solicitation for energy sector-led Research & Development (R&D) to advance cybersecurity for energy delivery systems. Funding would enable mid-term R&D projects to transition into real world cybersecurity capabilities that address the changing threat landscape. DOE aligns all cybersecurity R&D for energy delivery systems with the energy sector's 2011 Roadmap to Achieve Energy Delivery Systems Cybersecurity. DOE works in partnership with the energy sector towards the Roadmap's vision of resilient energy delivery systems designed, installed, operated, and maintained to survive a cybersecurity incident while sustaining critical functions.

- **Exercising and refining the energy sector's cyber incident response capabilities**

The Department is leading an effort to develop an effective, timely, and coordinated cybersecurity incident management capability in the energy sector. In collaboration with DHS, FERC, the Electricity Sector Information Sharing and Analysis Center (ES-ISAC), and industry, DOE is leveraging governmental and non-governmental resources to create a suite of deliverables that will develop the workforce, improve processes, and enhance technologies.

- **Forensics analysis platform**

Funding for this effort will establish a virtual collaborative environment for conducting real-time advanced digital forensics analysis, to be used to analyze untested and untrusted code, programs, and websites without allowing the software to harm the host device.

The DOE Nuclear Energy Enabling Technologies (NEET) program sponsors research and development (R&D) and strategic infrastructure investments to develop innovative and crosscutting nuclear energy technologies.

- **Nuclear Energy Enabling Technologies**

NE is partnering with industry, academia, and other government agencies to assess the cyber threat to our nation's nuclear reactor infrastructure, both research and power producing reactors, and to plan, with plant owners and operators, an appropriate response to the threat. Activities are supported by competitive awards through the NEUP and

NEET solicitations as well as through the SBIR process and directed R&D projects at the Idaho and Sandia National Laboratories.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

Protecting the DOE Enterprise

- FITARA Implementation Plan was collaboratively developed by the FITARA Working Group co-chaired by the Chief Acquisition Officer (CAO), Chief Financial Officer (CFO), and Chief Information Officer (CIO).
- Continued to collaboratively develop a DOE multifactor authentication implementation plan that contains a path forward for improving DOE's multifactor authentication compliance rate.
- Continued to foster intra-Departmental and interagency communications and outreach with CIO reconciling and disseminating incoming cyber requirements, data calls, etc.
- Through leadership and influence, DOE continued to challenge energy sector implementation partners to transform cyber management and operations to improve energy delivery and revolutionize the security of the grid.
- Continued implementation of the Identity, Credential and Access Management (ICAM) project at Headquarters and site elements.
- NNSA started the recapitalization of the Enterprise Secure Network (ESN) and developed a life-cycle management plan for hardware and software components.
- NNSA advanced the modernization of the cybersecurity infrastructure, comprised of almost 100 sensors and over 70 data acquisition servers dispersed nationwide for the NNSA's Information Assurance Response Center (IARC).

Energy Sector Cybersecurity

- A Cybersecurity for Energy Delivery Systems (CEDS) R&D project led by Applied Communication Sciences (ACS) developed innovative technology to provide anomaly and intrusion detection for advanced metering infrastructure and distribution automation wireless mesh networks. Piloted at a utility servicing over 600,000 accounts, this innovative technology gives the utility enhanced visibility into smart meter and distribution automation network activity.
- The Office of Electricity Delivery and Energy Reliability (OE) and the Oak Ridge National Laboratory (ORNL) executed an exclusive license agreement with a cybersecurity solutions provider, R&K Cyber Solutions LLC, for Hyperion, a software product developed by ORNL that can quickly recognize malicious software even if the specific program has not been previously identified as a threat. Hyperion further strengthens the cybersecurity of critical energy infrastructure by providing evidence of the secure functioning of energy delivery control system devices without requiring disclosure of the source code.

FY 2016 Activities in progress

Protecting the DOE Enterprise

- Continue the development, enhancement, and management of major cybersecurity programs, such as supply chain risk management, training and awareness, and continuous monitoring. These programs address evolving federal cybersecurity requirements and activities (e.g., FedRAMP, IS&S, etc.) and directly support overall cybersecurity efforts at the Department.
- By centrally managing cybersecurity programs, improve upon return-on-initiative dollars by implementing a standard program management framework and improving program oversight through periodic program reviews.
- Continue the recapitalization (and modernization) of ESN and continue implementing Public Key Infrastructure (PKI) Smart Cards across the secret fabric.
- Continue implementation of the Identity, Credential and Access Management (ICAM) project at Headquarters and site elements.
- Recertify the Computer Network Defense Service Provider (CNDSP) through the Defense Information Systems Agency.
- Complete all of NNSA Secure Network (NSN) Command Cyber Readiness Inspections (CCRI).
- Initiate NNSA's ESN Command Cyber Readiness Inspections (CCRI).
- Continue modernizing the Cybersecurity infrastructure, comprised of almost 100 sensors and over 70 data acquisition servers dispersed nationwide for the NNSA's IARC.
- NNSA is developing a single information environment to include design authority, enterprise architectural, and research and development activities.

Energy Sector Cybersecurity

- OE is collaborating 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.

FY 2017 Key Objectives

Protecting the DOE Enterprise

- Continue development, enhancement, and management of major cybersecurity programs, such as supply chain risk management, training and awareness, and continuous monitoring. These programs address evolving federal cybersecurity requirements and activities (e.g., FedRAMP, IS&S, etc.) and directly support overall cybersecurity efforts at the Department.
- By centrally managing cybersecurity programs, improve upon return-on-initiative dollars by implementing a standard program management framework and improving program oversight through periodic program reviews.
- Competitively solicit and award a new multi-year R&D projects in cybersecurity and establish a government and industry joint working groups on energy cybersecurity.
- Continue implementation of the Identity, Credential and Access Management (ICAM) project at Headquarters and site elements.
- NNSA will continue the recapitalization (and modernization) of ESN and ESN CCRI.
- NNSA will continue modernizing the cybersecurity infrastructure, comprised of almost 100 sensors and over 70 data acquisition servers dispersed nationwide for the NNSA's IARC.

Energy Sector Cybersecurity

- OE will issue a competitive solicitation for energy sector-led R&D that strengthens energy delivery control system cybersecurity, addressing legacy energy delivery control system infrastructure as well as the continuing introduction of new power system technologies.
- OE will issue a competitive research call for National Laboratory high-risk/high-payoff energy delivery control system cybersecurity research, and mid-term R&D that will also strengthen and maintain core capabilities for the energy sector. Research areas could include technologies or techniques that identify, encapsulate and remove undesired functionality that has been inserted into an energy control system or component at some point along the supply chain.

Research and Development
Crosscut

The Department of Energy supports research and development (R&D) activities and facilities to ensure that the U.S. remains at the leading edge of discovery and to provide the science and technology to fuel innovation and long-term economic growth. The vast scope of the R&D activities encompasses high priority areas such as advanced manufacturing, clean energy, and climate research; and the operation of a large suite of scientific user facilities in support of the R&D activities.

The Department's R&D reporting is now expanded to include administrative activities necessary to the success of the R&D programs. These activities include program direction, safeguards and security, and infrastructure funding that support the R&D programs. These changes are consistent with government-wide and international R&D reporting practices. This funding was not included in the R&D reporting in the FY 2016 and prior year budget justifications.

Research and Development (\$K)^a

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Basic Research					
Bonneville Power Administration Fund	4,868	4,868	4,868	4,868	0
Science ^c	4,310,357	4,333,630	4,505,148	4,827,314	+322,166
Electricity Delivery and Energy Reliability	7,644	7,428	5,844	8,376	+2,532
Fossil Energy R&D	5,355	5,239	6,057	5,494	-563
Nuclear Energy	35,447	35,970	29,570	8,426	-21,144
Defense Nuclear Nonproliferation	87,205	87,205	60,230	59,351	-879
Weapons Activities	3,677	3,677	0	0	0
Total, Basic Research	4,454,553	4,478,017	4,611,717	4,913,829	+302,112
Applied Research					
Bonneville Power Administration Fund	2,522	2,522	2,522	2,522	0
Science ^b	0	65,075	0	0	0
Electricity Delivery and Energy Reliability	66,813	64,929	78,424	81,096	+2,672
Energy Efficiency and Renewable Energy	594,019	575,776	640,428	996,235	+355,807
Fossil Energy R&D ^d	198,143	193,858	224,113	203,290	-20,823
Nuclear Energy	679,095	672,946	725,811	692,352	-33,459
Advanced Research Project Agency - Energy ^c	140,000	140,000	145,500	250,000	+104,500
Environmental Management	4,620	4,468	5,712	15,840	+10,128
Defense Nuclear Nonproliferation	148,311	148,311	162,913	160,533	-2,380
Weapons Activities	3,738,777	3,738,777	3,338,779	4,572,967	+1,234,188
21st Century Clean Transportation Plan Investments ^c	0	0	0	200,000	+200,000
Total, Applied Research	5,572,300	5,606,662	5,324,202	7,174,835	+1,850,633
Development					
Bonneville Power Administration Fund	8,822	8,822	8,822	8,822	0
Electricity Delivery and Energy Reliability	40,258	39,122	55,244	68,600	+13,356
Energy Efficiency and Renewable Energy	762,546	752,411	765,705	1,111,824	+346,119
Fossil Energy R&D ^d	332,024	324,844	375,540	340,649	-34,891
Nuclear Energy	111,952	110,938	122,057	101,629	-20,428
Advanced Research Project Agency - Energy ^c	140,000	140,000	145,500	250,000	+104,500
Naval Reactors	1,083,500	1,083,500	1,207,606	1,235,028	+27,422
Environmental Management	9,380	9,070	11,598	32,160	+20,562
Defense Nuclear Nonproliferation	47,803	47,803	53,020	52,246	-774
Weapons Activities	803,084	803,084	586,547	677,617	+91,070
21st Century Clean Transportation Plan Investments ^c	0	0	0	300,000	+300,000
Total, Development	3,339,369	3,319,594	3,331,639	3,878,575	+546,936

Research and Development Continued (\$K) ^a

	FY 2015 Enacted	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Subtotal, R&D					
Bonneville Power Administration Fund	16,212	16,212	16,212	16,212	0
Science ^c	4,310,357	4,398,705	4,505,148	4,827,314	+322,166
Electricity Delivery and Energy Reliability	114,715	111,479	139,512	158,072	+18,560
Energy Efficiency and Renewable Energy	1,356,565	1,328,187	1,406,133	2,108,059	+701,926
Fossil Energy R&D ^d	535,522	523,941	605,710	549,433	-56,277
Nuclear Energy	826,494	819,854	877,438	802,407	-75,031
Advanced Research Project Agency - Energy ^c	280,000	280,000	291,000	500,000	+209,000
Naval Reactors	1,083,500	1,083,500	1,207,606	1,235,028	+27,422
Environmental Management	14,000	13,538	17,310	48,000	+30,690
Defense Nuclear Nonproliferation	283,319	283,319	276,163	272,130	-4,033
Weapons Activities	4,545,538	4,545,538	3,925,326	5,250,584	+1,325,258
21st Century Clean Transportation Plan Investments ^c	0	0	0	500,000	+500,000
Subtotal, R&D	13,366,222	13,404,273	13,267,558	15,767,239	+2,499,681
R&D Related Equipment					
Science	182,472	161,849	178,476	161,839	-16,637
Energy Efficiency and Renewable Energy	3,600	3,600	3,600	3,600	0
Fossil Energy R&D ^d	15,782	15,782	15,782	40,682	+24,900
Naval Reactors	17,000	17,000	22,490	13,480	-9,010
Weapons Activities	116,442	116,442	125,808	103,000	-22,808
Total, Equipment	335,296	314,673	346,156	322,601	-23,555
R&D Related Construction					
Science	540,636	537,986	621,772	633,465	+11,693
Naval Reactors	138,000	138,000	145,400	171,612	+26,212
Total, Construction	678,636	675,986	767,172	805,077	+37,905
Total Department of Energy R&D and R&D Facilities					
Bonneville Power Administration Fund	16,212	16,212	16,212	16,212	0
Science ^c	5,033,465	5,098,540	5,305,396	5,622,618	+317,222
Electricity Delivery and Energy Reliability	114,715	111,479	139,512	158,072	+18,560
Energy Efficiency and Renewable Energy	1,360,165	1,331,787	1,409,733	2,111,659	+701,926
Fossil Energy R&D ^d	551,304	539,723	621,492	590,115	-31,377
Nuclear Energy	826,494	819,854	877,438	802,407	-75,031
Advanced Research Project Agency - Energy ^c	280,000	280,000	291,000	500,000	+209,000
Naval Reactors	1,238,500	1,238,500	1,375,496	1,420,120	+44,624
Environmental Management	14,000	13,538	17,310	48,000	+30,690
Defense Nuclear Nonproliferation	283,319	283,319	276,163	272,130	-4,033
Weapons Activities	4,661,980	4,661,980	4,051,134	5,353,584	+1,302,450
21st Century Clean Transportation Plan Investments ^c	0	0	0	500,000	+500,000
Total, R&D and R&D Facilities	14,380,154	14,394,932	14,380,886	17,394,917	+3,014,031

^a Totals may vary slightly from President's Budget Analytical Perspectives to reflect the most current estimates available.

^b FY 2017 Mandatory funding is included in Science (\$100,000,000 Basic Research); Advanced Research Project Agency-Energy (\$75,000,000 in Applied Research and \$75,000,000 in Development) and the 21st Century Clean Transportation Plan Investments (\$200,000,000 in Applied Research and \$300,000,000 in Development.)

^c Applied funding in FY 2015 Office of Science represents SBIR/STTR funding transferred from other DOE programs. No applied funding is shown in FY 2015 or FY 2016 because the transfer from other DOE programs has not yet occurred.

^d FY 2017 funding for Fossil Energy R&D differs from the totals in the Budget. Totals in the Budget are based on \$360 million in new Budget Authority. Estimates here include \$240 million in use of prior year balances, for a total program level of \$600 million.

Small Business Innovation Research and Small Business Technology Transfer

Crosscuts

The Department of Energy manages two separate Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) programs, one administered by the Office of Science and the other by the Advanced Research Projects Agency – Energy (ARPA-E). The Office of Science has managed the DOE SBIR and STTR programs for the Department since the SBIR program was created in 1982 and the STTR program was created in 1992. The ARPA-E SBIR/STTR programs were created in FY 2012 to manage ARPA-E's SBIR & STTR allocations independently.

The SBIR/STTR Reauthorization Act of 2011 reauthorized the SBIR and STTR programs and provided for annual increases phased in over six years. The Act directs DOE to expend not less than the percentages of nonexempt extramural R&D as tabulated below. By statute, “amounts obligated for atomic energy defense programs solely for weapons activities or for naval reactor programs” are exempt [15 USC 638(e) (1)].

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
SBIR	2.5%	2.6%	2.7%	2.8%	2.9%	3.0%	3.2%	3.2%
STTR	0.30%	0.35%	0.35%	0.40%	0.40%	0.45%	0.45%	0.45%
Combined	2.80%	2.95%	3.05%	3.20%	3.30%	3.45%	3.65%	3.65%

DOE SBIR/STTR Programs Office

The SBIR/STTR Programs Office works collaboratively with twelve participating offices to administer the programs: six R&D program offices within the Office of Science; the Offices of Electricity Delivery and Energy Reliability, Energy Efficiency and Renewable Energy, Fossil Energy, Nuclear Energy and Environmental Management; and the Office of Defense Nuclear Nonproliferation within the National Nuclear Security Administration. Each office makes awards commensurate with its allocation, and collaborates with other offices as necessary.

The participating programs are responsible for topic selection, reviewer assignment, award selection, and project oversight. Each program office considers its high priority research needs and program mission, as well as the Department’s goals for the program in developing research topics. The specific research topics selected for the SBIR and STTR programs are developed by the Department’s technical program managers.

The SBIR/STTR Programs Office is responsible for issuing topics and solicitations, managing the peer review and award selection process, working with the Science Office of Acquisition and Assistance to award SBIR/STTR Phase I and Phase II grants, issuing annual reports to the U. S. Small Business Administration, performing outreach, and setting overall policy for the Department regarding the two programs.

ARPA-E SBIR & STTR Programs

In FY 2012 ARPA-E established an SBIR/STTR program separate from the DOE-wide SBIR/STTR program. The ARPA-E SBIR/STTR program employs the same rigorous merit review, accelerated contracting, funding, and active project management as all other ARPA-E programs. The ARPA-E SBIR/STTR Program in FY 2017 will focus on targeted, mission-relevant areas where the agency believes that small business provides the best opportunity for innovative technology development.

Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) (\$K)

	FY 2015 Transferred	FY 2016 Projected	FY 2017 Request	FY 2017 vs FY 2016
Advanced Research Projects Agency - Energy				
SBIR	11,380	7,853	10,176	+2,323
STTR	890	1,177	1,431	+254
Electricity Delivery and Energy Reliability				
SBIR	2,702	3,975	5,041	+1,066
STTR	373	596	709	+113
Energy Efficiency and Renewable Energy				
SBIR ^a	25,765	26,240	46,793	+20,553
STTR	3,333	3,936	6,580	+2,644
Environmental Management				
SBIR	406	684	1,056	+372
STTR	56	103	149	+46
Fossil Energy				
SBIR ^b	10,283	12,268	11,373	-895
STTR	1,418	1,839	1,599	-240
Nonproliferation R&D				
SBIR	6,233	6,784	6,832	+48
STTR	860	1,018	961	-57
Nuclear Energy				
SBIR	11,992	13,129	11,901	-1,228
STTR	1,654	1,969	1,674	-295
Science				
SBIR	116,796	125,763	140,541	+14,778
STTR	16,109	18,865	19,764	+899
Total, SBIR	<u>185,557</u>	<u>196,696</u>	<u>233,713</u>	<u>+37,017</u>
Total, STTR	<u>24,693</u>	<u>29,503</u>	<u>32,867</u>	<u>+3,364</u>

^a Energy Efficiency and Renewable Energy's FY 2015 SBIR transferred contribution includes \$720,000 of prior year funds.

^b The narratives in the Fossil Energy Research and Development (FER&D) chapter reflect an SBIR transfer in FY 2015 of \$10,284,000. FER&D's contribution for SBIR in FY 2015 was \$10,283,059. The discrepancy is due to rounding.

Safeguards and Security

Crosscut

Program Mission

The Safeguards and Security (S&S) program at headquarters and each DOE field site protects against theft, diversion, sabotage, espionage, unauthorized access, compromise, and other hostile acts which may cause damage to national security, program continuity, the health and safety of employees, the public or the environment. The ‘crosscut’ summarizes the S&S programs that are distributed through the budget volumes. Each program’s S&S components are described in the budget justifications for:

- Science
- Weapons Activities
- Defense Environmental Cleanup
- Nuclear Energy
- Energy Efficiency and Renewable Energy
- Fossil Energy R&D
- Strategic Petroleum Reserve
- Legacy Management
- Independent Enterprise Assessments
- Environment, Health, Safety and Security
- Chief Information Officer
- Specialized Security Activities

Program Overview

The budget for the direct funded S&S programs is organized to ensure consistency in program and budget execution and ensure management, direction, tracking and monitoring of security costs throughout the Department. Each program budget provides visibility for S&S issues in order to help management ensure effective and efficient S&S program implementation. Figure 1 shows comparable overall funding for S&S in FY 2015 Current, FY 2016 Enacted and FY 2017 Request. It does not include funding for Energy Sector cybersecurity. The S&S crosscut budget is comprised of the functional components shown in the following table.

