

Department of Energy

FY 2023 Congressional Budget Request



Other Defense Activities
Departmental Administration
Inspector General
Technology Transitions
Working Capital Fund
Crosscutting Activities
Advanced Research Projects Agency- Energy
Energy Information Administration
Pensions

Department of Energy

FY 2023 Congressional Budget Request



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FY 2023 Congressional Budget Request

Volume 2

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DEPARTMENT OF ENERGY
Appropriation Summary
(dollars in thousands)

Department of Energy	FY 2021 Enacted	FY 2022 Annualized CR	FY2023 Request	FY 2023 vs. FY 21 Enacted	
				\$	%
Department of Energy					
Energy Efficiency and Renewable Energy	2,861,760	2,861,760	4,018,885	1,157,125	40.4%
Electricity	211,720	211,720	297,386	85,666	40.5%
Cybersecurity, Energy Security, and Emergency Response	156,000	156,000	202,143	46,143	29.6%
Petroleum Reserves					
Strategic Petroleum Reserves	188,000	188,000	214,175	26,175	13.9%
Naval Petroleum & Oil Shale Reserves	13,006	13,006	13,004	-2	0.0%
SPR - Petroleum Account	1,000	1,000	8,000	7,000	700.0%
Northeast Home Heating Oil Reserves	6,500	6,500	7,000	500	7.7%
Subtotal, Petroleum Reserves	208,506	208,506	242,179	33,673	16.1%
Grid Deployment Office	-	-	90,221	90,221	N/A
Federal Energy Management Program (FEMP)	-	-	169,661	169,661	N/A
Office of Manufacturing & Energy Supply Chains (MESC)	-	-	27,424	27,424	N/A
Office of State and Community Energy Programs (SCEP)	-	-	726,897	726,897	N/A
Nuclear Energy	1,357,800	1,357,800	1,518,460	160,660	11.8%
Nuclear Waste Disposal	27,500	27,500	10,205	-17,295	-62.9%
Fossil Energy and Carbon Management	750,000	750,000	893,160	143,160	19.1%
Uranium Enrichment Decontamination and Decommissioning Fund (UED&D)	841,000	841,000	822,421	-18,579	-2.2%
Energy Information Administration	126,800	126,800	144,480	17,680	13.9%
Non-Defense Environmental Cleanup	319,200	319,200	323,249	4,049	1.3%
Science	7,026,000	7,026,000	7,799,211	773,211	11.0%
Office of Technology Transitions	-	-	21,558	21,558	N/A
Office of Clean Energy Demonstrations	-	-	214,052	214,052	N/A
Advanced Research Project Agency-Energy	427,000	427,000	700,150	273,150	64.0%
Departmental Administration	166,000	166,000	397,203	231,203	139.3%
Indian Energy Policy and Programs	22,000	22,000	150,039	128,039	582.0%
Office of Inspector General	57,739	57,739	106,808	49,069	85.0%
Loan Programs					
Title 17 - Innovative Technology Loan Guarantee Program (1)	29,000	29,000	168,206	139,206	480.0%
Advanced Technology Vehicles Manufacturing Loan Program	5,000	5,000	9,800	4,800	96.0%
Tribal Energy Loan Guarantee Program	2,000	2,000	1,860	-140	-7.0%
Subtotal, Loan Programs	36,000	36,000	179,866	143,866	399.6%
Subtotal, Energy Programs	14,595,025	14,595,025	19,055,658	4,460,633	30.6%
National Nuclear Security Administration					
Federal Salaries and Expenses	443,200	443,200	496,400	53,200	12.0%
Weapons Activities	15,345,000	15,345,000	16,486,298	1,141,298	7.4%
Defense Nuclear Nonproliferation	2,260,000	2,260,000	2,346,257	86,257	3.8%
Naval Reactors	1,684,000	1,684,000	2,081,445	397,445	23.6%
National Nuclear Security Administration	19,732,200	19,732,200	21,410,400	1,678,200	8.5%
Environmental and Other Defense Activities					
Defense Environmental Cleanup	6,426,000	6,426,000	6,914,532	488,532	7.6%
Defense UED&D Fund (2)	-	-	-	-	N/A
Other Defense Activities	920,000	920,000	978,351	58,351	6.3%
Subtotal, Environmental and Other Defense Activities	7,346,000	7,346,000	7,892,883	546,883	7.4%
Nuclear Energy (050)	149,800	149,800	156,600	6,800	4.5%
Subtotal, Atomic Energy Defense Activities	27,228,000	27,228,000	29,459,883	2,231,883	8.2%
Power Marketing Administrations					
Southeastern Power Administration (SEPA)	-	-	-	-	N/A
Southwestern Power Administration (SWPA)	10,400	10,400	10,608	208	2.0%
Western Area Power Administration	89,372	89,372	98,732	9,360	10.5%
Falcon and Amistad Operating and Maintenance Fund	228	228	228	0	0.0%
Colorado River Basins Marketing Fund	-21,400	-21,400	-8,568	12,832	-60.0%
Subtotal, Power Marketing Administrations	78,600	78,600	101,000	22,400	28.5%
Subtotal, Department of Energy	41,901,625		48,616,541	6,714,916	16.0%
Federal Energy Regulatory Commission	-	-	-	-	N/A
Receipts and Offsets					
Excess Fees and Recoveries, FERC	-9,000	-9,000	-9,000	-	0.0%
Title XVII Loan Guar. Prog Section 1703 Negative Credit Subsidy Receipts	-	-	-7,000	-7,000	N/A
UED&D Fund Discretionary Payments	-	-	-417,000	-417,000	N/A
Receipts and offsets	-9,000	-9,000	-433,000	-424,000	4711.1%
Department of Energy	41,892,625	41,892,625	48,183,541	6,290,916	15.0%