Figure 1: Overall DOE S&S Funding FY 2015 – FY 2017 (dollars in millions)

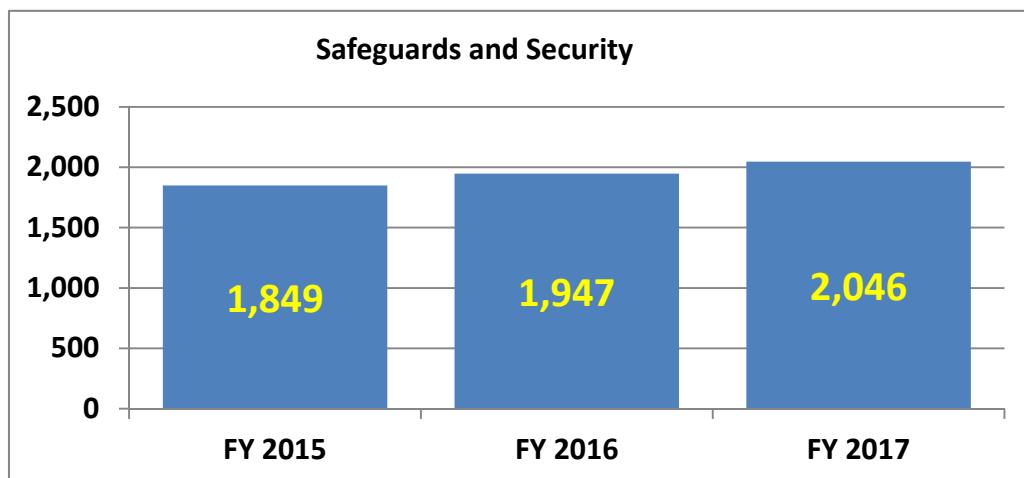


Table 1: Functional Components of S&S

Protective Forces	Provides for the protection of special nuclear materials, information, employees, and government property from theft, diversion, sabotage, and malicious destruction.
Physical Security Systems	Addresses access control and interior/exterior intrusion detection systems.
Information Security	Ensures that individuals protect classified matter and sensitive unclassified matter, and establishes protection systems that require degrees of protection for each classification level.
Cybersecurity	Assures protection of computer resources and networks.
Personnel Security	Supports activities associated with the access authorization program.
Material Control and Accountability	Provides assurance that the nuclear materials used and/or stored at DOE facilities are properly controlled and accounted for at all times.
Program Management	Assures a framework for efficient and effective security operations.
Security Investigations	Provides for background investigations for access authorizations.
Transportation Security	Provides secure transportation of nuclear materials.
Security Infrastructure/Construction	Provides for update and repair of security related infrastructure and construction for that purpose.
Specialized Security Activities	Provides highly specialized analyses in support of national security objectives.

Table 2 shows S&S funding by program cost elements; and Table 3 by functional cost elements. Subsequent sections break out each functional element of field security by program.

Table 2: S&S Funding by Program (dollars in thousands)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Safeguards and Security (S&S) by Program					
Field Security					
Science	85,649	96,914	96,961	47	0.0%
Weapons Activities	1,037,852	1,082,597	1,132,457	49,860	4.6%
Defense Environmental Cleanup	240,000	236,633	255,973	19,340	8.2%
Nuclear Energy	104,000	126,161	129,303	3,142	2.5%
Energy Efficiency and Renewable Energy	9,200	9,200	9,200	0	0.0%
Fossil Energy R&D	6,210	6,800	10,117	3,317	48.8%
Strategic Petroleum Reserve	23,567	24,777	28,322	3,545	14.3%
Legacy Management	1,616	1,972	2,377	405	20.5%
Subtotal, Field S&S	1,508,094	1,585,054	1,664,710	79,656	5.0%
Headquarters Safeguards and Security					
Independent Enterprise Assessments	19,044	19,039	21,014	1,975	10.4%
Environment, Health, Safety and Security	57,039	58,213	69,104	10,891	18.7%
Specialized Security Activities	203,152	230,377	237,912	7,535	3.3%
Chief Information Officer	21,364	21,006	20,026	-980	-4.7%
Working Capital Fund	39,994	32,980	32,981	1	0.0%
Subtotal, Headquarters S&S	340,593	361,615	381,037	19,422	5.4%
Total, Safeguards and Security	1,848,687	1,946,669	2,045,747	99,078	5.1%

Table 3: S&S Funding by Functional Cost Element (dollars in thousands)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
S&S by Functional Cost Element					
Field Security					
Protective Forces	664,463	669,554	689,858	20,304	3.0%
Physical Security Systems	134,472	139,834	148,420	8,586	6.1%
Information Security	41,901	43,643	45,086	1,443	3.3%
Cybersecurity	195,626	197,655	220,196	22,541	11.4%
Personnel Security	55,776	55,656	57,247	1,591	2.9%
Material Control and Accountability	40,181	37,193	38,369	1,176	3.2%
Program Management	109,139	114,730	124,003	9,273	8.1%
Security Investigations	36,212	31,662	34,796	3,134	9.9%
Transportation Security	220,324	239,070	283,107	44,037	18.4%
Security Infrastructure/Construction	10,000	56,057	23,628	-32,429	N/A
Subtotal, Field S&S	1,508,094	1,585,054	1,664,710	79,656	5.0%
Headquarters Safeguards and Security					
Independent Enterprise Assessments	19,044	19,039	21,014	1,975	10.4%
Environment, Health, Safety and Security	57,039	58,213	69,104	10,891	18.7%
Specialized Security Activities	203,152	230,377	237,912	7,535	3.3%
Chief Information Officer	21,364	21,006	20,026	-980	-4.7%
Working Capital Fund	39,994	32,980	32,981	1	0.0%
Subtotal, Headquarters	340,593	361,615	381,037	19,422	5.4%
Total Safeguards and Security	1,848,687	1,946,669	2,045,747	99,078	5.1%

Protective Forces

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Protective Forces					
Science	37,767	38,805	39,638	833	2.1%
Weapons Activities	378,485	390,592	387,000	-3,592	-0.9%
Defense Environmental Cleanup	159,494	146,272	164,807	18,535	12.7%
Nuclear Energy	60,661	65,611	65,738	127	0.2%
Energy Efficiency and Renewable Energy	5,200	5,200	5,200	0	0.0%
Fossil Energy R&D	3,592	3,666	3,745	79	2.2%
Strategic Petroleum Reserve	18,732	18,859	23,191	4,332	23.0%
Legacy Management	532	549	539	-10	-1.8%
Total, Protective Forces	664,463	669,554	689,858	20,304	3.0%

Mission

The Protective Forces element of field S&S provides funding to protect the Department's critical assets, which include nuclear weapons in DOE custody, nuclear weapons components, special nuclear materials, classified information and DOE facilities against a spectrum of threats, including terrorist activity, sabotage, espionage, theft, diversion, loss or unauthorized use.

Protective Force programs throughout the complex provide for personnel salaries, wages and benefits for personnel; management and supervision; and well-maintained and logically deployed equipment and facilities to ensure effective performance of assigned functions and tasks under normal and emergency conditions.

Protective Forces programs include the conduct of access control and security response operations; the physical protection of special nuclear material, classified matter and information, and government property; emergency response forces and tactical assistance during events as well as an on-scene security commander; random patrols; coordination with local law enforcement and protective force elements aimed at providing effective response to emergency situations; random prohibited article inspections; security alarm monitoring and dispatch services; the collection and destruction of classified matter; and constant testing of the protective force to respond to various event scenarios.

Protective Forces programs maintain a Special Response Team capability to provide resolution of incidents that require effective and timely response with force options that exceed the capability of front line protective force personnel. This includes recapture and recovery operations involving the use of special weapons, systems and tactics to effect recovery of special nuclear material under authorized control.

Physical Security Systems

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Physical Security Systems					
Science	11,314	12,019	10,357	-1,662	-13.8%
Weapons Activities	89,866	85,805	95,564	9,759	11.4%
Defense Environmental Cleanup	20,727	29,025	28,346	-679	-2.3%
Nuclear Energy	11,309	11,632	12,690	1,058	9.1%
Fossil Energy R&D	204	257	311	54	21.0%
Strategic Petroleum Reserve	939	957	1,016	59	6.2%
Legacy Management	113	139	136	-3	-2.2%
Total, Physical Security Systems	134,472	139,834	148,420	8,586	6.1%

Mission

The Physical Security Systems element of field S&S provides for the physical protection of special nuclear material and equipment, sensitive information, Departmental property and unclassified facilities. Included are buildings, fences, barriers, lighting, sensors, surveillance devices, entry control devices, access control systems, explosive detection systems, power systems and other real property and hardware designed for, or affecting security. This hardware and equipment are operated and used to support the protection of DOE property and other interests of national security.

Security Systems programs support DOE-wide efforts required to conduct performance assurance testing. These programs also ensure that security alarm systems are operational and functioning in accordance with applicable DOE requirements. Physical Security System programs are also responsible for two subprograms: (1) a barriers, secure storage, and lock program to restrict, limit, delay or deny entry into a designated area; and (2) an entry control and access program that provides positive identification of personnel requiring access to facilities and initial access to facilities in general, ensuring that persons entering or leaving facilities are authorized, and do not introduce prohibited articles into or remove Government property from Departmental facilities.

The budget estimates include all access control administrative activity involving production, accountability and destruction of access authorization badges and firearms credentials. They also include systems components and tamper-safe oversight by monitoring and responding to alarms, determining access and securing all alarmed structures on site. In addition, this element provides for handling all radio communications for the protection of the facilities.

Information Security

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Information Security					
Science	4,268	4,416	4,467	51	1.2%
Weapons Activities	30,432	29,779	31,776	1,997	6.7%
Defense Environmental Cleanup	3,064	5,262	4,304	-958	-18.2%
Nuclear Energy	3,632	3,721	3,985	264	7.1%
Energy Efficiency and Renewable Energy	200	200	200	0	0.0%
Fossil Energy R&D	52	54	56	2	3.7%
Strategic Petroleum Reserve	247	205	242	37	18.0%
Legacy Management	6	6	56	50	833.3%
Total, Information Security	41,901	43,643	45,086	1,443	3.3%

Mission

The Information Security element of field S&S ensures that material and documents that may contain sensitive and classified information are accurately and consistently identified, properly reviewed for content, appropriately marked and protected from unauthorized disclosure, and ultimately destroyed in an approved manner.

Information Security programs provides for plans, policies, procedures and training to ensure that all employees are aware of the requirements for the identification, review, classification, declassification, marking, protection and proper disposal of sensitive information and classified material. In addition, operational security considerations are used to preclude inadvertent compromise of classified material.

Cybersecurity

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Cybersecurity					
Science	18,430	27,070	27,197	127	0.5%
Weapons Activities	154,805	132,588	146,592	14,004	10.6%
Defense Environmental Cleanup	5,079	17,370	19,900	2,530	14.6%
Nuclear Energy	11,419	14,466	16,258	1,792	12.4%
Energy Efficiency and Renewable Energy	2,190	2,190	2,190	0	0.0%
Fossil Energy R&D	1,335	1,750	4,872	3,122	178.4%
Strategic Petroleum Reserve	1,464	1,299	2,047	748	57.6%
Legacy Management	904	922	1,140	218	23.6%
Total, Cybersecurity	195,626	197,655	220,196	22,541	11.4%

Mission

The Cybersecurity element of field S&S ensures that sensitive and classified information that is electronically processed, transmitted, or stored, is properly identified and protected. Cybersecurity programs also ensure that electronic systems are appropriately marked and protected. The programs plan, document, and test classified automated information systems (AIS), communications security (COMSEC), investigations and studies of compromising emanations (TEMPEST); and maintain an appropriate level of infrastructure reliability and integrity, as well as an unclassified AIS program. Included are appropriate plans, policies and procedures, assessments, tests, monitoring and self-assessments, certifications, and user and administrator training and awareness.

The amounts given here are program funds and do not include amounts in Program Direction accounts for Federal staff assigned to Cybersecurity work within the program offices. Nor do they include security elements that are within software applications developed for the Department's programmatic or administrative purposes; whether directly or indirectly funded.

Headquarters Cybersecurity: The Office of the Chief Information Officer also funds headquarters cybersecurity and program offices fund cybersecurity through the mechanism of the Working Capital Fund for the enterprise-wide CyberOne effort managed within the OCIO. In FY17 up to an additional \$33 million will be funded through the WCF and managed by the OCIO. The table below includes cybersecurity efforts in EA and EHSS that pertain to cybersecurity testing, oversight, and insider threat activities. The Energy Information Administration EIA provides cybersecurity mechanisms for the National Energy Information System.

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Cybersecurity (Including OCIO and CyberOne)*					
Field Cybersecurity	195,626	197,655	220,196	22,541	11.4%
Energy Information Administration	837	851	865	14	1.6%
Environment, Health, Safety and Security	4,385	5,409	5,409	0	0.0%
Independent Enterprise Assessments	4,044	4,039	5,502	1,463	36.2%
WCF Funding for Cybersecurity	39,994	32,980	32,981	1	0.0%
Office of the CIO	21,364	21,006	20,026	-980	-4.7%
Total, Cybersecurity	266,250	261,940	284,979	23,039	8.8%

* In the above tables, CyberOne funding is included only on the WCF line.

Personnel Security

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Personnel Security					
Science	5,335	5,412	6,086	674	12.5%
Weapons Activities	34,151	33,587	33,021	-566	-1.7%
Defense Environmental Cleanup	8,569	8,395	10,029	1,634	19.5%
Nuclear Energy	6,153	6,749	6,549	-200	-3.0%
Energy Efficiency and Renewable Energy	720	720	720	0	0.0%
Fossil Energy R&D	154	173	207	34	19.7%
Strategic Petroleum Reserve	661	587	602	15	2.6%
Legacy Management	33	33	33	0	0.0%
Total, Personnel Security	55,776	55,656	57,247	1,591	2.9%

Mission

The Personnel Security element of field S&S supports the access authorization program, and ensure security sensitivity through security briefings such as the initial refresher and termination briefings, re-orientations, computer based training, special workshops and classes, publications, closed circuit television programs, signs, posters and special event days. Support for the access authorization program includes: (1) personnel security assurance program, adjudications, screening and analysis of personnel security cases for determining eligibility for access authorizations, administrative reviews, and handling of Freedom of Information and Privacy Act requests related to security access authorizations; (2) security awareness and education; and (3) activities associated with classified and unclassified visits and assignments by foreign nationals.

Material Control and Accountability

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Material Control and Accountability					
Science	2,256	2,454	2,458	4	0.2%
Weapons Activities	28,678	24,839	26,568	1,729	7.0%
Defense Environmental Cleanup	4,147	4,764	4,289	-475	-10.0%
Nuclear Energy	4,440	4,456	4,354	-102	-2.3%
Fossil Energy R&D	660	680	700	20	2.9%
Total, Material Control and Accountability	40,181	37,193	38,369	1,176	3.2%

Mission

The Material Control and Accountability (MC&A) element of field S&S provides assurance that nuclear materials are properly controlled and accounted for at all times. MC&A provides evidence that all nuclear materials are accounted for appropriately and that theft, diversion, or operational loss has not occurred. MC&A also supports weapons production, nuclear nonproliferation, nuclear materials operations, facility closure, and nuclear critical safety by determining and documenting the amounts of nuclear materials in weapons and packaged items. MC&A administration includes the following: (1) assessing the levels of protection, control and accounting required for the types and quantities of materials at each facility; (2) documenting facility plans for nuclear materials control and accounting; (3) assigning authorities and responsibilities for MC&A functions; (4) ensuring that facility MC&A personnel are trained and qualified to perform their responsibilities; (5) establishing programs to report occurrences such as nuclear material theft, the loss of control or inability to account for nuclear materials, or evidence of malevolent acts; (6) conducting performance testing of required program elements; and (7) establishing facility programs to conduct and document internal assessments of their operations and MC&A programs.

Program Management

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Program Management					
Science	6,279	6,738	6,758	20	0.3%
Weapons Activities	74,511	75,289	83,204	7,915	10.5%
Defense Environmental Cleanup	19,708	22,331	22,527	196	0.9%
Nuclear Energy	6,386	7,845	9,251	1,406	17.9%
Energy Efficiency and Renewable Energy	490	490	490	0	0.0%
Fossil Energy R&D	213	220	226	6	2.7%
Strategic Petroleum Reserve	1,524	1,494	1,074	-420	-28.1%
Legacy Management	28	323	473	150	46.4%
Total, Program Management	109,139	114,730	124,003	9,273	8.1%

Mission

The Program Management element of field S&S develops the framework for efficient and effective security operations. This includes the development and updating of S&S plans, conducting vulnerability assessments to determine if assets are at risk, modeling to ensure the plans and operations meet mission objectives, identifying assets that need protection, developing local threat assessments and participating in the S&S quality panel process and security education. In addition, these programs ensure that plans are developed and revised in accordance with DOE requirements, professional and technical training is administered, and Departmental S&S goals and objectives are implemented complex wide.

The programs develop S&S plans or other applicable security plans and implement S&S requirements, conduct surveys to determine whether S&S requirements have been implemented, respond to national and local threats and perform a vulnerability analysis that measures the risk of S&S assets. Program Management includes participation in the quality panel process, which raises issues from the field to the headquarters managers and ensures that the staff is properly educated in security matters.

Security Investigations

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Security Investigations					
Weapons Activities	27,000	30,000	33,000	3,000	10.0%
Defense Environmental Cleanup	8,812	1,262	1,396	134	10.6%
Energy Efficiency and Renewable Energy	400	400	400	0	0.0%
Total, Security Investigations	36,212	31,662	34,796	3,134	9.9%

* NE and SC Security Investigations costs for Federal Employees are subsumed within Personnel Security.

Mission

The Security Investigations element of field S&S funds background investigations associated with providing access authorizations (security clearances) to DOE Federal and contract personnel who, in the performance of their official duties, require access to classified information or certain quantities of special nuclear material. Background investigations are required by Section 145 of the Atomic Energy Act of 1954, as amended, and Executive Order 12968, Access to Classified Information. The investigations are performed and access authorizations granted based on 10 C.F.R. 710, Criteria and Procedures for Determining Eligibility for Access to Classified Matter or Special Nuclear Material.

The Federal Bureau of Investigation conducts background investigations for DOE Federal personnel for positions of a high degree of importance or sensitivity as required by DOE Order 470.4, Safeguards and Security Program. Funding provides for initial background investigations, periodic reinvestigations, and reimbursement for fingerprint and name checks. The Office of Personnel Management conducts the majority of background investigations for DOE Federal personnel and contractors. Funding provides for initial single scope background investigations, periodic reinvestigations, and initial and reinvestigation national agency checks.

Transportation Security

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Transportation Security					
Weapons Activities	219,924	237,118	282,732	45,614	19.2%
Defense Environmental Cleanup	400	1,952	375	-1,577	-80.8%
Total, Transportation Security	220,324	239,070	283,107	44,037	18.4%

Mission

Transportation security provides for the secure transport of weapons, weapons components, and nuclear materials to support Directed Stockpile Work and consolidation and disposition of nuclear material within the complex; to meet DOE, DOD, and other customer requirements. This functional component of S&S is funded primarily within NNSA's Secure Transportation Asset (STA) Program.

STA provides safe and secure shipments for Weapons Activities, Naval Reactors, Defense Nuclear Nonproliferation and Nuclear Counterterrorism Incident Response and other Department elements requiring this capability. The STA program supports Departmental initiatives to convert weapons-grade material to commercial reactor fuel. STA supports other DOE programs including Nuclear Energy and Environmental Management; and others, including the National Aeronautics and Space Administration, and international shipments in cooperation with Canada, The United Kingdom, and France.

Security Infrastructure/Construction

Funding Schedule (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	\$ Chg.	% Chg.
Security Infrastructure/Construction					
Weapons Activities	0	43,000	13,000	-30,000	-69.8%
Defense Environmental Cleanup	10,000	0	0	0	N/A
Nuclear Energy	0	11,681	10,478	-1,203	-10.3%
Strategic Petroleum Reserve	0	1,376	150	-1,226	N/A
Total, Construction	10,000	56,057	23,628	-32,429	-57.9%

* Weapons Activities includes Security Improvement Program addition in FY 2016.

Mission

Security Infrastructure provides critical security infrastructure investments and protection enhancements necessary to ensure adequate protection of DOE sites and personnel. In FY 2015 Defense Environmental Cleanup funds the Argus system at Savannah River Site. At Idaho National Laboratory (INL), activities include upgrading the perimeter intrusion detection and assessment systems (PIDAS) and the central alarm system (CAS) at the Materials and Fuels Complex (MFC). At INL funding will be provided to refurbish the Live-Fire Shoot House training facility to improve safety and perform designs, related analyses, and modifications to support a multi-year effort to enhance physical security infrastructure. At the Nevada Test Site NNSA funds the replacement of the obsolete PECOS alarm management system at the NNSS DAF with Argus, the current enterprise standard for Category I Special Nuclear Material protection; as a line item construction project. The Weapons Activities Security Improvements Program (SIP) was created with \$30,000,000 in one-time FY 2016 funds to begin to address the backlog of security infrastructure upgrades needed to replace, maintain, and improve the reliability of aging systems, the preponderance of which are well beyond the manufacturer's lifecycle. In FY 2017 no further funds are requested for SIP, but NNSA will provide further details in a project by project funding plan.

Education Activities

The following section provides consolidated information on educational activities at the Department of Energy and includes data for fellowships, scholarships, workforce training programs and primary and secondary school activities. This section responds to language in the Explanatory Statement accompanying the Consolidated Appropriations Act, Public Law (P.L.) 113-76, requesting the Department of Energy to submit this data annually.

Educational Activities Summary (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Fellowships				
Energy Efficiency and Renewable Energy	2,000	2,400	2,000	-400
Environmental Management	8,000	8,000	8,000	0
Nuclear Energy	4,650	4,650	0	-4,650
Science	4,500	11,200	11,200	0
Weapons Activities	20,337	22,685	24,719	+2,034
Defense Nuclear Nonproliferation	3,250	3,750	3,550	-200
Naval Reactors	979	1,032	1,057	+25
Federal Salaries and Expenses	1,346	1,500	1,600	+100
Subtotal, Fellowships	45,062	55,217	52,126	-3,091
Scholarships				
Nuclear Energy	350	350	0	-350
Weapons Activities	0	413	413	0
Subtotal, Scholarships	350	763	413	-350
Primary and Secondary School Activities				
Energy Efficiency and Renewable Energy	0	185	185	0
Fossil Energy	17	18	19	+1
Science	2,930	2,900	3,000	+100
Subtotal, Primary and Secondary School Activities	2,947	3,103	3,204	+101
Workforce Training Programs				
Energy Efficiency and Renewable Energy	10,891	11,699	12,286	+587
Environmental Management	2,000	2,000	2,000	0
Nuclear Energy	0	2,000	1,000	-1,000
Science	14,114	14,114	17,539	+3,425
Subtotal, Workforce Training Programs	27,005	29,813	32,825	+3,012
Total, Department of Energy Educational Activities	75,364	88,896	88,568	-328

Education Activities (\$K)					
Fellowships	Fellowships				
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016	
Energy Efficiency and Renewable Energy					
Solar Energy					
SunShot Post-Doctoral Fellowship	2,000	2,400	2,000	-400	
The DOE SunShot Initiative postdoctoral research program funds emerging research leaders to pursue breakthrough solar energy technologies. These 2-year awards provide doctoral degree recipients the opportunity to conduct applied research at universities, national laboratories, and other research facilities.					
Subtotal, Energy Efficiency and Renewable Energy	2,000	2,400	2,000	-400	
Environmental Management					
Environmental Management					
Minority Serving Institutions Partnership Program	8,000	8,000	8,000	0	
In FY 2010, EM began managing the Minority Serving Institution Partnership Program for the Department to achieve the DOE goals of the partnership. This includes aligning the processes and outcomes with the departmental mission in order to develop the needed skills and talent for DOE's enduring technical workforce at its laboratories and production plants, and to enhance research and education in science, technology, engineering, and mathematics at under-represented colleges and universities.					
Subtotal, Environmental Management	8,000	8,000	8,000	0	
Nuclear Energy					
Nuclear Energy Fellowships	4,650	4,650	0	-4,650	
FY 2016 funding supports 30 graduate-level student fellowship grants to support nuclear science and engineering education and research and the training of the next generation nuclear energy workforce.					
Subtotal, Nuclear Energy	4,650	4,650	0	-4,650	
Science					
Advanced Scientific Computing Research					
Computational Science Graduate Fellowship (CSGF) Program	3,000	10,000	10,000	0	
The CSGF fellowship, is jointly funded by the DOE's Office of Science, Advanced Scientific Computing Research and the DOE's National Nuclear Security Administration, and supports the training of graduate students in computational sciences relevant to DOE's high performance computers and applications directly relevant to the DOE mission. CSGF requires students follow a course of study that transcends the boundaries of traditional academic disciplines - substantive graduate work in each of a scientific or engineering discipline, and generally includes computer science and applied mathematics. It also requires a practicum at a DOE lab in collaboration with a computational scientist. Fellows are mentored to become scientists and engineers able to communicate across scientific and technological disciplines.					

Education Activities (\$K)					
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016	
Fellowships continued					
Fusion Energy Sciences					
National Undergraduate Fellowship (NUF) Program in Plasma Physics and Fusion Energy Sciences	300	0	0	0	0
The NUF Program in Plasma Physics and Fusion Energy Sciences is an undergraduate research internship program. NUF provides outstanding undergraduates with an opportunity to conduct research in disciplines that generally comprise plasma sciences with an emphasis on fusion research. The goal of the Program is to stimulate students' interest in the fields relevant to fusion research, and also to provide capable assistance in and with experience in fusion research projects. In order that the students obtain a sufficient background to begin their research projects, the nine week project is preceded by a one week introductory course at the Princeton Plasma Physics Laboratory in the basic elements of plasma physics; the students then travel to the sites of their research projects. FY 2014, SC began to merge the NUF program with the Science Undergraduate Laboratory Internships (SULI) program supported by SC's Workforce Development for Teachers and Scientists.					
Workforce Development for Teachers and Scientists					
Albert Einstein Distinguished Educator Fellowship	1,200	1,200	1,200	0	0
The Albert Einstein Distinguished Educator Fellowship Act of 1994 gives the Department of Energy responsibility for administering a program of fellowships for elementary and secondary school mathematics and science teachers. The Office of Science's Workforce Development of Teachers and Scientists manages the Albert Einstein Distinguished Educator Fellowship Program for the Federal government and encourages participation by other Federal agencies. Selected teachers spend eleven months in a Congressional Office or a Federal agency. DOE supports 6-7 Fellows annually; approximately 4-5 DOE Fellows are placed in Congressional Offices and 2-3 are placed in DOE. Other agencies that have participated include the National Science Foundation, the National Aeronautics and Space Administration, and the National Oceanic and Atmospheric Administration, who sponsor their own fellows.					
Subtotal, Science	4,500	11,200	11,200	0	
Weapons Activities					
Weapons Activities					
NNSA Graduate Fellowship Program	1,700	2,000	2,900	+900	
NNSA manages a technical fellowship program to cultivate the next generation of leaders in managing in the nuclear stockpile, nonproliferation, nuclear security, and international security. This program will help foster the pipeline of highly qualified professionals who will sustain expertise in these areas through future employment within the nuclear security enterprise.					

Education Activities (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Fellowships continued				
Science Campaign				
Military Academy Collaboration	316	322	363	+41
The NNSA's Military Academy Collaboration (MAC) Program seeks to enhance the relationship between the NNSA and the Department of Defense by providing future military leaders an in depth, technical understanding of and appreciation for NNSA capabilities. The Program offers support for four to six weeks of "in-residence" training on laboratory research and development projects, with travel, billeting, group transportation, and per diem paid by NNSA. The Program is also a recruitment tool for attracting interest in future employment by NNSA. Currently, the Program features collaborations between eight NNSA laboratories, plants, and test sites, and five military service academies: the United States Air Force Academy; the United States Coast Guard Academy; the United States Naval Academy; the United States Military Academy; and the United States Merchant Marine Academy.				
Minority Serving Institutions Partnership Program	14,500	16,500	18,956	+2,456
The Minority Serving Institutions (MSI) Partnerships program align investments in university capacity and workforce development with the NNSA mission to develop the needed skills and talent for NNSA's enduring technical workforce at the laboratories and production plants, and to enhance research and education at under-represented colleges and universities. NNSA MSI programs are designed to increase participation of women and minorities in the nuclear security enterprise and across the nation in science, technology, engineering and math (STEM) disciplines; developing individuals; building core competencies for NNSA; and improving institutional capacity in MSIs.				
Advanced Simulation and Computing Campaign				
Computational Science Graduate Fellowship	1,500	1,500	1,500	0
This Fellowship is jointly funded by the Office of Science's Advanced Scientific Computing Research program and the National Nuclear Security Administration. The Fellowship supports students pursuing doctoral degrees in fields that use high-performance computing to solve complex science and engineering problems.				
Inertial Confinement Fusion Ignition and High Yield				
Stewardship Science Graduate Fellowship (SSGF)	2,321	2,363	1,000	-1,363
The Stewardship Science Graduate Fellowship (SSGF) Program supports Ph.D. students in fields of study critical to stewardship science, such as properties of materials under extreme conditions and hydrodynamics, nuclear science, and High Energy Density Physics. The Program provides opportunities for SSGF Fellows to conduct research at NNSA's laboratories with some of the Nation's most sophisticated and powerful experimental and computational facilities. In doing so, the Fellowship Program builds a community of talented and committed doctoral students, NNSA laboratory staff, and university researchers who share a common desire to advance their science while impacting national security.				
Subtotal, Weapons Activities	20,337	22,685	24,719	+2,034

Education Activities (\$K)

	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Fellowships continued				
Defense Nuclear Nonproliferation				
Nonproliferation and International Security				
Nuclear Nonproliferation International Safeguards Fellowship	750	750	750	0
This program is designed to meet a critical NNSA need for appropriately trained National Laboratory personnel in research, development, and implementation in areas pertinent to Nuclear Nonproliferation and International Safeguards. This fellowship is narrowly targeted to meet a specified expertise gap and produce interdisciplinary PhD graduates from the sciences and engineering who have a solid grasp on policy implications. Fellows are selected by a twelve-member panel of subject matter experts at the National Labs, and complete hands-on research alongside safeguards and nonproliferation teams within the Lab complex.				
Defense Nuclear Nonproliferation				
NNSA Graduate Fellowship Program	2,500	3,000	2,800	-200
NNSA manages a technical fellowship program to cultivate the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security. This program will help foster the pipeline of highly qualified professionals who will sustain expertise in these areas through future employment within the nuclear security enterprise.				
Subtotal, Defense Nuclear Nonproliferation	3,250	3,750	3,550	-200
Naval Reactors				
Rickover Fellowship	979	1,032	1,057	+25
The Rickover Fellowship is an annual fellowship in support of naval nuclear propulsion program.				
Subtotal, Naval Reactors	979	1,032	1,057	+25
Federal Salaries and Expenses				
NNSA Graduate Fellowship Program	1,346	1,500	1,600	+100
NNSA manages a technical fellowship program to cultivate the next generation of leaders in managing in the nuclear stockpile, nonproliferation, nuclear security, and international security. This program will help foster the pipeline of highly qualified professionals who will sustain expertise in these areas through future employment within the nuclear security enterprise.				
Subtotal, Federal Salaries and Expenses	1,346	1,500	1,600	+100
Total Fellowships	45,062	55,217	52,126	-3,091

Education Activities (\$K)

Scholarships	Scholarships			
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Nuclear Energy				
Integrated University Program				
Undergraduate Student Scholarships	350	350	0	-350
FY 2016 funding supports 46 undergraduate student scholarship grants to support nuclear science and engineering education and research and the training of the next generation nuclear energy workforce.				
Subtotal, Nuclear Energy	350	350	0	-350
Weapons Activities				
Nuclear Workforce Initiative (NWI)	0	413	413	0
The Savannah River Site Community Reuse Organization (SRSCRO) is preparing an unsolicited grant request to further its Nuclear Workforce Initiative (NWI). The grant will support a workforce sustainability program and include a nuclear workforce marketing and outreach plan, scholarships in key programs and workplace learning experiences. Schools partnering with SRSCRO are Georgia Regents University, Augusta Technical College, University of South Carolina Aiken, University of South Carolina Salkehatchie and Aiken Technical College. Under the NWI, seven new nuclear education and training programs were developed and implemented to address specific skill gaps in the nuclear industry, with employer partners as advisors and speakers. The proposed grant would provide funding to each participating school to manage program and student population needs and also provide funding to SRSCRO to manage broad marketing campaigns, outreach efforts and overall program management.				
Subtotal,	0	413	413	0
Total Scholarships	350	763	413	-350

Education Activities (\$K)

Primary and Secondary School Activities

Primary and Secondary School Activities				
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Energy Efficiency and Renewable Energy				
Geothermal Technologies	0	185	185	0
Geothermal Student Competition administered at ORISE seeks to engage college and university students in our goal of advancing the development of geothermal as a domestic clean energy resource.				
Subtotal, Energy Efficiency and Renewable Energy	0	185	185	0
Fossil Energy				
Program Direction				
Science Technology Engineering and Mathematics (STEM)	17	18	19	+1
This program supports various school sponsored STEM outreach activities, lab days, and science festivals.				
FY2015 was the first year to host a Lab Day at NETL. Going forward, this will be a DOE-wide event where all labs will host a day in response to Executive Order. DOE Lab Day is a collaborative initiative between the U. S. Department of Energy (DOE) and the White House "My Brother's Keeper" taskforce. A key component of the Department's engagement with the MBK taskforce is the Lab Day events. DOE Laboratories and field locations work with MBK city coordinators to leverage those resources as a source of education, mentorship, and other efforts in support of MBK objectives. Others activities included in this category are the DOE regional science bowls and the Earth Day Poster Contest. These activities encourage participation of primary and secondary schools to further energy related awareness.				
Subtotal, Fossil Energy	17	18	19	+1
Science				
Workforce Development for Teachers and Scientist				
National Science Bowl	2,930	2,900	3,000	+100
The DOE Office of Science National Science Bowl® (NSB) is a nationwide academic competition testing students' knowledge in all areas of mathematics and science, including energy. High school and middle school students are quizzed in a fast paced, question-and-answer format. Since 1991, more than 225,000 students have participated in regional and national competitions. The National Science Bowl® regional winning teams receive all-expenses paid trips to Washington D.C. to compete at the National Finals in late April. Competing teams are composed of four students, one alternate, and a teacher who serves as an advisor and coach. The Office of Science manages the National Science Bowl®, provides central management of 115 regional events, and sponsors the NSB finals competition.				
Subtotal, Science	2,930	2,900	3,000	+100
Total Primary and Secondary School Activities	2,947	3,103	3,204	+101

Education Activities (\$K)

Workforce Training Programs

Workforce Training Programs	Workforce Training Programs			
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Energy Efficiency and Renewable Energy				
Advanced Manufacturing				
Critical Materials Institute	200	200	200	0
Multidisciplinary teams at the Critical Materials Institute explore ways to address challenges in critical materials, including mineral processing, manufacture, substitution, efficient use, and end-of-life recycling. Approximately one percent of total planned funding is allocated to support educational activities. Funding for institutes that are planned but not launched prior to or during FY 2013 is not included.				
Industrial Technical Assistance/Industrial Assessment Centers	6	7	10	+3
Currently located at 24 of the Nation's top engineering schools, the Industrial Assessment Centers combine a traditional engineering curriculum with a unique blend of hands-on experience gained through conducting assessments at small and medium-sized manufacturers.				
Manufacturing Demonstration Facility	190	190	190	0
Work at the Oak Ridge Manufacturing Demonstration Facility focuses on improving and demonstrating new additive manufacturing and carbon fiber manufacturing technologies. Approximately 1 percent of total planned funding is allocated to support educational activities.				
America Makes	20	0	0	0
America Makes advances additive manufacturing technology and products, and serves as a nationally recognized additive manufacturing center of innovation excellence, working to transform the U.S. manufacturing sector and yield significant advancements throughout industry. Approximately 1 percent of total planned funding is allocated to support educational activities.				
R&D Facilities/Wide Bandgap Traineeships	2	2	0	-2
In coordination with the Office of Science, the program will implement a technical training program focused on wide bandgap power electronics which will consist of a mixture of classroom and project based practical experience.				
EERE Advanced Manufacturing Internship Program	500	500	500	0
The EERE Advanced Manufacturing Internship Program will be administered by ORISE who shall administer an education program by providing up to 50 students, recent graduates, and active or former U.S. military servicemen and women for participation in a 6-week internship program at Oak Ridge National Laboratory (ORNL) in the area of Advanced Manufacturing.				
Advanced Manufacturing R&D Facilities/Advanced Composites Traineeships	200	200	200	0
Support for advanced manufacturing traineeships at a Clean Energy Manufacturing Innovation institute on advanced composites (IACMI).				
Advanced Manufacturing R&D Facilities/Smart Manufacturing Traineeships	200	200	200	0
Support for advanced manufacturing traineeships at a Clean Energy Manufacturing Innovation institute on smart manufacturing.				

Education Activities (\$K)				
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Workforce Training Programs continued				
Advanced Manufacturing R&D Facilities/CEMI Institute #4 Traineeships	200	200	200	0
Support for advanced manufacturing traineeships at a Clean Energy Manufacturing Innovation institute on a topic yet to be determined.				
Advanced Manufacturing R&D Facilities/CEMI Institute #5 Traineeships	0	200	200	0
Support for advanced manufacturing traineeships at a Clean Energy Manufacturing Innovation institute on a topic yet to be determined.				
Advanced Manufacturing R&D Facilities/CEMI Institute #6 Traineeships	0	0	200	+200
Support for advanced manufacturing traineeships at a Clean Energy Manufacturing Innovation institute on a topic yet to be determined.				
Strategic Programs				
Energy Literacy	100	0	0	0
The Energy Literacy Project is an effort to support the Department's efforts to promote the nation's energy literacy in the participation of a coordinated energy education and energy literacy effort, to insure that the public has a modest understanding of energy sources, generation, use and conservation strategies to enable informed energy decision. A major activity associated with this goal was the creation of the Energy Literacy document "Essential Principles and Fundamental Concepts for Energy Education;" a peer reviewed collaborative effort to define energy literacy. This collaborative effort includes over 20 recognized educational partners and 13 federal agencies that comprise the U.S. Global Change Research Program Partner agencies.				
National Training and Education Resource (NTER)	300	50		-50
NTER is an easy-to-access, open source, web-based learning platform that enables learners, instructors, and organizations to deliver online training to learners at all levels. It provides free, state-of-the-art resources to help institutions develop, deploy, and manage educational and training courses for audiences of any type. This system was built with the capability to securely share content across all institutions and with the public. As an open source project, the NTER platform is free and has no licensing fees.				
Solar Decathlon	0	2,500	3,000	+500
The U.S. Department of Energy Solar Decathlon is an award-winning program that challenges 20 collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. In addition to showcasing the cost savings and environmental benefits of market-ready solar technologies, the event encourages participating students to think in new ways about incorporating practical, affordable clean-energy solutions into residential applications.				
Vehicle Technology				
Outreach, Deployment & Analysis/Advanced Vehicle Competitions	2,500	2,500	2,500	0
The Advanced Vehicle Competitions activity educates the next generation of young engineers in automotive technology, providing first-hand experience with advanced technologies such as PHEVs and advanced combustion alternative fuel vehicles. In April 2014, DOE and GM announced the participating universities and vehicle platform for EcoCAR 3, a four-year completion series. The EcoCAR 2 competition concluded in June 2014; the outyear estimate is for the final year of EcoCAR 2 and the five-year span of EcoCAR 3.				