DEPARTMENT OF ENERGY
Appropriation Summary
(dollars in thousands)

Department of Energy	FY 2021 Enacted	FY 2022 Annualized CR	FY2023 Request	FY 2023 vs. FY 21 Enacted	
				\$	%
DOE Budget Function					
NNSA Defense (050) Total	19,732,200	19,732,200	21,410,400	1,678,200	8.5%
Non-NNSA Defense Total	7,495,800	7,495,800	8,049,483	553,683	7.4%
Defense (050)	27,228,000	27,228,000	29,459,883	2,231,883	8.2%
Science (250)	7,026,000	7,026,000	7,799,211	773,211	11.0%
Energy (270)	7,638,625	7,638,625	10,924,447	3,285,822	43.0%
Non-Defense (Non-050)	14,664,625	14,664,625	18,723,658	4,059,033	27.7%

(1) The FY 2021 and FY 2022 Continuing Resolution entries for Title 17 and ATVM do not reflect rescissions of prior year emergency balances enacted in Public Law 116-260. Including the rescissions, the final amounts for Title 17 and ATVM would be -\$363 million and -\$1,903 million, respectively.

(2) In the FY 2023 Request, Defense Uranium Decontamination and Decommissioning is requested within the Defense Environmental Cleanup Appropriation.

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 \$978,351,000, to remain available until expended: Provided, That of such amount, \$331,781,000 shall be available until September 30, 2024, for program direction.

Note.--A full-year 2022 appropriation for this account was not enacted at the time the Budget was prepared; therefore, the Budget assumes this account is operating under the Continuing Appropriations Act, 2022 (Division A of Public Law 117-43, as amended). The amounts included for 2022 reflect the annualized level provided by the continuing resolution.

Explanation of Changes

Request includes funding to strengthen foundational activities of the Environmental Justice (EJ) Program within the Office of Legacy Management, enabling the EJ program to reach a larger number of affected communities.