Education Activities (\$K)

Workforce Training Programs continued	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Outreach, Deployment & Analysis/Graduate Automotive Technology Education Graduate Automotive Technology Education (GATE) helped to train a future workforce of automotive engineering professionals knowledgeable about, and experienced in, developing and commercializing advanced automotive technologies. This will help overcome technology barriers preventing the development and production of cost-effective, high-efficiency vehicles for the U.S. market by providing research opportunities and developing/establishing cross-disciplinary graduate engineering curriculum emphasizing that center's technology specialty. Focus is on three critical automotive technology areas: hybrid propulsion, energy storage, and lightweight materials. In 2011, 7 GATE Centers were awarded for a DOE total of \$6.4M over 5 years.	2,500	2,500	2,500	0
Building Technologies Solar Decathlon The U.S. Department of Energy Solar Decathlon is an award-winning program that challenges 20 collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. In addition to showcasing the cost savings and environmental benefits of market-ready solar technologies, the event encourages participating students to think in new ways about incorporating practical, affordable clean-energy solutions into residential applications.	2,800	0	0	0
Workforce Development Activities The combined workforce development activities are done in an effort to improve the quality, consistency, and dependability of the commercial buildings advanced energy workforce through guidelines for high-quality training and certification programs.	56	1,000	1,000	0
Race to Zero Student Design Competition The U.S. Department of Energy (DOE) Race to Zero Student Design Competition (Race to Zero) is engaging undergraduate students, graduate students, and university faculty to become part of a new leadership movement to achieve truly sustainable homes. The competition was designed to 1) inspire and develop the next generation of building science professionals; 2) advance and enhance building science curriculum in universities; and 3) complement the experiential learning benefits provided by the U.S. Department of Energy Solar Decathlon through an additional collegiate competition opportunity.	400	400	450	+50
Bioenergy Technologies The Bioenergy Technology Office supports several small educational activities as part of Strategic Communications aimed at establishing effective stakeholder engagement and improving public awareness. These activities include an online career map designed to illustrate employment opportunities to members of the public looking for a job in bioenergy as well as an annual infographic challenge through which high school students research bioenergy topics and create educational infographics.	0	300	300	0
Wind Energy Wind for Schools Wind for schools helps develop a future wind energy workforce by engaging students at higher education institutions to join Wind Application Centers and serve as project consultants for small wind turbine installations at rural elementary and secondary schools.	500	0	0	0
Collegiate Wind Competition The U.S. Department of Energy Collegiate Wind Competition challenges interdisciplinary teams of undergraduate students from a variety of programs to offer a unique solution to a complex wind energy project, providing each student with real-world experience as they prepare to enter the wind industry workforce.	217	750	636	-114
Subtotal, Energy Efficiency and Renewable Energy	10,891	11,699	12,286	+587

Education Activities (\$K)

Workforce Training Programs continued	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016
Environmental Management				
Environmental Management				
Environmental Management Traineeship Program	2,000	2,000	2,000	0
In order to address the ongoing technical challenges of the EM program, EM established an EM Traineeship Program that focuses on Subsurface Contaminant Migration, Remediation, Robotics, Radiochemistry, and Project Management for Nuclear-Hazardous Waste Management Projects. This program is University led graduate training, developed in collaboration/partnership with the DOE National Laboratories and provides significant training for students as a part of the traineeship. The traineeship program supports master's- and Ph.D.-level graduate student appointments at DOE laboratories for practical, hands-on experience supporting a broad range of subsurface remediation, robotics, radiochemistry, and project management applications, ensuring cross-disciplinary training.				
Subtotal, Environmental Management	2,000	2,000	2,000	0
Nuclear Energy				
Nuclear Energy Enabling Technologies/Nuclear Energy Traineeships	0	2,000	1,000	-1,000
FY 2016 funding supports 5 year financial assistance awards will provide training for up to 18 graduate students in radiochemistry aligned with DOE workforce needs by employing a competitive selection process that is open, transparent, and peer reviewed. In FY 2017, NE will undertake a study to identify workforce needs in nuclear energy that are not being addressed by the market.				
Subtotal, Nuclear Energy	0	2,000	1,000	-1,000
Science				
High Energy Physics				
U.S. Particle Accelerator School	614	614	614	0
The Accelerator School provides a national graduate-level training program for undergraduate, graduate students, postdocs, and DOE national laboratory staff to obtain training not otherwise available to the scientific and engineering communities in the field of particle beams and their associated accelerator technologies. The host institution is Fermi National Accelerator Laboratory (Fermilab), although the location of the summer school changes from year to year depending on which university hosts it. Students are usually able to obtain course credit through their academic institutions. Nearly half of the participants are DOE laboratory staff. The expected outcome is the advancement of accelerator physics through a cadre of well-trained engineers and accelerator physicists. The school offers one of the few opportunities for in-job training in accelerator physics. There is little or no instruction or training available in this area within university physics programs.				
DOE/High Energy Physics Traineeship Program in Advanced Technology	0	0	1,000	1,000
The High Energy Physics-directed DOE Traineeship Program in Advanced Technology will support up to 20 graduate students per year to complete studies in key technology areas needed for the DOE mission. The program will focus on providing highly trained accelerator and detector MS or PhD graduates that contribute to the DOE national lab programs through internships, lab-based practicums, workshops, and/or coursework at a DOE Laboratory. It is expected that a substantial fraction of the graduates will take permanent positions with the DOE national laboratories. Specific workforce development needs, identified by surveys of the DOE labs, will be addressed in the initial years of the traineeship program including: cryogenic engineering, radiofrequency technology, and beam physics. Funding supports up to \$55k per student for stipends, tuition, and limited travel for up to two years. Award duration is expected to be five years.				

Education Activities (\$K)					
	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016	
Workforce Training Programs continued					
Nuclear Physics					
Graduate Traineeship in the fields of Radiochemistry and Nuclear Chemistry with an emphasis in isotope production	0	0	1,000	1,000	
This new initiative in FY 2017 will address training in nuclear chemistry and radiochemistry uniquely relevant to radioisotope production to assure the ongoing availability of the very specialized workforce necessary to produce radioactive and enriched stable isotopes, including target processing and radionuclide purification using remote handling facilities such as hot-cells, glove-boxes, robotics and other forms of automation. This traineeship will help remedy the shortage of Ph.D.s with isotope production expertise, as identified by NSACI, NAS, and NSAC in various reports. This program is scheduled for 5 years at \$1 million per year, which will support 10-20 students per year.					
Workforce Development for Teachers and Scientists					
Office of Science Graduate Student Research Program	2,500	2,500	2,575	+75	
The goal of the Office of Science Graduate Student Research (SCGSR) program is to prepare graduate students for science, technology, engineering, or mathematics (STEM) careers critically important to the DOE Office of Science mission, by providing graduate thesis research opportunities at DOE laboratories. The SCGSR program provides supplemental awards to outstanding U.S. graduate students to pursue part of their graduate thesis research at a DOE laboratory in areas that address scientific challenges central to the Office of Science mission. The research opportunity is expected to advance the graduate student's overall doctoral thesis while providing access to the expertise, resources, and capabilities available at the DOE laboratories.					
Visiting Faculty Program	1,700	1,700	1,800	+100	
The Visiting Faculty Program (VFP) goal is to increase the research competitiveness of faculty members and students at post-secondary institutions of higher education (colleges and universities) historically underrepresented in the research community in order to expand the workforce that addresses DOE mission areas. Through direct collaboration with research staff at DOE host laboratories, VFP appointments provide an opportunity for faculty and students to develop skills applicable to programs at their home institutions; this helps increase the STEM workforce in DOE science mission areas at institutions historically underrepresented within the DOE enterprise. Appointments are in the summer term for 10 weeks.					
Community College Internships	1,000	1,000	1,250	+250	
The Community College Internship (CCI) program goal is to encourage community college students to pursue technical careers relevant to the DOE mission by providing technical training experiences at DOE laboratories under the direction of laboratory staff who serve as advisors and mentors. The CCI program places community college students in paid internships conducting technology-focused projects supporting laboratory work under the supervision of a laboratory technician or researcher. Appointments are for 10 weeks during the summer term or for 16 weeks during the fall and spring terms.					
Science Undergraduate Laboratory Internship	8,300	8,300	9,300	+1,000	
The Student Undergraduate Laboratory Internship (SULI) program goal is to encourage undergraduate students to enter STEM careers especially relevant to the DOE mission by providing research experiences at DOE National Laboratories under the direction of scientific and technical laboratory staff who serve as research advisors and mentors. With its long history, the SULI program places undergraduate students in paid internships in science and engineering research activities at DOE laboratories, working with laboratory staff scientists or engineers on projects related to ongoing research programs.					
Appointments are for 10 weeks during the summer term or for 16 weeks during the fall and spring terms.					
Subtotal, Science	14,114	14,114	17,539	+3,425	
Total Workforce Training Programs	27,005	29,813	32,825	+3,012	

Advanced Materials Crosscut

(\$K)	
FY 2016 Enacted	FY 2017 Request
48,000	113,450

Overview

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, invoking 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 past decade has seen tremendous progress in tools development for materials research. The confluence of new theories, novel synthesis and characterization capabilities, and new computer platforms with the urgent demand for new and improved energy technologies that require accelerated pace of materials advancement at lower cost has created an unprecedented opportunity to impact the materials development cycle from scientific discovery to technological innovation. The Presidential Materials Genome Initiative (MGI), announced in June 2011 alongside the Advanced Manufacturing Partnership (AMP), seeks to address challenges in clean energy, health and human welfare, national security, and the next generation workforce by enabling discovery, development, manufacturing and deployment of advanced materials at least twice as fast as possible today at a fraction of the cost. We are at the threshold of a new era where the integrated synthesis, characterization and modeling of complex materials will transform our ability to understand and design new materials with predictive power for real world applications. In close collaboration with the Office of Science and Technology Policy (OSTP), DOE recognized that the applied mission imperatives of the DOE Offices of Energy Efficiency and Renewable Energy (EERE), Fossil Energy (FE), Nuclear Energy (NE), and the National Nuclear Security Administration (NNSA) could provide the necessary pull from materials discovery, an Office of Science (SC) imperative, to accelerate manufacture and deployment of materials for national security and energy applications. The efforts supported in this Crosscut will also be leveraged by other DOE offices, including Environmental Management and Energy Reliability and Electricity Delivery.

We propose that by bringing together American manufacturing expertise, U.S. academic research leadership in materials discovery, and DOE national laboratories’ world leading capabilities in high performance computing, predictive modeling, synthesis, and materials characterization, we will spark a revolution in materials technology deployment. Through collaboration, focused research, development, and demonstration (RD&D) endeavors, and public-private partnerships, we aim to accelerate development of solutions to the most pressing national security and clean energy materials challenges by delivering the tools needed to ensure that new materials technologies are developed and deployed qualification ready. Through partnership, U.S. materials and component manufacturers of all sizes will also gain access to the DOE Lab capabilities in advanced computing and materials, resulting in new made-in-America products being delivered to the world marketplace, and the creation of stable jobs.

In the 2015 Quadrennial Technology Review (QTR) and in workshops, roundtables, and meetings with industry, academic institutions, and input from the National Laboratories, advanced materials research was identified as a cross-cutting high priority area. While materials RD&D underpins much of DOE’s historic and current portfolio across both basic science and applied offices, 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. An important R&D focus is development of computational open-sourced tools and research capabilities that are robust, validated, data-populated, user friendly, and that capture the material science of discovery, processing, and end use behavior. This crosscut is anchored by a shared vision of the optimal approach to designing, scaling, and qualifying materials that harnesses the following suite of innovative capabilities, tools, and methodologies that represent a radical improvement over resource- and time-intensive testing loops necessary in the past:

1. **Multi-scale experimental and computational predictive tools for materials, including multi-material components, to enable design for controlled lifetimes and reliabilities:** *Develop the validated, science-based predictive tools that accurately describe a component's performance at service conditions. Modeling and evaluation will range from nano-, to meso-, micro-, or macro-structural evolution over time, use cycles, and reliability testing, including the resulting impacts on the material's chemical and structural integrity. Models will also consider the impacts of multi-material interfaces on overall component performance. In addition, advanced characterization tools and rapid test and characterization methodologies will be developed to validate model predictions, and to reduce uncertainty.*
2. **New methodologies and tools for modeling and validation of manufacturing processes and components:** *Develop a suite of validated predictive tools, sensors and diagnostics, and other methodologies, to ensure that the requisite materials characteristics are reliably delivered during the manufacture of components. These will include validated computational tools that accurately describe the impacts of processing steps and diagnostics for in-situ process monitoring during manufacture, as well as non-destructive evaluation of components during or resulting from process steps. In addition to confirming component performance through controlled manufacture, these tools will also inform opportunities to maximize efficiencies during the manufacture process.*
3. **Integration of computational and experimental techniques, including high-throughput approaches, towards a unified materials development infrastructure:** *Develop and demonstrate coupled computational and experimental techniques, integration methods, and infrastructure that balance the various advantages and disadvantages of different materials research approaches and deliver emergent R&D. Methods enabling concurrent computational and experimental investigation of new materials will be developed, including techniques and standards supporting feedback between researchers and tools during experimentation and simulation.*
4. **Scale-up of qualified materials understanding:** *Develop methods to understand the effects of manufacturing processes at increasing throughput in order to predictively scale up materials from proof-of-concept laboratory discovery experiments through small-scale development processes and pilot-scale materials production to full-scale manufacturing. This will ensure that born-qualified predictive materials development can be achieved at ever increasing volumes and rates from milligrams to kilograms to metric tonnes.*
5. **Digital data management, informatics, reliability and access:** *Develop digital data repositories by material class that can be networked and are machine discoverable and accessible for algorithms to crawl the broad sets of data and identify unique trends or correlations. Methods will be developed to analyze the large volume of data generated during the manufacture and testing of materials components and to incorporate that learning to improve the predictive capability of simulations, reduce uncertainty in materials performance, and to drive down the risks associated with market deployment. Methods will also be developed to harmonize digital-data storage standards in order to ensure that they are extensible, interoperable, and accessible and address issues relating to open-source standards, data privacy, intellectual property integrity, cybersecurity integrity and experimental integrity for datasets both within and between materials and applications which need to be addressed to ensure public value from the resulting research.*

A gap analysis comparing program priorities; white spaces identified through the QTR, Quadrennial Energy Review (QER), and the National Lab Big Ideas Summit; and current capabilities was conducted to determine where mutual opportunity space existed for both compelling new R&D and accelerated deployment of new advanced materials. Based on this assessment, two topic areas were identified that offer significant new R&D opportunity space for accelerating materials development and deployment under the approach described above:

- **Lightweight Materials & Composites – FY 2017 Emphasis on Polymer Carbon Fiber Composites**

- **Materials Under Extremes – FY 2017 Emphasis on Corrosion and Extreme Conditions**

These two areas are considered the highest priority for planning and implementing highly coordinated R&D activities across DOE and form the foundation of the FY 2017 budget proposal. Beyond these two focus areas, many additional categories of materials would similarly benefit from utilizing integrated synthesis, characterization and modeling of complex materials to accelerate solutions. Such potential focus areas include semiconductors and quantum materials; chemical reactions and catalysis; energy conversion materials and devices; critical materials; and advanced sensors, control, platforms and models. These areas will be nurtured by the cross-DOE program teams for future opportunities for closely coordinated R&D activities. (Additional information on these focus areas is included at the end of this document.)

Highlights and Major Changes in the FY 2017 Budget Request

The FY 2017 Request is the first year for the DOE-wide crosscut on advanced materials, which builds on existing collaborations across DOE offices. In FY 2016, the offices for Science, Fossil Energy, Energy Efficiency and Renewable Energy, Nuclear Energy, and the National Nuclear Security Administration all had existing materials programs, some of which leveraged accelerated approaches. However, these were primarily standalone efforts by each office. The FY 2017 materials crosscut marks a more formal coordination across offices through the Materials Working Group as part of the Clean Energy Manufacturing Tech Team to evaluate and conduct more jointly focused research in areas of mutual interest. Technology-specific efforts unique to individual offices will also continue but will also benefit from more proactive dissemination of best practices, tools, and data across offices.

Advanced Materials Crosscut
Funding by Appropriation and Program (\$K)

	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Energy Efficiency & Renewable Energy				
Vehicle Technologies: Materials Technology	4,290	11,000	39,300	+28,300
Advanced Manufacturing: Advanced Manufacturing R&D Projects	8,500	9,500	10,000	+500
Advanced Manufacturing: Advanced Manufacturing R&D Facilities	14,000	14,000	14,000	---
Total, Energy Efficiency & Renewable Energy	26,790	34,500	63,300	+28,800
Fossil Energy Research & Development				
CCS and Advanced Power Systems: Crosscutting Research and Analysis/Extreme Environment Materials	5,000	1,000	23,150	+22,150
Total, Fossil Energy Research & Development	5,000	1,000	23,150	+22,150
Nuclear Energy				
Reactor Concepts RD&D: Light Water Reactor Sustainability	400	400	400	---
Reactor Concepts RD&D: Advanced Reactor Technologies	2,500	3,000	0	-3,000
Nuclear Energy Enabling Technologies: Crosscutting Technology Development	0	0	2,000	+2,000
Total, Nuclear Energy	2,900	3,400	2,400	-1,000
Science				
Basic Energy Sciences: Materials Sciences and Engineering	2,100	2,100	17,600	+15,500
Total, Office of Science	2,100	2,100	17,600	+15,500
National Nuclear Security Administration				
Engineering program: Enhanced Surveillance Subprogram	4,000	4,000	4,000	---
Advanced Manufacturing Development	3,000	3,000	3,000	---
Total, National Nuclear Security Administration	7,000	7,000	7,000	---
Total Materials Crosscut	43,790	48,000	113,450	+65,450

Advanced Materials Crosscut
FY 2017 Funding by Focus Area (\$K)

	Lightweight Materials: Polymer Composites	Materials Under Extremes: Corrosion	Total
Energy Efficiency & Renewable Energy			
Vehicle Technologies: Materials Technology	34,000	5,300	39,300
Advanced Manufacturing: Advanced Manufacturing R&D Projects	3,500	6,500	10,000
Advanced Manufacturing: Advanced Manufacturing R&D Facilities	14,000		14,000
Total, Energy Efficiency & Renewable Energy	51,500	11,800	63,300
Fossil Energy Research & Development			
CCS and Advanced Power Systems: Crosscutting Research and Analysis/Extreme Environment Materials	---	23,150	23,150
Total, Fossil Energy Research & Development	---	23,150	23,150
Nuclear Energy			
Reactor Concepts RD&D: Light Water Reactor Sustainability	---	400	400
Nuclear Energy Enabling Technologies: Crosscutting Technology Development	---	2,000	2,000
Total, Nuclear Energy	---	2,400	2,400
Science			
Basic Energy Sciences: Materials Sciences and Engineering	6,000	11,600	17,600
Total, Office of Science	6,000	11,600	17,600
National Nuclear Security Administration			
Engineering program: Enhanced Surveillance Subprogram	2,000	2,000	4,000
Advanced Manufacturing Development	3,000	---	3,000
Total, National Nuclear Security Administration	5,000	2,000	7,000
Total, Materials Crosscut	62,500	50,950	113,450

Program Roles

Departmental Collaboration

In 2015, the Materials Working Group was established in the Clean Energy Manufacturing Tech Team to focus on the cross-DOE materials R&D activities and opportunities for enhanced coordination. The team includes representatives from DOE's Office of Science (BES), technology offices (EERE, FE, NE, and OE) and NNSA. Foundational 2015 activities included the QTR, QER, and the National Lab Big Ideas Summit. In addition, a series of roundtable and stakeholder dialogues were held across different regional locations to gather industry and university input on R&D directions as well as potential models for public private partnership.