Other Defense Activities
(\$K)

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
920,000	920,000	978,351

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 (OHA), and Defense Related Administrative Support (DRAS). Funding from DRAS is used to offset administrative expenses for work supporting defense-oriented activities.

Highlights and Major Changes in the FY 2023 Budget Request

- Within EA, the budget provides increased funding for Safety and Security Training and needed operating levels at the National Training Center (NTC).
- SSA assures coverage of national security related activities.
- LM's FY 2023 request is \$33,087,000 above the FY 2021 enacted level. In addition to supporting the enhancement of core LTS activities mentioned above, \$13,075,000 will allow LM to increase its foundational Environmental Justice program activities, enabling the program to reach a larger number of affected communities. Funding ensures equity and climate resilience are assessed and implemented for all LM's activities.

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

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Environment, Health, Safety and Security	206,320	206,320	215,539	+9,219
Office of Enterprise Assessments	79,070	79,070	85,427	+6,357
Specialized Security Activities	283,500	283,500	306,067	+22,567
Legacy Management	163,059	163,059	196,146	+33,087
Defense-Related Administrative Support	183,789	183,789	170,695	-13,094
Office of Hearings and Appeals	4,262	4,262	4,477	+215
Total, Other Defense Activities	920,000	920,000	978,351	+58,351

Outyear Priorities and Assumptions

In the FY 2012 Consolidated Appropriations Act (P.L. 112-74), Congress directed the Department to include a future-years energy program (FYEP) in subsequent requests that reflects the proposed appropriations for five years. This FYEP shows outyear funding for each account for FY 2024 - FY 2027. The outyear funding levels use the growth rates from and match the outyear account totals published in the FY 2023 President's Budget for both the 050 and non-050 accounts. Actual future budget request levels will be determined as part of the annual budget process.

**Future Years Energy Program (FYEP)
(\$K)**

	FY 2023 Request	FY 2024	FY 2025	FY 2026	FY 2027
Total, Other Defense Activities	978,351	1,000,000	1,024,000	1,047,000	1,071,000

Environment, Health, Safety and Security

Overview

The Office of Environment, Health, Safety and Security (EHSS) provides corporate leadership and strategic approaches in enabling the Department of Energy (DOE) mission and furthering the protection afforded 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.

Environment, Health, Safety and Security Funding (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Environment, Health, Safety and Security					
Environment, Health and Safety					
Worker Safety	4,603	4,603	4,656	+53	+1.2%
Nuclear Safety	5,379	5,379	6,030	+651	+12.1%
Environment	2,407	2,407	2,407	+0	+0%
Health Programs					
Domestic Health Programs					
Health Research	2,970	2,970	2,570	-400	-13.5%
Former Worker Medical Screening	19,850	19,850	19,850	+0	+0%
Employee Compensation Program	5,135	5,135	4,691	-444	-8.6%
International Health Programs					
Russian Health Studies	2,750	2,750	2,750	+0	+0%
Japanese Health Studies	14,000	14,000	14,000	+0	+0%
Marshall Islands Program	6,300	6,300	6,300	+0	+0%
Total, Environment, Health and Safety	63,394	63,394	63,254	-140	-0.2%

Other Defense Activities/Environment
Health, Safety and Security

FY 2023 Congressional Budget Justification

Security					
Insider Threat Program	3,000	3,000	1,000	-2,000	-66.7%
Security Operational Support	5,940	5,940	7,591	+1,651	+27.8%
Classification, Declassification and Controlled Information	13,679	13,679	13,679	+0	-0.0%
Security Investigations	4,533	4,553	4,000	-533	-11.8%
Headquarters Security Operations	43,774	43,774	49,330	+5,556	+12.7%
Total, Security	70,926	70,926	75,600	+4,674	+6.6%
Total, Environment, Health, Safety and Security	134,320	134,320	138,854	+4,534	+3.4%
Program Direction	72,000	72,000	76,685	+4,685	+6.5%
Total, Environment, Health, Safety and Security	206,320	206,320	215,539	+9,219	+4.5%