The Materials Working Group provides a collaborative structure to identify scientific and technology challenges, efficiently leverage funding and expertise through multi-office collaborations, and avoid redundancy of duplicative efforts, especially as these relate to materials in manufacturing endeavors. Functions include:

- Exchanging details on current materials RD&D portfolios across DOE offices;
- Maintaining broad DOE awareness of OSTP multiagency MGI and manufacturing subcommittees;
- Identifying materials research challenges and recommending and implementing solutions;
- Assessing DOE RD&D budgets, plans and priorities, and identifying potential cross-cutting initiatives;
- Facilitating intra-departmental and interagency collaboration of cross-cutting materials RD&D activities; and
- Establishing partnerships with industry stakeholders related to materials and manufacturing.

Lightweight Materials & Composites –Polymer Carbon Fiber Composites (\$60.5M)

Lightweight materials hold the potential for energy savings in energy generation, distribution and use. However, they can be costly, energy and carbon intensive and challenging to manufacturing. Additionally, performance improvements are still possible with new materials and control of interfacial properties. There are two primary classes of polymer composites: (1) light weight structural materials and (2) multifunctional polymer materials with enhanced optical, thermal, electric/dielectric and ionic performance. Composite performance and energy intensity are limited by current polymer and reinforcement (e.g. carbon fibers) materials, for which new material discovery is required. Furthermore, the current process for manufacturing fibers, composites, and structures is also limiting due to challenges in process scale-up. Development is still required to reduce the huge cost of polymer composites development and practical implementation. Through the Advanced Materials Crosscut, we propose a paradigm shift, building on MGI efforts in structural materials, to accelerate the design and development of new carbon fiber polymer composites in the following areas:

Science

Basic Energy Sciences (\$6.0M): A basic research challenge for lightweight materials such as polymer composites is improved understanding of how to design the interfaces between the matrix and the reinforcements, including new tools to characterize these interfaces and predictive capabilities to design improved chemistries and structures. To address these challenges, building on a base program of \$1M, an addition of \$5.0M is proposed for FY 2017 that would support new basic materials research to develop new characterization tools for polymer composites, taking advantage of the BES synchrotron, neutron and nano-scale science user facilities and to use these tools to obtain an in-depth understanding of the interface region and its role in properties. These experimental data will be combined with molecular theory to develop predictive modeling capabilities. By combining polymer science and surface design of reinforcing materials (e.g., carbon fibers), this new understanding would provide guidance for discovery of new materials for these applications and avenues to greatly improve properties through appropriate control of the structure/chemistry of the interface region. Integration of these insights with processing and micro/macro system modeling advances in EERE-supported research would enable engineering of new, low-cost fiber precursors and improved predictive capabilities for designing next generation materials systems. BES plans to issue a FOA to competitively award the new funds; the details of the FOA will be determined by planned roundtables and other information gathering from the broad community and will be closely coordinated with EERE and NNSA to maximize the leverage of the combined DOE research activities on polymer composites.

Energy Efficiency & Renewable Energy

Vehicle Technologies (\$34.0M): To more rapidly deploy lightweight materials and manufacturing processes for automotive use, Vehicle Technologies will issue a \$31M funding opportunity announcement (FOA) and \$3M for a Laboratory Consortium in which MGI tools and techniques are developed and applied to predict and develop a low cost polymeric precursor for carbon fiber designed specifically to meet the mechanical and cost requirements for high volume automotive applications (Tensile Strength 250 KSI (1.72 GPa), Tensile Modulus of 25 MSI (172 GPa), elongation to failure > 1 % and cost < \$5.00/lb). The focus will include multi-scale experimental and computational predictive tools for carbon fiber precursors and processing that enable design for automotive properties and cost; developing new methodologies and tools to validate model predictions and reduce uncertainty; and utilizing digital data management and informatics. The outcome will be a set of validated computational tools to rapidly design and predict properties and processing for optimized low-cost carbon fiber precursors. Vehicle Technologies efforts in this area will emphasize the use of integrated computational and experimental techniques along with the unique characterization and scale up resources available at the DOE National Laboratories to rapidly address industry challenges and automotive technology barriers associated with developing optimized precursors for low cost carbon fiber. In coordination with efforts of the Vehicle Technologies subprogram, research on polymer/fiber interfaces/interphases funded by DOE Basic Energy Sciences will generate new understanding and advance interface-specific characterization techniques. This research will underpin new theory and computational models of interface phenomena and properties.

Advanced Manufacturing (\$17.5M): The technology challenges to the scalable manufacturing of fiber materials and processes for lightweight composite materials are supported through the Carbon Fiber Test Facility (CFTF) at Oakridge National Laboratory. The CFTF is a pilot-scale experimental production capability for making carbon fiber. CFTF works in partnership with the private sector to explore technologies to reduce carbon fiber production costs and energy intensity to stimulate widespread use of the strong, lightweight material. As part of the materials crosscut CFTF will support efforts on scale up materials from bio-based, textile, synthetic, and other low cost precursors. In addition, work will continue to validate new process understanding through computational simulation and experimental studies. In addition to the Advanced Materials Crosscut proposal for the CFTF, the FY 2017 request also includes complementary and leveraged funding as annual support for existing manufacturing institutes such as the Innovative Advanced Composite Materials Institute (IACMI).

National Nuclear Security Administration

Enhanced Surveillance Subprogram and Advanced Manufacturing Development (\$5.0M):

Note that NNSA's investment in advanced manufacturing (see the NNSA Budget) includes \$75 million in FY 2017 to pursue a number of advanced manufacturing activities. Reported immediately below are only those pertaining to advanced manufacturing of polymers.

Qualification of Polymers

New modeling and simulation tools for component shape and property optimization and a science-based understanding of NNSA-specific Additive Manufacturing (AM) feedstock, processes, and materials must be developed. While initial AM components will be qualified using existing Stockpile Stewardship Program technologies and processes, accelerated qualification of AM components requires targeted R&D. AM can broadly transform NNSA's stockpile development and production. In the case of polymeric cushions/pads, reductions in development time have already been realized. Qualification activities associated with cushions/pads will take time to fully realize across the spectrum of possible applications.

Aging of Polymers

NNSA has ongoing concerns with lifetime assessment and aging studies of polymers. The FY 2017 request supports development of rigorous techniques for applying experimental data and mechanistic models, and accelerated aging experiments to polymers. An algorithm for tracking the evolution, diffusion, and consumption of gases in non-isothermal environments was discovered, developed, and implemented in the aging models.

Crosscutting Research Highlights: DOE Basic Energy Sciences will generate new understanding and advance interface-specific characterization techniques. This research will underpin new theory and computational models of interface phenomena and properties. In coordination with Vehicle Technologies and Advanced Manufacturing, these insights will be integrated with advances in EERE-supported research enabling design and engineering of next generation materials. BES will plan roundtables and other information gathering from the broad community will be closely coordinated with EERE to maximize the leverage of the combined DOE research activities on polymer composites.

Materials for Extreme Environments - Corrosion and Extreme Conditions (\$49.95M)

Corrosion, the destructive chemical degradation of a material across a range of temperatures, pressures and chemical environments, can substantially reduce performance and useful lifetime. Corrosion is estimated to cost 6% of the Gross Domestic Product (GDP), approaching 1 trillion per year.¹ It was identified in the QER as a challenge for energy infrastructure, transmission generation and storage. Forms of corrosion and degradation in extreme environments include uniform attack, selective leaching, intergranular corrosion, stress corrosion, galvanic, erosion-corrosion, pitting, creep, fatigue and crevice corrosion. In addition, the QTR identified the manufacturing of materials for harsh service environments as a priority technical area for development, including materials for high-temperatures, pressures, radiation and chemical environments. The primary existing control strategy for corrosion is with protective oxide layers, reducing temperature, adding inhibitors, coatings, cathode protection, microstructure tailoring and alloy development. The field is on the threshold of important breakthroughs, building on emerging advances across many fields of science and technology, and is especially well-matched with the MGI approach.

Science

Basic Energy Sciences (\$11.6M): Corrosion-resistant materials are integral to energy generation and use—new and higher efficiency energy technologies place increasing demands on materials performance with respect to extremes in stress, strain, temperature, chemical reactivity and radiation flux as lifetimes are extended and operating conditions are maximized for enhanced energy generation and minimal environmental impact. These operating conditions require materials that can be used reliably in the associated extreme environments. Development of these new materials requires a comprehensive understanding of the impact of the degradation that results from exposures to these conditions. To address these challenges, building on a base program of \$1.1M, an addition of \$10.5M is proposed for FY 2017 to support research that will focus on advancing the fundamental understanding of corrosion and degradation processes by assessing the evolution of material structure and properties in multiple extreme environments. The research will combine experiments and multi-scale modeling (linking nano to meso to macro) with emphasis on the interfaces in the materials, a region with enhanced susceptibility to corrosion and degradation. In addition to providing the foundation for discovery of new materials for these harsh operating conditions, these models can also be integrated with predictive models of corrosion degradation for systems in actual service environments developed by the appropriate DOE technology offices (e.g., NE for nuclear energy, FE for fossil energy, and EERE for corrosion in renewable energy systems) for lifetime predictions and systems analyses. BES plans to issue a FOA to competitively award the new funds; the details of the FOA will be determined by planned round tables and other information gathering from the broad community and will be closely coordinated with the DOE technology offices to maximize the leverage of the combined DOE research activities on corrosion and extreme environments.

Energy Efficiency & Renewable Energy

Vehicle Technologies (\$5.3M): Corrosion of automotive materials is a key barrier towards wider adoption of multi-material lightweight vehicle structures. While application of multi-material structure enables using the most optimal material for each structural sub-system or component in a vehicle, interaction of these materials at joints and interfaces promotes corrosion and reduces vehicle life. FY 2017 will include a \$5.3M effort to explore advanced corrosion protection technologies for automotive structures with a particular emphasis on leveraging results in the basic science community and developing towards commercially viable technologies.

Advanced Manufacturing (\$6.5M): Additive manufacturing of alloys and composite multi-materials provides both new opportunities and challenges for materials in extreme conditions. Additive techniques provide a new process pathway for introducing and predictively controlling microstructure and composition in materials. This process has the potential to cost-

¹ *<http://www.g2mtlabs.com/2011/06/nace-cost-of-corrosion-study-update/>

effectively create functional structures with built-in and location-specific tailored resistance to extreme conditions. Significant technical issues related to computational modeling and understanding of microstructure, investigation and verification of predictive process control and the development of tools accelerated qualification of additive materials matched to service harsh environments are significant technical challenges to scaling additive processes to manufacturing. In FY 2017, the Manufacturing Demonstration Facility (MDF) and partnering across the National Laboratory system will highlight research related to additive manufacturing with two areas of R&D supporting the materials crosscut. The first is in tailoring and predictive control of microstructure and properties to location-specific requirements through additive manufacturing, including understanding of precursor materials and structure on additive processed materials (\$4M). The second area is in development of low Nickel, creep resistant superalloys in conjunction with additive R&D (\$2.5M).

Fossil Energy (FE)

CCS and Advanced Power Systems (\$23.15M): There is a need for extreme environment materials for oxycombustion, chemical looping, advanced ultra-supercritical steam and supercritical CO₂ power generation. This new initiative, requested at \$23.15M in FY 2017, includes the development of rules/guidelines on what types and classes of models should be used for design of extreme environment materials and predictive behavior modeling of an existing material. Predictive behavior modeling will start at the component design level and will enable faster and more accurate design of materials, and define the limitations of existing modeling tools. By using High Performance Computing (HPC), FE will generate an understanding of the process, structure, properties and performance needed for code certifications. FE will look beyond gram to kilograms of material to the tonne scale of materials manufacturing for the functionalization, scale-up (micro to macro scale), certification, component testing and supply chain development for new classes of extreme environment materials.

Nuclear Energy

Reactor Concepts RD&D (\$0.4M):

In Reactor Concepts RD&D, Light Water Reactor Sustainability continues the development of a modern materials science modeling tool (\$0.4M).

Nuclear Energy Enabling Technologies (NEET) (\$2.0M):

Within NEET, the Advanced Materials Crosscut is supported by the Reactor Materials (RM) and Advanced Methods for Manufacturing (AMM) in the Crosscutting Technology Development subprogram. In FY 2017, RM will fund approximately \$1.0 million for one competitively solicited advanced materials manufacturing research project focused on materials in extreme environments. AMM will fund approximately \$1.0M for one competitively solicited award focused on developing new additive manufacturing techniques.

National Nuclear Security Administration

Enhanced Surveillance Subprogram Advanced Manufacturing Development (\$2.0M): NNSA is developing integrated corrosion models required for understanding multi-mode corrosion phenomena affecting the lifetimes of complex systems. The overarching model incorporates gas evolution, reactive transport and corrosion kinetics and mechanisms. The integrated codes are now being optimized for high performance computing platforms and transition to full three-dimensional predictive modeling.

Crosscutting Research Highlights:

Corrosion is an issue that cuts across DOE mission space as well as industry sectors. The predictive multi-mode corrosion degradation models being developed by NNSA and SC-BES can also be integrated with predictive models of corrosion degradation for systems in actual service environments developed by the appropriate DOE technology offices for lifetime predictions and systems analyses. These efforts will be closely coordinated with the DOE technology offices to maximize the combined DOE research activities on corrosion and extreme environments.

Key Accomplishments and Objectives

FY 2015 Key Accomplishments

- Advanced Materials was established as a formal DOE crosscutting initiative
- Materials Working Group was established in the Clean Energy Manufacturing Tech Team

- A series of roundtable and stakeholder dialogues was held across different regional locations to gather industry and university input in identifying the specific interest and needs for accelerated advanced materials development as well as identification of potential models for public private partnership appropriate for this challenge.

FY 2016 Planned Accomplishments

- Execute individual program office efforts for advanced materials development in Vehicle Technologies for low cost Mg sheet, EERE's Hydrogen and Fuel Cell Technologies program for non-PGM catalysts and membrane electrode assemblies, EERE's Buildings Technologies program for low GWP refrigerant materials, and FE for Materials Under Extremes. These efforts were defined ahead of formalizing a DOE-wide Advanced Materials crosscutting initiative to start in FY 2017. Programs will collectively share information on approaches, best practices and outcomes through the Materials Working Group to the benefit of all.
- Hold workshops, round tables, webinars and other information gathering to provide additional guidance on topics for FY 2017 research and development activities.
- Continued proactive coordination discussions of the broad materials research portfolios across DOE.

FY 2017 Key Objectives

- Launch coordinated initiatives between Science-BES and Applied Energy Offices (EE, FE, NE) in the areas of Lightweight Materials with an emphasis on carbon fiber reinforced polymer composites and Materials Under Extremes with an emphasis on corrosion.

Individual Program Office Directions

In addition to the two coordinated R&D topic areas in the FY 2017 Advanced Materials Crosscut, the Department has complementary investments through individual program offices in areas where there is both scientific headroom and an established need to apply accelerated materials development approaches in order to achieve DOE mission objectives. These five topic areas highlighted below represent opportunities where there is gap in knowledge that can be bridged with new fundamental science through SC-BES or where existing investments in basic science can be leveraged and combined with applied office efforts for developing accelerated materials development tools and capabilities. These activities are equally valued as complementary efforts within the programs as they continue to expand the availability of fundamental science, tools, capabilities, data, and best practices that can be applied towards future program efforts and lay the foundation for a growing and enduring base of accelerated materials development expertise. A more formal coordination through the crosscut will be explored for each of these areas for future budgets.

Semiconductors & Quantum Materials

Next generation semiconductors and related materials for electronics, photonic, and sensor applications have far reaching implications for energy technologies. Materials are the key enablers for advances in this crosscutting area. For example, power electronics have a critical role in transforming the current electric grid into the next-generation grid. Power electronics enable utilities to deliver power effectively with increased reliability, security, and flexibility to the electric power system. While approximately 30% of all power generation utilize power electronics somewhere between the point of generation and its end use today, by 2030 it is expected that up to 80% of generated electricity will utilize power electronics. Enabling next generation materials for these applications requires coordination of innovative materials discovery that takes advantage of manipulation of properties at the quantum level and technology focused advances in wide bandgap power electronics.

Semiconductor and quantum materials are critical enabling materials technologies for energy systems, with applications ranging from information systems for computation, communications and controls, to quantum structures for sensing, computation and scientific instrumentation and to power electronics for grid infrastructure systems, renewable integration, building integration and electric vehicles. Basic and applied scientific understanding of materials and processes at the atom-scale, nano-scale, meso-scale and micro-scale is essential to leveraging opportunities in semiconductor and quantum materials in state-of-the-art systems.

Science

Basic Energy Sciences: Many next generation energy-relevant technological advances, including next generation semiconductors, computers, magnetism, and superconductivity, will likely be enabled by quantum materials—materials

whose properties result from strong and coherent interactions of the constituent electrons with each other, the atomic lattice, or light. Due to recent advances in the ability to manipulate and exploit coherence in light and matter, building on a program of \$4M, additional funding of \$7.5M is proposed for FY 2017 for research that will take advantage of these phenomena to advance the understanding required to discover new materials with unprecedented properties. Research would include predictive modeling, evaluation of phenomena that occur at ultrafast timescales (beyond equilibrium phenomena), and controlled synthesis and design of materials to enable high quality, tailored interfaces, controlled heterogeneity, and coherent manipulation of charge, spin and lattice dynamics that result in entirely new material properties. Interfaces are particularly important in this class of materials as many are made up of multiple thin layers or small islands of atoms (quantum dots); atomic disorder and defects in these structures and diffusion of atoms across the interfaces between the different materials can greatly impact the properties. BES plans to issue a FOA to competitively award the new funds; the details of the FOA will be determined by a “Basic Research Needs” workshop on quantum materials that will be planned in cooperation with EERE and the Next Generation Power Electronics National Manufacturing Innovation Institute (PowerAmerica) to ensure identification of cross-cutting priority research directions in this rapidly growing field.

Energy Efficiency & Renewable Energy

Advanced Manufacturing: The FY 2017 request renews annual support for existing manufacturing institutes such as Power America. Power America NNMI Institute will support investigation of materials and processes used for manufacturing and packaging of wide bandgap semiconductors and power electronics that are cost-competitive with silicon based electronics and offer ~2% energy savings across the many sectors using electric energy and reduced environmental impact while creating manufacturing jobs in U.S. In FY 2017 there will be enhanced coordination with BES as well as academic researchers at universities and laboratories in a technical road-mapping process to ensure ongoing communication of scientific advances with the potential to ultimately meet industrial needs.

Solar Energy: Combinatorial process development has been used very successfully by the integrated circuit and pharmaceutical industries to rapidly and cost effectively move technologies from initial development to full optimization that enables competitive domestic high tech manufacturing. In FY 2016, the Solar Energy program established a program for combinatorial research approaches to materials discovery, optimization, and analysis for innovative, durable and bankable module form-factor. The Solar Energy program intends to continue its efforts in this space in FY 2017 to support innovation in technologies, including but not limited to antireflection coatings, thermally superior encapsulants, and glass alternatives.

Chemical Reactions and Catalysis

Low cost, durable catalysts that minimize the use of precious metals and aid in efficient chemical conversion or energy storage are broad crosscutting areas that affect many DOE offices and industry sectors. Performance of those catalysts at functional material interfaces, as part of manufactured systems or devices, is equally important to the base catalyst performance. The following proposals seek to accelerate development of new cost-effective catalysts and materials-based storage solutions, the performance of which is maintained within application devices.

Energy Efficiency & Renewable Energy

Hydrogen and Fuel Cell Technologies: *Non-Platinum Group Metal (PGM) Catalysts for Membrane Electrode Assemblies (MEA)*

The first major Hydrogen and Fuel Cell Technologies program-specific advanced materials thrust is the establishment of a high-functioning team through a consortium approach to bring together expertise from national laboratories, industry and universities to accelerate non-PGM catalyst, electrode and MEA development. High-throughput combinatorial experimental and advanced modeling tools will be implemented and coupled to baseline non-PGM catalyst research and development. Efforts will enable meeting 2020 and ultimate fuel cell cost targets of \$40/kW and \$30/kW, respectively.

Renewable Hydrogen Production

The second major Hydrogen and Fuel Cell Technologies program-specific advanced materials thrust is the establishment of a high-functioning team though a consortium approach in advanced water-splitting technologies, such as direct photo electrochemical and solar-thermochemical water splitting. A focus will be on utilizing core-capabilities and expertise in accelerated materials development (both theoretical and experimental) for advancing the critical materials systems (such as

photon absorbers, separators and catalysts) needed to advance TRL in these renewable hydrogen technologies. Efforts will enable achieving the ultimate program hydrogen production cost target of <\$2/kg-H₂.

Advanced Materials-Based Hydrogen Storage

The third major Hydrogen and Fuel Cell Technologies program-specific advanced materials thrust relies on a consortium approach to develop advanced materials-based hydrogen storage technologies, which have potential to meet the DOE longer-term targets for onboard hydrogen storage. Collaborative efforts among the national labs, industry and academia will include development and utilization of multi-scale computational predictive tools encompassing multi-phase component studies focused on thermodynamics, gas/proton solid interactions and diffusion. Efforts will enable achieving the program's onboard storage goals through development of reversible materials meeting required performance criteria, including volumetric hydrogen densities exceeding 40 g/L.

Bioenergy Technologies: A significant aggregate effort will be devoted to R&D to continue the development of biological organisms and chemical catalysts for the conversion of hydrolysis, syngas, and bio-oil intermediates to fuels and products. Unfortunately, conventional methods for catalyst screening, development, and characterization are extremely slow and cumbersome. This effort will utilize high-throughput screening capabilities, computational modeling, and cutting edge catalysts characterization tools developed by the Office of Science to develop bio- and chemo- catalysts. By leveraging high-throughput screening capabilities, computational modeling, and detailed characterization of catalysts, we envision improved catalyst materials development in an applied “Catalysis Consortium.” Access to these techniques will allow for rapid identification (>100x more efficient catalyst screening) of new robust catalytic materials that will be necessary for the realization of cost-competitive biofuels.

Advanced Manufacturing: Catalysts for efficient chemical conversions - Process Intensification: While the manufacturing sector consumes nearly 1/4 of the US energy budget, the refining of petroleum and the manufacturing of chemicals are the largest manufacturing sub-sector, consuming nearly 10% of US energy. However, as highlighted in the QTR and the recently published bandwidth study of the US Chemicals industry, these sectors have the theoretical potential to be exothermic, highlighting the importance of catalysts, which reduce the energy inputs and enhance the selective materials manufacturing. Coupled with advanced methods and equipment for mixing, separations and thermal coupling, catalyst materials forms the foundation for the entire emerging field of process intensification for chemical processes, applicable to industries ranging across chemicals, pulp and paper, environmental clean-up, waste water treatment and bio-fuels production. At the same time, there have been tremendous advances in the scientific understanding of catalysts. In 2017, the advanced manufacturing office will investigate opportunities to translate this new scientific understanding into practical catalytic system, leveraging and scaling up the computation and experimental tools developed through MGI.

Energy Conversion Materials and Devices

Energy conversion materials take one form of energy or flux, such as thermal, mechanical, electrical, or magnetic, and convert it to another useful form such as electricity generated from heat using thermoelectric materials as part of waste heat recovery or cooling effects from magnetocaloric materials used in Advanced Cooling (HVAC). Significant opportunities exist to enhanced efficiency of systems and for using low global warming potential (GWP) materials.

Energy Efficiency & Renewable Energy

Building Technologies: An expanded low-GWP advanced cooling (HVAC) R&D effort will be executed through a competitive FOA to address near-term and long-term RD&D needs to reduce climate impacts of HVAC and refrigeration technologies, in support of the President’s Climate Action Plan and the recently proposed amendment to the Montreal Protocol by the U.S., Canada, and Mexico to reduce the use of HFCs (hydrofluorocarbons) by 85 percent by 2036 for developed countries, and by 2046 for developing countries. HFCs in HVAC and refrigeration systems in buildings and industrial facilities accounted for approximately 55 percent of total HFC use in 2010, plus another 24% (approximately) for air conditioning in vehicles.² The goal of the Center is to enable a paradigm shift to a future where low-GWP HVAC solutions are the new norm and non-vapor compression will be dominant in several end uses. Near-term needs will be addressed by developing “drop-in” and “soft-

² EPA, “Recent International Developments under the Montreal Protocol,” <http://www.epa.gov/ozone/intpol/mpagreement.html>, accessed Aug 3, 2015.

optimized” refrigerants suitable to replace HFCs in today’s vapor-compression systems, while long-term solutions will focus on eliminating refrigerants entirely by going to non-vapor-compression systems.

The Building Technologies program supports MGI efforts on magnetocaloric and (potentially) electrocaloric materials would enhance one pathway in the program’s comprehensive low-GWP (Global Warming Potential) research focus. The development of magnetocaloric and other advanced materials for refrigeration is a significant research focus in the search for low-GWP solutions via new refrigerants, materials, or system configurations. For example, developing high-performance magnetic refrigerant materials that will significantly enhance the efficiency and commercialization potential of magnetocaloric HVAC systems (a non-vapor cycle) is a primary goal; MGI effort would focus on the materials science development aspects, i.e., on developing better magnetocaloric materials. These new materials should require a weaker magnetic field to operate, and contain less expensive raw materials. Once several magnetocaloric materials with better material properties have been identified, they can be incorporated into improved system designs to achieve cost-effective, low-GWP solutions.

Advanced Manufacturing: The Advanced Manufacturing office will continue to work to develop scalable manufacturing processes and controls for energy conversion materials (thermoelectrics, magnetocalorics, multiferroics) in partnership with Building Technologies program efforts on low GWP advanced HVAC-materials. This work will build upon the initial efforts to use additive manufacturing processes to as technique for the high-throughput synthesis of experimental samples.

Critical Materials

Materials classified as critical by the Department of Energy are essential to the clean energy economy (they have essential demand and limited substitutes) and are at risk for supply disruptions. Critical materials include five rare earth elements -- dysprosium, terbium, europium, neodymium and yttrium. Other elements -- lithium and tellurium -- are projected by the Department to be “near critical” in the next 15 years.

Energy Efficiency & Renewable Energy

Advanced Manufacturing: In FY 2017, the Critical Materials Institute (CMI) will receive the first annual increment funding in its second, final phase. A focus of the CMI will be computational materials research that complements the Advanced Materials Crosscut. The final phase will build upon the successful work during the first five years, during which new technologies have been investigated, developed and transferred for diversifying the supply, developing alternatives and enhancing recycling of rare-earth materials. Success of CMI has been through merit based scientific evaluation, annual in depth technical peer reviews and team-based collaboration across four national laboratories, universities as well as a growing industrial partnership. The Critical Materials Institute will continue focusing on technologies that help American manufacturers make better use of the critical materials to which they have access, as well as to reduce or eliminate the need for materials that are subject to supply disruptions. These critical materials, including many rare earth elements, are essential for American competitiveness in the primary focus area of clean energy manufacturing. Through interagency collaboration, there is secondary impact of this scientific effort in other nationally important industries like defense.

Advanced Sensors, Controls, Platforms, and Models – SMART Manufacturing

Smart Manufacturing (Advanced sensors, controls, platforms and models) was recently identified by the White House’s Advanced Manufacturing Partnership (AMP) 2.0 as one of the highest priority manufacturing technology areas in need of federal investment.³ Smart Manufacturing encompasses machine-to-plant-to-enterprise-to-supply-chain aspects of sensing, control, prediction, and optimization of processes, as well as hardware and software platforms for industrial automation across the product and process lifecycle. Smart Manufacturing technologies have potential application and impact across the whole manufacturing sector: 1) energy intensive/energy dependent industries, 2) industries focused on the production of clean energy and more efficient energy technologies, and 3) the manufacturing sector more broadly by enabling productivity improvements across all manufacturing industries. Smart Manufacturing allows a holistic view of sensors, information, models, and algorithms in manufacturing, supported by a new wave of networked data and computation with unprecedented capability, and enabling the seamless interoperation of cyber and physical assets. This combination of technologies and

³ President’s Council of Advisors on Science and Technology, “Accelerating U.S. Advanced Manufacturing,” October 2014. http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/amp20_report_final.pdf

practices holds great promise to create a much higher degree and fidelity of process information and insight that can be used to manufacture materials.

Energy Efficiency & Renewable Energy

Advanced Manufacturing: The FY 2017 program will request annual support for existing Clean Energy Manufacturing Institutes that are part of the National Network for Manufacturing Innovation, such as Smart Manufacturing, that will be launched in FY 2016 for “Advanced Sensors, Controls, Platforms and Models” in scalable processes that also includes specific focus for sensor computational materials research. Funding will support sensor computational materials research as a complement to the Advanced Materials Crosscut.

National Nuclear Security Administration

Digital Manufacturing: NNSA cannot rely on other federal agencies or industry to develop AM capabilities adequate to meet NNSA requirements. The ability to add voxels (3-D pixels) of material under digital control to a growing part promises many compelling advantages for efficient, agile production, or repair in small-lots of complex shapes, graded compositions, and embedded functionality. Due to the broad applicability of AM to NNSA applications this will be an ongoing subject of research investments.

Pensions

Pensions

Contractor Pensions and Other Postretirement Benefits

This section of the budget provides projected contractor defined-benefit (DB) pension plan contributions and other postretirement benefit reimbursement costs. The DB pension plan contributions are provided for FY 2015 through FY 2017 by plan and by the following Department of Energy (DOE) Program Offices:¹

- Office of Environmental Management (EM)
- Office of Science (SC)
- Office of Energy Efficiency and Renewable Energy (EERE)
- Office of Nuclear Energy (NE)
- Office of Electricity Delivery and Energy Reliability (OE)
- Office of Fossil Energy (FE)
- Office of Legacy Management (LM)

Projected contractor DB pension plan contributions are provided for FY 2015 through FY 2021 by plan and in aggregate for the National Nuclear Security Administration (NNSA).

Information regarding projected reimbursements for other postretirement benefits (primarily medical) can be found in Section II below.

Contractors that manage and operate DOE's laboratories, weapons plants, and execute environmental cleanup projects at various government-owned sites and facilities are required by DOE to assume sponsorship of the existing contractor DB pension plans and other postretirement benefit plans for incumbent employees who work and retire from employment at those sites and facilities. A portion of the DOE's funding is used to reimburse the costs of the DOE contractors' contributions to DB pension plans and the reimbursements for benefits paid from the other postretirement benefit plans, either as part of the indirect costs or as direct obligations for legacy plans.

Section I - Contractor DB Pension Plan Contributions²

DOE reimburses contractors for pension contributions at levels that are at least equal to the minimum required by the Employee Retirement Income Security Act (ERISA). The minimum required contribution (MRC) is determined on a plan year basis. Only two of the contractor plans have a plan year that coincides with the fiscal year and therefore the majority of fiscal year pension allocations are spread across 2 plan years. At a minimum, plan sponsors of single or multiple employer plans³ in which the plan assets were less than liabilities in the prior year must make quarterly contributions during the plan year with the first one due 3½ months after the beginning of the plan year and any outstanding amount due 8½ months after the plan year ends.

DOE's reimbursement of contractor costs in excess of the minimum contribution will require approval by the Contracting Officer, as well as approval by the parties designated by NNSA and the Program Offices, and coordination with the Chief Financial Officer, the General Counsel, and other affected Headquarters Offices. Table 1 provides the information related to plans where funding in excess of the MRC was requested during FY 2015, and includes the MRC (assuming the legally required payments were made at the specified dates), the contribution approved, and the actual amount contributed during FY 2015. In March 2015, NNSA, SC and NE granted requests by contractors for reimbursement of contributions in excess of the minimum for 16 plans primarily to minimize fluctuations in indirect rates and to mitigate increases in future contribution requirements, including the anticipated FY 2020 increase resulting from expiration of Highway and

¹ Tables include projected contributions from Reimbursable Work (previously referred to as "non-DOE Work") and "Other" entities (e.g., DOE departmental administration, classified programs, etc.).

² Since the final assets of the Fernald Pension Plan were distributed in early FY 2015, DOE has reimbursed contributions for 35 funded defined benefit (DB) pension plans and 13 non-qualified DB pension plans. Non-qualified plans have no assets and are funded on a pay-as-you-go basis.

³A single employer plan is a plan sponsored by only one employer; a multiple employer plan is a plan sponsored by 2 or more unrelated employers and not established by a collective bargaining agreement; a multi-employer plan is a plan established and maintained pursuant to a collectively bargaining agreement between a labor union and a group of employers in a particular trade or industry.

Transportation Funding Act (HATFA) funding relief.⁴ Based on the contractors' assumptions in January 2015, minimum required contributions were expected to increase in FY 2020 and later years after expiration of HAFTA's funding relief.

Table 1 - FY 2015 Contributions in Excess of the MRC (\$K)

Plan	FY 2015 Budget - President's Budget	FY 2015 Minimum Required Contribution	Additional Amount Requested	FY 2015 Total Amount Approved	FY 2015 Final Contributions
Pension Plan for Eligible Bettis Employees and Retirees	54,100	-	54,100	54,100	54,273
Pension Plan of the Pacific Northwest Laboratories, Battelle Memorial Institute	40,000	13,125	31,875	45,000	36,443
Retirement Program for Employees of Consolidated Nuclear Security, LLC at the U. S. Department of Energy Facilities at Oak Ridge, Tennessee	65,000	16,300	52,700	69,000	69,000
Salaried Employee Pension Plan for KAPL Employees and Retirees	46,900	-	46,900	46,900	46,900
Pension Plan for KAPL Employees in Participating Bargaining Units	5,600	-	5,600	5,600	5,600
Kansas City Division Hourly Employees' Pension Plan	5,000	-	7,000	7,000	7,000
Honeywell Retirement Earnings Plan for Aerospace Employees at the Kansas City Division	15,000	-	20,000	20,000	20,000
Idaho National Laboratory Employee Retirement Plan	59,800	22,890	26,810	49,700	52,700
LANS Defined Benefit Pension Plan	140,000	-	140,000	140,000	140,000
LLNS Defined Benefit Pension Plan	23,000	-	23,000	23,000	23,000
National Security Technologies, LLC (NSTec) Employee Retirement Plan	29,300	4,065	12,845	16,910	16,910
Consolidated Nuclear Security Retirement Plan for Non-Bargaining Pantex Location Employees	17,330	5,400	17,500	22,900	22,900
Sandia Corporation Retirement Income Plan	150,000	-	150,000	150,000	150,000
Pension Plan for Employees at ORNL	42,000	-	46,000	46,000	56,000
WSI-LV Retirement Plan	1,611	156	733	889	889
Independent Guard Association of Nevada Pension Trust Fund	1,180	-	360	360	330
Total	695,821	61,936	635,423	697,359	701,945

Battelle Memorial Institute received permission to contribute up to \$45 million to the Pension Plan of the Pacific Northwest Laboratories, but actually contributed \$36.4 million; separately, UT Battelle received provisional approval in April to contribute up to an additional \$10 million to the Pension Plan for Employees at ORNL pension plan in the event UT Battelle was able to manage its operations at ORNL such that the contribution was feasible. Battelle Energy Alliance received approval in September to contribute an additional \$3 million to Idaho's pension plan after determining that it also had managed its operations such that the contribution was feasible. The contribution for the Bettis plan is slightly higher than what was approved in April since it includes the restoration of lost earnings of plan assets associated with benefit overpayments to the plan by Bechtel Marine Propulsion Corporation. While this additional contribution was not reimbursed by DOE, it is reported here for completeness.

⁴ The Highway and Transportation Funding Act required the extended use of higher (non-market based) interest rates to discount future plan liabilities. Using a higher interest rate to discount plans' future liabilities reduces the liability and thus results in lower minimum required contributions.

The contractors are making concerted efforts to reduce the costs and volatility associated with these plans as the costs have steadily increased. In recent years, contractors have made changes to their DB pension plans in an effort to reduce the costs associated with them.

One contractor amended its plans to require certain active participants to contribute to the plans beginning on January 1, 2015 and closed two plans to certain collectively bargained employees after January 1, 2016. Two contractors have amended their plans to offer terminated vested participants the option to take their benefit in the form of a lump sum subject to a maximum limit on the lump sum. Liabilities thus settled are removed from the liabilities carried on the Department's financial statements. These amendments reduce future administrative expenses and Pension Benefit Guaranty Corporation premiums while offering the terminated vested participants the opportunity to access their retirement benefits earlier. One other contractor expects to implement a similar amendment before the end of the calendar year.

The terminations of Lockheed Martin Specialty Components Inc. Pension Plan, which provides benefits to former workers of the Legacy Management Pinellas site, is in process. The Yucca Mountain Pension Plan termination was completed in November 2015 with a final contribution of \$622,000 being made. In accordance with standard procedures for pension plan terminations, all participants in these plans will (or did) receive an annuity in the amount of the value of their pension interest at the time of termination or a lump sum payment.

Due to the timing of the required annual valuation for these contractor DB pension plans, the actual amount of the contractors' annual contributions to these DB pension plans that DOE will reimburse each fiscal year will not generally be known until after budget development. The majority of contractor contributions are included in indirect costs.⁵ Thus, budgetary line items that include DOE reimbursement of contractor contributions to DB pension plans assume an indirect rate anticipated to be sufficient to meet reimbursement requirements. In the case of plans covering employees working for various programs, the allocation of contributions among NNSA, the program offices and work for others is done based on each site's best estimate of the allocation of work based on current and anticipated work for the various parties that the site serves.⁶

Projections of future DB pension plan contributions are highly sensitive to underlying data, methods, and especially assumptions. Changes in the population data that are different from the data expected impact the future costs of these plans; participants retiring earlier, living longer than expected may increase the costs, while compensation increases less than expected may decrease the costs. The most significant assumptions affecting the contribution amounts are those assumptions with respect to future market conditions. In particular, the assumption of the expected return on investments earned by the plans each future year, as well as what the corporate bond yields will be in the future, because they drive the discount rate used to determine the liabilities, have the largest impact on the ultimate contributions that will be reimbursed by the DOE. For example, the actual contributions for fiscal year 2016 will not be known until January 2016 at the earliest because these contributions will be determined based on the asset value as of December 31, 2015, and the discount rate in effect at that time.

Therefore, it is important to emphasize that the actual amounts reimbursed for the applicable fiscal years shown will almost certainly be different from the projections provided in this section. The information provided for the funded plans (excluding the non-qualified plans) is based on plan contributions projected by the DOE's contractors in July and August 2015. The non-qualified plan amounts equal the expected benefit payments which were provided by the contractors for the prior year financial statements. The information has been reviewed by NNSA and relevant DOE program offices and by the Office of the Chief Financial Officer.

- Table 2 provides aggregate FY 2015 actual and FY 2016 and FY 2017 estimated pension plan contributions eligible for reimbursement for all plans.

⁵ Legacy Management Plans, the NNSA legacy University of California (UC) plans and the East Tennessee Technology Park Pension Plan for Grandfathered Employees rely on direct costs.

⁶ These allocations were provided by the contractors to the DOE in July 2015.

- Table 3 provides aggregate FY 2018-2021 estimated pension plan contributions expected to receive NNSA reimbursements.
- Table 4 provides plan-by-plan FY 2015 actual contributions and FY 2016 and FY 2017 estimated pension contributions eligible for reimbursement by NNSA and the DOE.
- Table 5 provides plan-by-plan FY 2018-2021 estimated pension plan contributions eligible for reimbursement by NNSA.

**Table 2: NNSA and DOE Program Office Actual Contributions for FY 2015
and Projected Contributions for FY 2016 and FY 2017 (\$K)**
Based on July 2015 and later⁷ data and pro-rated by Program Office

Program Office	FY 2015	FY 2016	FY 2017	FY 2015-FY 2017 Total Projected Contributions
NNSA	841,437	832,130	597,793	2,271,360
EM	178,733	185,137	233,700	597,570
SC	83,315	77,696	75,431	236,442
EERE	31,468	31,444	31,772	94,684
NE	18,016	15,679	15,162	48,857
OE	2,464	2,361	2,186	7,011
FE	2,084	1,980	1,776	5,840
LM	14,012	12	12	14,036
Reimbursable Work	163,667	174,560	117,045	455,271
Other	16,913	16,856	18,790	52,559
Total	1,352,110	1,337,854	1,093,665	3,783,629

There may be small variance in totals due to rounding

NNSA received notice from University of California (UC) in November 2015, after the data was provided for these tables, that the trustees decreased the funding interest rate and updated the mortality table effective with the July 1, 2015 valuation. The contributions for the two legacy UC Plans (LANL and LLNL) and consequently the NNSA amounts shown in Table 1- Table 4 will increase by \$65.7 million in FY 2017, \$66.3 million in FY 2018 and \$151.2 million in FY 2019 based on the most recent estimates provided by UC.

Table 3: FY 2018-2021 NNSA Projected Reimbursements for Pension Contributions (\$K)
Based on July 2015 and later data⁸

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2018-FY 2021 Total Projected Contributions
NNSA	569,129	409,395	459,924	453,716	1,892,164

There may be small variance in totals due to rounding

Table 4 provides the following information for each plan:

⁷Final information for FY 2015 contributions reported in October 2015 while projected contributions for FY 2016 and later reported in July-August 2015 for all departmental elements.

⁸ See footnote 6, supra.

Plan name and Plan type: single employer, multi-employer, multiple employer, state or non-qualified.

Status: *Open* means that the plans are open to new employees who earn benefits under a traditional defined benefit formula. *Closed* means that the plans are closed to new employees, but active employees who were employed prior to the plan being closed continue to earn benefits; this includes plans where new entrants only or new entrants and legacy employees receive benefits under reduced hybrid formulas which are much less volatile (indicated by the word hybrid after closed). For non-qualified plans, “closed” means that the universe of possible participants is limited to individuals who are currently accruing benefits in the closed qualified plan at the respective site and who may at some point qualify for the non-qualified plan under the terms of the non-qualified plan.) *Partially Closed* means that the plan is closed to some subset of the employee population, but that other employees (e.g., represented employees covered by collective bargaining agreements) are still becoming members of the plan at the time of hire. *Frozen* means that plan liabilities are frozen, i.e., that there are no longer any employees accruing credit for current service under the plan.

Reimbursements & Allocations: Expected contributions are allocated by program office for fiscal year 2015-2017 with 2015 representing actual contributions and contributions for later years based on submissions as outlined in footnote 6. *There may be small variances in totals due to rounding.*

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
East Tennessee Technology Park Pension Plan for Grandfathered Employees		2015	10,575	-	10,575	-	-	-	-	-	-	-	-
	Closed	2016	12,467	-	12,467	-	-	-	-	-	-	-	-
	Multi-employer	2017	12,323	-	12,323	-	-	-	-	-	-	-	-
University of California Retirement Plan - Lawrence Berkeley National Laboratory		2015	40,403	598	226	27,143	4,182	186	360	485	7,071	12	141
	Open	2016	38,791	574	217	26,060	4,015	178	345	465	6,788	12	136
	State	2017	40,240	596	225	27,033	4,165	185	358	483	7,042	12	141
Pension Plan for Eligible Bettis Employees and Retirees		2015	54,273	29,850	-	-	-	-	-	-	24,423	-	-
	Closed	2016	70,200	38,610	-	-	-	-	-	-	31,590	-	-
	Single Employer	2017	26,200	14,410	-	-	-	-	-	-	11,790	-	-
Pension Plan of the Pacific Northwest Laboratories, Battelle Memorial Institute		2015	36,443	7,653	364	7,289	3,644	729	729	364	10,933	-	4,738
	Open	2016	35,000	7,350	350	7,000	3,500	700	700	350	10,500	-	4,550
	Single Employer	2017	35,000	7,350	350	7,000	3,500	700	700	350	10,500	-	4,550
Retirement Program for Employees of Consolidated Nuclear Security, LLC at the U. S. Department of Energy Facilities at Oak Ridge, Tennessee		2015	69,000	66,240	-	-	-	-	-	-	690	-	2,070
	Partially Closed	2016	72,000	69,120	-	-	-	-	-	-	720	-	2,160
	Single Employer	2017	40,600	38,976	-	-	-	-	-	-	406	-	1,218
HPM Occupational Health Services Retirement Plan		2015	-	-	-	-	-	-	-	-	-	-	-
	Partially Closed	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-
Hanford Multi-Employer Pension Plan		2015	82,604	-	79,299	3,304	-	-	-	-	-	-	-

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
Idaho National Laboratory Employee Retirement Plan	Partially Closed	2016	83,631	-	80,286	3,345	-	-	-	-	-	-	-
	Multi-employer	2017	87,936	-	84,419	3,517	-	-	-	-	-	-	-
		2015	52,700	5,804	26,341	109	912	12,428	54	5	6,477	-	570
	Closed	2016	49,700	5,313	26,341	99	835	10,606	50	5	5,929	-	522
	Multiple Employer	2017	49,700	5,313	26,341	99	835	10,606	50	5	5,929	-	522
		2015	46,900	25,795	-	-	-	-	-	-	21,105	-	-
	Closed	2016	67,800	37,290	-	-	-	-	-	-	30,510	-	-
	Single Employer	2017	26,100	14,355	-	-	-	-	-	-	11,745	-	-
		2015	5,600	3,080	-	-	-	-	-	-	2,520	-	-
	Closed	2016	8,300	4,565	-	-	-	-	-	-	3,735	-	-
Pension Plan for KAPL Employees in Participating Bargaining Units	Single Employer	2017	3,000	1,650	-	-	-	-	-	-	1,350	-	-
		2015	7,000	6,664	-	-	-	-	-	-	336	-	-
	Closed Traditional - Hybrid for New Entrants	2016	7,000	6,664	-	-	-	-	-	-	336	-	-
	Single Employer	2017	3,000	2,856	-	-	-	-	-	-	144	-	-
		2015	20,000	18,520	-	-	-	-	-	-	1,480	-	-
Honeywell Retirement Earnings Plan for Aerospace Employees at the Kansas City Division	Closed	2016	20,000	18,520	-	-	-	-	-	-	1,480	-	-
	Single Employer	2017	13,600	12,594	-	-	-	-	-	-	1,006	-	-
		2015	140,000	103,600	9,800	7,000	700	1,400	-	700	15,400	-	1,400
LANS Defined Benefit Pension Plan	Closed	2016	134,000	99,160	9,380	6,700	670	1,340	-	670	14,740	-	1,340

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
University of California Retirement Plan - Lawrence Livermore National Laboratory Retained Segment	Single Employer	2017	106,000	78,440	7,420	5,300	530	1,060	-	530	11,660	-	1,060
		2015	252,000	252,000	-	-	-	-	-	-	-	-	-
	Frozen	2016	237,076	237,076	-	-	-	-	-	-	-	-	-
LLNS Defined Benefit Pension Plan	State	2017	150,688	150,688	-	-	-	-	-	-	-	-	-
		2015	23,000	16,330	-	1,150	230	-	-	-	4,830	-	460
	Closed	2016	23,000	16,330	-	1,380	230	-	-	-	4,600	-	460
	Single Employer	2017	22,000	16,280	-	660	220	-	-	-	4,400	-	440
Lockheed Martin Specialty Components, Inc. Pension Plan		2015	-	-	-	-	-	-	-	-	-	-	-
	Frozen	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-
University of California Retirement Plan - Los Alamos National Laboratory Retained Segment		2015	157,967	157,967	-	-	-	-	-	-	-	-	-
	Frozen	2016	141,428	141,428	-	-	-	-	-	-	-	-	-
	Single Employer	2017	124,396	124,396	-	-	-	-	-	-	-	-	-
National Renewable Energy Laboratory Retirement Plan		2015	16,696	-	-	835	13,524	-	167	-	2,170	-	-
	Froze Traditional - Hybrid for all	2016	18,226	-	-	911	14,763	-	182	-	2,369	-	-
	Single Employer	2017	19,786	-	-	989	16,026	-	198	-	2,572	-	-
National Strategic Protective Services Pension Plan		2015	-	-	-	-	-	-	-	-	-	-	-
	Partially Closed	2016	2,800	-	1,092	1,708	-	-	-	-	-	-	-
	Single Employer	2017	2,000	-	780	1,220	-	-	-	-	-	-	-

¹¹ See footnote 6, supra.

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Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
National Security Technologies, LLC (NSTec) Employee Retirement Plan	Froze	2015	16,910	12,209	1,285	-	-	-	-	-	3,128	-	287
	Traditional - Hybrid for all	2016	18,200	13,140	1,383	-	-	-	-	-	3,367	-	309
	Single Employer	2017	19,900	14,368	1,512	-	-	-	-	-	3,682	-	338
Consolidated Nuclear Security, LLC Retirement Plan for Bargaining Unit Members of the Pantex Guards Union	2015	423	414	-	-	-	-	-	-	-	-	-	8
	Closed	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	1,600	1,568	-	-	-	-	-	-	-	-	32
Retirement Plan for Bargaining Unit Employees of the Metal Trades Council of Consolidated Nuclear Security, LLC	2015	1,727	1,692	-	-	-	-	-	-	-	-	-	35
	Closed	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	5,300	5,194	-	-	-	-	-	-	-	-	106
Consolidated Nuclear Security Retirement Plan for Non- Bargaining Pantex Location Employees	2015	22,900	22,442	-	-	-	-	-	-	-	-	-	458
	Closed	2016	24,000	23,520	-	-	-	-	-	-	-	-	480
	Single Employer	2017	8,400	8,232	-	-	-	-	-	-	-	-	168
Rocky Flats Retirement Plan for Hourly Protection Employees	2015	-	-	-	-	-	-	-	-	-	-	-	-
	Frozen	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-
Rocky Flats Retirement Plan	2015	14,000	-	-	-	-	-	-	-	-	14,000	-	-
	Frozen	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
Sandia Corporation Retirement Income Plan	Closed	2015	150,000	87,600	900	3,450	3,450	900	750	300	51,750	-	900
		2016	150,000	91,050	750	3,300	3,450	900	750	300	48,300	-	1,200
	Single Employer	2017	109,034	66,184	545	2,399	2,508	654	545	218	35,109	-	872
Savannah River Nuclear Solutions LLC Multiple Employer Pension Plan	Closed	2015	67,383	14,824	47,842	-	-	-	-	-	-	-	4,717
		2016	68,000	14,960	48,280	-	-	-	-	-	-	-	4,760
	Multiple Employer	2017	120,000	26,400	85,200	-	-	-	-	-	-	-	8,400
B&W Conversion Services Pension Plan for Grandfathered Employees	Closed	2015	-	-	-	-	-	-	-	-	-	-	-
		2016	1,700	-	1,700	-	-	-	-	-	-	-	-
	Single Employer	2017	1,600	-	1,600	-	-	-	-	-	-	-	-
Pension Plan for Employees at ORNL	Open	2015	56,000	4,256	280	32,872	4,760	2,352	392	224	9,800	-	1,064
		2016	46,000	3,496	230	27,002	3,910	1,932	322	184	8,050	-	874
	Single Employer	2017	46,000	3,496	230	27,002	3,910	1,932	322	184	8,050	-	874
Waste Isolation Pilot Plant Pension Plan	Open	2015	-	-	-	-	-	-	-	-	-	-	-
		2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	9,800	-	9,800	-	-	-	-	-	-	-	-
West Valley Pension Plan	Closed	2015	1,187	-	1,187	-	-	-	-	-	-	-	-
		2016	2,100	-	2,100	-	-	-	-	-	-	-	-
	Single Employer	2017	2,400	-	2,400	-	-	-	-	-	-	-	-

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
Mound Employees Pension Plan		2015	-	-	-	-	-	-	-	-	-	-	-
	Frozen	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-
WSI-LV Retirement Plan		2015	889	889	-	-	-	-	-	-	-	-	-
	Closed	2016	909	909	-	-	-	-	-	-	-	-	-
	Single Employer	2017	766	766	-	-	-	-	-	-	-	-	-
Independent Guard Association of Nevada Pension Trust Fund		2015	330	330	-	-	-	-	-	-	-	-	-
	Closed	2016	280	280	-	-	-	-	-	-	-	-	-
	Single Employer	2017	670	670	-	-	-	-	-	-	-	-	-
Yucca Mountain Salaried Pension Plan		2015	-	-	-	-	-	-	-	-	-	-	-
	Frozen	2016	-	-	-	-	-	-	-	-	-	-	-
	Single Employer	2017	-	-	-	-	-	-	-	-	-	-	-
Battelle Memorial Institute Excess Benefit and Supplemental Executive Pension Plans		2015	11	2	0	2	1	0	0	0	3	-	1
	Closed	2016	10	2	0	2	1	0	0	0	3	-	1
	Non-qualified	2017	10	2	0	2	1	0	0	0	3	-	1
Executive and Supplemental Pension Plans for Designated Bettis Employees		2015	1,414	777	-	-	-	-	-	-	636	-	-
	Closed	2016	1,392	766	-	-	-	-	-	-	626	-	-
	Non-qualified	2017	1,489	819	-	-	-	-	-	-	670	-	-
Excess and Supplemental Pension Plan for Designated KAPL Employees		2015	221	121	-	-	-	-	-	-	99	-	-
	Closed	2016	255	140	-	-	-	-	-	-	115	-	-
	Non-qualified	2017	270	148	-	-	-	-	-	-	121	-	-
LANS 401(a)(17) Restoration Plan		2015	125	93	9	6	1	1	-	1	14	-	1

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
LANS Restoration Plan	Closed	2016	60	45	4	3	0	1	-	0	7	-	1
	Non-qualified	2017	84	62	6	4	0	1	-	0	9	-	1
		2015	11	8	1	1	0	0	-	0	1	-	0
LLNS 401(a)(17) Restoration Plan	Closed	2016	25	18	2	1	0	0	-	0	3	-	0
	Non-qualified	2017	32	24	2	2	0	0	-	0	4	-	0
		2015	130	92	-	6	1	-	-	-	27	-	3
LLNS Restoration Plan	Closed	2016	230	163	-	14	2	-	-	-	46	-	5
	Non-qualified	2017	317	234	-	10	3	-	-	-	63	-	6
		2015	72	51	-	4	1	-	-	-	15	-	1
Sandia Nonqualified Pension Plan	Closed	2016	112	80	-	7	1	-	-	-	22	-	2
	Non-qualified	2017	146	108	-	4	1	-	-	-	29	-	3
		2015	2,110	1,232	13	49	49	13	11	4	728	-	13
The Savannah River Nuclear Solutions, LLC Nonqualified Pension Plan	Closed	2016	2,131	1,294	11	47	49	13	11	4	686	-	17
	Non-qualified	2017	2,225	1,350	11	49	51	13	11	4	716	-	18
		2015	530	117	377	-	-	-	-	-	-	-	37
Washington Government Services Executive Pension	Frozen	2016	435	96	309	-	-	-	-	-	-	-	30
	Non-qualified	2017	422	93	300	-	-	-	-	-	-	-	30
		2015	49	-	49	-	-	-	-	-	-	-	-
	Frozen	2016	56	-	56	-	-	-	-	-	-	-	-

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 4: FY 2015 Actual and FY 2016 and FY 2017 Projected Contributions by Plan, NNSA and Program Office
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Plan status (open, partially closed, closed, frozen)	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	OE	FE	Reimbursable Work	LM	Other
Plan (TRU Solutions Participants Only)	Non-qualified	2017	58	-	58	-	-	-	-	-	-	-	-
Washington Government Services Executive Pension Plan (West Valley Participants Only)	2015	184	-	184	-	-	-	-	-	-	-	-	-
	Frozen	2016	178	-	178	-	-	-	-	-	-	-	-
	Non-qualified	2017	176	-	176	-	-	-	-	-	-	-	-
Consolidated Nuclear Security, LLC Equalization Retirement Income Plan and Supplemental Retirement Income Plan	2015	180	173	-	-	-	-	-	-	-	2	-	5
	Closed	2016	162	156	-	-	-	-	-	-	2	-	5
	Non-qualified	2017	159	153	-	-	-	-	-	-	2	-	5
UT-Battelle Equalization Retirement Income Plan and Supplemental Retirement Income Plan	2015	164	12	1	96	14	7	1	1	29	-	-	3
	Open	2016	198	15	1	116	17	8	1	1	35	-	4
	Non-qualified	2017	239	18	1	140	20	10	2	1	42	-	5
Total	2015	1,352,110	841,437	178,733	83,315	31,468	18,016	2,464	2,084	163,667	14,012	16,913	
	2016	1,337,854	832,130	185,137	77,696	31,444	15,679	2,361	1,980	174,560	12	16,856	
	2017	1,093,665	597,793	233,700	75,431	31,772	15,162	2,186	1,776	117,045	12	18,790	

¹¹ See footnote 6, supra.

May be small variances in totals due to rounding.

Table 5: FY 2018-FY2021 Projected Contributions for NNSA by Plan
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Fiscal Year	NNSA
University of California Retirement Plan - Lawrence Berkeley National Laboratory	2018	619
	2019	643
	2020	669
	2021	697
Pension Plan for Eligible Bettis Employees and Retirees	2018	14,190
	2019	11,275
	2020	10,835
	2021	10,835
Pension Plan of the Pacific Northwest Laboratories, Battelle Memorial Institute	2018	7,350
	2019	7,350
	2020	7,350
	2021	7,350
Retirement Program for Employees of Consolidated Nuclear Security, LLC at the U. S. Department of Energy Facilities at Oak Ridge, Tennessee	2018	70,752
	2019	85,440
	2020	102,336
	2021	94,944
Idaho National Laboratory Employee Retirement Plan	2018	5,313
	2019	5,313
	2020	1,444
	2021	6,118
Salaried Employee Pension Plan for KAPL Employees and Retirees	2018	9,955
	2019	12,375
	2020	12,100
	2021	12,100
Pension Plan for KAPL Employees in Participating Bargaining Units	2018	1,320
	2019	1,265
	2020	1,210
	2021	1,210
Kansas City Division Hourly Employees' Pension Plan	2018	2,856
	2019	2,856
	2020	2,856
	2021	2,856
Honeywell Retirement Earnings Plan for	2018	13,057

May be small variances in totals due to rounding.

Table 5: FY 2018-FY2021 Projected Contributions for NNSA by Plan
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Fiscal Year	NNSA
Aerospace Employees at the Kansas City Division	2019	13,705
	2020	13,427
	2021	13,057
LANS Defined Benefit Pension Plan	2018	85,100
	2019	94,720
	2020	104,340
	2021	112,480
University of California Retirement Plan - Lawrence Livermore National Laboratory Retained Segment	2018	100,732
	2019	-
	2020	-
	2021	-
LLNS Defined Benefit Pension Plan	2018	15,540
	2019	14,800
	2020	14,060
	2021	13,680
University of California Retirement Plan - Los Alamos National Laboratory Retained Segment	2018	91,147
	2019	-
	2020	-
	2021	-
National Security Technologies, LLC (NSTec) Employee Retirement Plan	2018	23,990
	2019	21,048
	2020	22,241
	2021	23,002
Consolidated Nuclear Security, LLC Retirement Plan for Bargaining Unit Members of the Pantex Guards Union	2018	3,528
	2019	3,822
	2020	4,508
	2021	4,312
Retirement Plan for Bargaining Unit Employees of the Metal Trades Council of Consolidated Nuclear Security, LLC	2018	12,446
	2019	12,348
	2020	14,798
	2021	14,406
Consolidated Nuclear Security Retirement Plan for Non-Bargaining Pantex Location Employees	2018	8,918
	2019	8,820

May be small variances in totals due to rounding.

Table 5: FY 2018-FY2021 Projected Contributions for NNSA by Plan
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Fiscal Year	NNSA
	2020	16,758
	2021	10,780
Sandia Corporation Retirement Income Plan	2018	68,709
	2019	70,360
	2020	70,800
	2021	68,118
Savannah River Nuclear Solutions LLC Multiple Employer Pension Plan	2018	25,300
	2019	34,100
	2020	52,140
	2021	51,040
Pension Plan for Employees at ORNL	2018	3,496
	2019	3,496
	2020	1,748
	2021	-
WSI-LV Retirement Plan	2018	732
	2019	753
	2020	773
	2021	796
Independent Guard Association of Nevada Pension Trust Fund	2018	840
	2019	1,440
	2020	1,840
	2021	1,980
Battelle Excess Benefit and SERP Plans	2018	2
	2019	2
	2020	2
	2021	2
Executive and Supplemental Pension Plans for Designated Bettis Employees	2018	863
	2019	888
	2020	910
	2021	940
Excess and Supplemental Pension Plans for Designated KAPL Employees	2018	158
	2019	162
	2020	167

May be small variances in totals due to rounding.

Table 5: FY 2018-FY2021 Projected Contributions for NNSA by Plan
 Based on July 2015 and later¹¹ data and pro-rated by Program Office
 (\$K)

Plan Name	Fiscal Year	NNSA
LANS 401(a)(17) Restoration Plan	2021	172
	2018	84
	2019	111
	2020	139
LANS Restoration Plan	2021	165
	2018	33
	2019	44
	2020	58
LLNS 401(a)(17) Restoration Plan	2021	77
	2018	312
	2019	395
	2020	484
LLNS Restoration Plan	2021	591
	2018	135
	2019	168
	2020	208
Sandia Nonqualified Plan	2021	264
	2018	1,393
	2019	1,440
	2020	1,473
SRNS Nonqualified Plan	2021	1,498
	2018	90
	2019	87
	2020	84
BW-Y12 NQ Plan	2021	81
	2018	150
	2019	147
	2020	144
UTB ORNL NQ Plan	2021	140
	2018	20
	2019	21
	2020	23
	2021	25

May be small variances in totals due to rounding.

Table 5: FY 2018-FY2021 Projected Contributions for NNSA by Plan
Based on July 2015 and later¹¹ data and pro-rated by Program Office
(\$K)

Plan Name	Fiscal Year	NNSA
Total	2018	569,129.0
	2019	409,395
	2020	459,924
	2021	453,716

May be small variances in totals due to rounding.

Section II - Other Postretirement Benefit Plans

For the most part, contractors do not fund other postretirement benefit plans in advance, but instead pay the claims incurred by the retired members or the premiums required to cover the plan benefits. The other postretirement benefits covered by the contractors are primarily medical including prescription drug but may also include dental, vision and life insurance benefits that are provided upon retirement from the contractor. The costs associated with these plans are expected to grow as the retired population grows and as healthcare cost trends continue to increase.

Due to the fact that the claims are not paid until incurred and processed, the actual amounts of contractors' payment of claims that DOE will reimburse for FY 2016 will not be known until after budget development. The contractor costs are included in indirect costs. The budget assumes an indirect rate sufficient to meet reimbursement requirements.ⁱ As mentioned in the pension section, the allocation of contributions among NNSA, the non-NNSA program offices, and work for others, is done based on each site's best estimate of the allocation of work based on current and anticipated work for the various parties that the site serves.

The contractors are making concerted efforts to reduce the costs associated with these plans as the costs have steadily increased. In recent years, contractors have made changes to their other postretirement benefit plans in an effort to reduce the costs associated with them as well as to simplify administration. These changes include:

- **Changes to Retirees' Out of Pocket Expenditures:** One contractor changed its retirees' benefit options including copays, deductibles, out of pocket maximums and prescription drug coverage.
- **Medicare Exchange Programs for Post-65 Retirees:** One contractor moved its post-65 retirees from the employer-sponsored plan to a stipend arrangement whereby the contractor provided retirees a stipend paid into a Health Reimbursement Arrangement for them to use to purchase coverage under a Medicare Exchange program - . This plan reduces retiree medical costs while providing the retirees with opportunities to select a medical plan tailored to their needs.
- **Closed Plan:** One plan will be closed to personnel hired after August 2016.
- **Terminated Plan:** The Yucca Mountain Postretirement Benefit which provided pre-65 coverage at a significant cost to retirees was terminated.

Projections of future postretirement benefits to be paid are highly sensitive to underlying data, methods, and assumptions, particularly assumptions related to future increases in the expected claims paid each year as well as the underlying assumptions regarding usage and coverage. Thus, the actual amounts reimbursed in a future fiscal year may be different. All of the information provided is based on expected reimbursements as reported by the DOE's respective contractors in July 2015; it has been reviewed by the appropriate NNSA and DOE program office and the Office of the Chief Financial Officer.

- Table 1 provides aggregate FY 2015-2017 projected other postretirement benefit reimbursements.
- Table 2 provides aggregate FY 2018-2021 projected other postretirement benefit reimbursements for NNSA.

ⁱThe LM plans rely on direct costs.

Table 1: FY 2015-2017 NNSA and DOE Program Office Projected Other Postretirement Benefits Payments (\$K)
 Based on July 2015 data and pro-rated by Program Office

Program Office	FY 2015	FY 2016	FY 2017	Total FY 2015 - FY 2017
NNSA	149,515	161,168	173,089	483,772
EM	80,936	85,361	89,097	255,394
SC	53,230	57,017	59,045	169,292
EERE	5,653	5,986	6,368	18,008
NE	7,259	8,133	8,805	24,197
OE	590	623	662	1,875
FE	899	920	947	2,765
Reimbursable Work	49,369	51,373	54,574	155,316
LM	58,574	55,599	57,280	171,453
Other	8,128	8,851	9,502	26,482
Total	414,155	435,031	459,369	1,308,555

There may be small variances in totals due to rounding.

Table 2: FY 2018-2021 NNSA and DOE Program Office Projected Other Postretirement Benefits Payments (\$K)
 Based on July 2015 data and pro-rated by Program Office

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2018 - FY 2021 Total Projected Contributions
NNSA	183,538	194,764	203,331	212,473	794,106

**GENERAL PROVISIONS—DEPARTMENT OF ENERGY
(INCLUDING TRANSFER [AND RESCISSIONS] OF FUNDS)**

SEC. 301. (a) No appropriation, funds, or authority made available by this title for the Department of Energy shall be used to initiate or resume any program, project, or activity or to prepare or initiate Requests For Proposals or similar arrangements (including Requests for Quotations, Requests for Information, and Funding Opportunity Announcements) for a program, project, or activity if the program, project, or activity has not been funded by Congress.

(b)(1) Unless the Secretary of Energy notifies the Committees on Appropriations of both Houses of Congress at least 3 full business days in advance, none of the funds made available in this title may be used to—

- (A) make a grant allocation or discretionary grant award totaling \$1,000,000 or more;
- (B) make a discretionary contract award or Other Transaction Agreement totaling \$1,000,000 or more, including a contract covered by the Federal Acquisition Regulation;
- (C) issue a letter of intent to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B); or
- (D) announce publicly the intention to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B).

(2) The Secretary of Energy shall submit to the Committees on Appropriations of both Houses of Congress within 15 days of the conclusion of each quarter a report detailing each grant allocation or discretionary grant award totaling less than \$1,000,000 provided during the previous quarter.

(3) The notification required by paragraph (1) and the report required by paragraph (2) shall include the recipient of the award, the amount of the award, the fiscal year for which the funds for the award were appropriated, the account and program, project, or activity from which the funds are being drawn, the title of the award, and a brief description of the activity for which the award is made.

(c) The Department of Energy may not, with respect to any program, project, or activity that uses budget authority made available in this title under the heading "Department of Energy—Energy Programs", enter into a multiyear contract, award a multiyear grant, or enter into a multiyear cooperative agreement unless—

- (1) the contract, grant, or cooperative agreement is funded for the full period of performance as anticipated at the time of award; or
- (2) the contract, grant, or cooperative agreement includes a clause conditioning the Federal Government's obligation on the availability of future year budget authority and the Secretary notifies the Committees on Appropriations of both Houses of Congress at least 3 days in advance.

(d) Except as provided in subsections (e), (f), and (g), the amounts made available by this title shall be expended as authorized by law for the programs, projects, and activities specified in the "Final Bill" column in the "Department of Energy" table included under the heading "Title III—Department of Energy" in the explanatory statement [described in section 4 (in the matter preceding division A of this consolidated] *accompanying this Act*].

(e) The amounts made available by this title may be reprogrammed for any program, project, or activity, and the Department shall notify the Committees on Appropriations of both Houses of Congress at least 30 days prior to the use of any proposed reprogramming that would cause any program, project, or activity funding level to increase or decrease by more than \$5,000,000 or 10 percent, whichever is less, during the time period covered by this Act.

(f) None of the funds provided in this title shall be available for obligation or expenditure through a reprogramming of funds that—

- (1) creates, initiates, or eliminates a program, project, or activity;
- (2) increases funds or personnel for any program, project, or activity for which funds are denied or restricted by this Act; or
- (3) reduces funds that are directed to be used for a specific program, project, or activity by this Act.

(g)(1) The Secretary of Energy may waive any requirement or restriction in this section that applies to the use of funds made available for the Department of Energy if compliance with such requirement or restriction would pose a substantial risk to human health, the environment, welfare, or national security.

(2) The Secretary of Energy shall notify the Committees on Appropriations of both Houses of Congress of any waiver under paragraph (1) as soon as practicable, but not later than 3 days after the date of the activity to which a requirement or restriction would otherwise have applied. Such notice shall include an explanation of the substantial risk under paragraph (1) that permitted such waiver.

SEC. 302. The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. 303. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 3094) during fiscal year [2016] 2017 until the enactment of the Intelligence Authorization Act for fiscal year [2016] 2017.

SEC. 304. None of the funds made available in this title shall be used for the construction of facilities classified as high-hazard nuclear facilities under 10 CFR Part 830 unless independent oversight is conducted by the Office of [Independent] Enterprise Assessments to ensure the project is in compliance with nuclear safety requirements.

SEC. 305. None of the funds made available in this title may be used to approve critical decision-2 or critical decision-3 under Department of Energy Order 413.3B, or any successive departmental guidance, for construction projects where the total project cost exceeds \$100,000,000, until a separate independent cost estimate has been developed for the project for that critical decision.

SEC. 306. Notwithstanding section 301(c) of this Act, none of the funds made available under the heading "Department of Energy—Energy Programs—Science" in this or any subsequent Energy and Water Development and Related Agencies appropriations Act for any fiscal year may be used for a multiyear contract, grant, cooperative agreement, or Other Transaction Agreement of \$1,000,000 or less unless the contract, grant, cooperative agreement, or Other Transaction Agreement is funded for the full period of performance as anticipated at the time of award.

[SEC. 307. (a) None of the funds made available in this or any prior Act under the heading "Defense Nuclear Nonproliferation" may be made available to enter into new contracts with, or new agreements for Federal assistance to, the Russian Federation.

(b) The Secretary of Energy may waive the prohibition in subsection (a) if the Secretary determines that such activity is in the national security interests of the United States. This waiver authority may not be delegated.

(c) A waiver under subsection (b) shall not be effective until 15 days after the date on which the Secretary submits to the Committees on Appropriations of both Houses of Congress, in classified form if necessary, a report on the justification for the waiver.]

SEC. [308] 307. (a) NEW REGIONAL RESERVES.—The Secretary of Energy may not establish any new regional petroleum product reserve unless funding for the proposed regional petroleum product reserve is explicitly requested in advance in an annual budget submission and approved by the Congress in an appropriations Act.

(b) The budget request or notification shall include—

- (1) the justification for the new reserve;
- (2) a cost estimate for the establishment, operation, and maintenance of the reserve, including funding sources;
- (3) a detailed plan for operation of the reserve, including the conditions upon which the products may be released;
- (4) the location of the reserve; and
- (5) the estimate of the total inventory of the reserve.

[SEC. 309. Of the amounts made available by this Act for "National Nuclear Security Administration—Weapons Activities", up to \$50,000,000 may be reprogrammed within such account for Domestic Uranium Enrichment, subject to the notice requirement in section 301(e).]

[SEC. 310. (a) Unobligated balances available from appropriations are hereby rescinded from the following accounts of the Department of Energy in the specified amounts:

- (1) "Energy Programs—Energy Efficiency and Renewable Energy", \$1,355,149.00 from Public Law 110–161; \$627,299.24 from Public Law 111–8; and \$1,824,051.94 from Public Law 111–85.
- (2) "Energy Programs—Science", \$3,200,000.00.

(b) No amounts may be rescinded by this section from amounts that were designated by the Congress as an emergency requirement pursuant to a concurrent resolution on the budget or the Balanced Budget and Emergency Deficit Control Act of 1985.]

[SEC. 311. Notwithstanding any other provision of law, the provisions of 40 U.S.C. 11319 shall not apply to funds appropriated in this title to Federally Funded Research and Development Centers sponsored by the Department of Energy.]

[SEC. 312. None of the funds made available in this Act may be used—

- (1) to implement or enforce section 430.32(x) of title 10, Code of Federal Regulations; or
- (2) to implement or enforce the standards established by the tables contained in section 325(i)(1)(B) of the Energy Policy and Conservation Act (42 U.S.C. 6295(i)(1)(B)) with respect to BPAR incandescent reflector lamps, BR incandescent reflector lamps, and ER incandescent reflector lamps.]

[SEC. 313. (a) Of the funds appropriated in prior Acts under the headings "Fossil Energy Research and Development" and "Clean Coal Technology" for prior solicitations under the Clean Coal Power Initiative and FutureGen, not less than \$160,000,000 from projects selected under such solicitations that have not reached financial close and have not secured funding sufficient to construct the project prior to 30 days after the date of enactment of this Act shall be deobligated, if necessary, shall be utilized for previously selected demonstration projects under such solicitations that have reached financial close or have otherwise secured funding sufficient to construct the project prior to 30 days after the date of enactment of this Act, and shall be allocated among such projects in proportion to the total financial contribution by the recipients to those projects stipulated in their respective cooperative agreements.

(b) Funds utilized pursuant to subsection (a) shall be administered in accordance with the provisions in the Act in which the funds for those demonstration projects were originally appropriated, except that financial assistance for costs in excess of those estimated as of the date of award of the original financial assistance may be provided in excess of the proportion of costs borne by the Government in the original agreement and shall not be limited to 25 percent of the original financial assistance.

(c) No amounts may be repurposed pursuant to this section from amounts that were designated by the Congress as an emergency requirement pursuant to a concurrent resolution on the budget or the Balanced Budget and Emergency Deficit Control Act of 1985.

(d) This section shall be fully implemented not later than 60 days after the date of enactment of this Act.]

SEC. 308. Amounts made available by this title may be transferred to the Technology Commercialization Fund in amounts not to exceed 0.9% of the amounts appropriated for applied energy research and development. Amounts so transferred shall be available for a broad spectrum of energy technology or combination of technologies, consistent with section 1001 of the Energy Policy Act of 2005 (42 U.S. Code paragraph 16391(e)), and shall remain available until expended.

SEC. 309. Not to exceed 5 percent of any appropriation made available for Department of Energy activities funded in this Act or subsequent Energy and Water Development and Related Agencies Appropriations Acts may be transferred between such appropriations, but no such appropriation, except as otherwise provided, shall be increased or decreased by more than 5 percent by any such transfers, and notification of any such transfers shall be submitted promptly to the Committees on Appropriations of the House of Representatives and the Senate.

SEC. 310. Consolidated Emergency Operations Center. Amounts available for the Department of Energy under this title in this and prior appropriations Acts shall be available for the design of a consolidated Emergency Operations Center: Provided, That no amounts may be repurposed from amounts that were designated by the Congress as an emergency requirement pursuant to the Concurrent Resolution on the Budget or the Balanced Budget and Emergency Deficit Control Act of 1985, as amended.

SEC. 311. TREATMENT OF LOBBYING AND POLITICAL ACTIVITY COSTS AS ALLOWABLE COSTS UNDER DEPARTMENT OF ENERGY CONTRACTS.

(a) Allowable Costs.—

(1) Section 4801(b) of the Atomic Energy Defense Act (50 U.S.C. 2781(b)) is amended—

(A) by striking "(1)" and all that follows through "the Secretary" and inserting "The Secretary"; and

(B) by striking paragraph (2).

(2) Section 305 of the Energy and Water Development Appropriation Act, 1988, as contained in section 101(d) of Public Law 100–202 (101 Stat. 1329–125), is repealed.

(b) Regulations Revised.—The Secretary of Energy shall revise existing regulations consistent with the repeal of 50 U.S.C. 2781(b)(2) and section 305 of Public Law 100–202 and shall issue regulations to implement 50 U.S.C. 2781(b), as amended by subsection (a), no later than 150 days after the date of the enactment of this Act. Such regulations shall be consistent with the Federal Acquisition Regulation 48 C.F.R. 31.205–22.

(Energy and Water Development and Related Agencies Appropriations Act, 2016.)

Title V – General Provisions

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

[SEC. 502. (a) None of the funds made available in title III of this Act may be transferred to any department, agency, or instrumentality of the United States Government, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act), or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality.

(b) None of the funds made available for any department, agency, or instrumentality of the United States Government may be transferred to accounts funded in title III of this Act, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act), or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality.

(c) The head of any relevant department or agency funded in this Act utilizing any transfer authority shall submit to the Committees on Appropriations of both Houses of Congress a semiannual report detailing the transfer authorities, except for any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality, used in the previous 6 months and in the year-to-date. This report shall include the amounts transferred and the purposes for which they were transferred, and shall not replace or modify existing notification requirements for each authority.]

SEC. [503] 502. None of the funds made available by this Act may be used in contravention of Executive Order No. 12898 of February 11, 1994 (Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations). (*Energy and Water Development and Related Agencies Appropriations Act, 2016.*)