**Explanation of Changes
Funding (\$K)**

FY 2023 Request vs FY 2021 Enacted

Environment, Health, Safety and Security:

Worker Safety: No significant change.	+53
Nuclear Safety: No significant change.	+651
Health Programs: No significant change.	-844
Insider Threat: Funding decrease reflects completion of Insider Threat studies and moving support for the Security, Suitability, Credentialing Line of Business from Insider Threat to Security Operational Support.	-2,000
Security Operational Support: Funding increase primarily reflects moving support for the Security, Suitability, Credentialing Line of Business from Insider Threat to Security Operational Support.	+1,651
Security Investigations: No significant change.	-533
Headquarters Security Operations: Funding increase primarily reflects the fixed price of the recently completed competitively awarded Protective Force Contract.	+5,556
Program Direction: Funding increase reflects 4.6% pay raise, an increase in Travel, Information Technology costs and additional Working Capital Fund (WCF) expenses.	+4,685

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 and analytical services programs; 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.

The Environment, Health and Safety subprogram 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, effective resource utilization, radiological clearance; and control programs for the safe reuse and recycle of DOE equipment and materials and for the 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, and supports 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 2023, 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 program activities include establishing and maintaining nuclear safety policies and requirements to ensure adequate 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. This program provides assistance to field elements in implementing requirements and resolving issues; and provides oversight of DOE nuclear operations and facilities. Nuclear Safety maintains 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.

Environment

Environmental activities support DOE's efficient use of resources and energy and its compliance with environmental requirements. Funding provides technical support for the development of policies, requirements, and guidance related to responsible management of natural and cultural resources on and around DOE sites, and performance tracking across the DOE complex and in support of Department-wide conservation efforts. Environmental activities also fund coordination, planning and technical analyses supporting EHSS's role representing DOE to external agencies and stakeholders to develop cost effective and efficient means of meeting environmental and public protection objectives and avoiding future liabilities. One such area of concern involves identifying and characterizing the extent of Per- and Polyfluoroalkyl Substances (PFAS) use and inventories across the enterprise. Environmental activities also support the development of guidance and tools for implementation of practical and broadly accepted consensus standards. 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 Associated Worker Registry; the U.S. Transuranium and Uranium Registry; 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 facilities. In addition, EHSS also screens DOE-related beryllium vendor facilities on behalf of DOE, as mandated by 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

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, and automatically extended every five years unless terminated by either Party. 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 to 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 (RERF), pursuant to an agreement between the United States and Japan. RERF conducts epidemiologic studies and medical surveillance of the survivors of the atomic bombings of Hiroshima and Nagasaki; and engages in innovative science to develop new research methods and approaches for assessing radiation health effects for use as a basis for the development of radiation standards.

Marshall Islands Program

The Marshall Islands program provides medical surveillance and treatment of Marshallese citizens who were affected by U.S. nuclear weapons testing in the Pacific. It also provides for environmental monitoring for safe resettlement of four atolls affected by the testing. The work was specified by the Compact of Free Association Acts of 1986 and 2003 between the United States and the Republic of the Marshall Islands and by the Insular Areas Act of 2011 that required enhanced monitoring of the Runit Island Nuclear Waste Containment Structure beginning in FY 2013.

Health and Safety

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Environment, Health, Safety \$63,394,000	\$63,254,000	-\$140,000
Worker Safety \$4,603,000	\$4,656,000	+\$53,000
<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 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 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. 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 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> No significant change.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>1970; and 29 C.F.R. 1960, Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters.</p> <ul style="list-style-type: none"> • 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 conducting specific accident investigations. • 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. • 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. • 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, 		

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
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.		
Nuclear Safety \$5,379,000	\$6,030,000	+\$651,000
<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 in implementing nuclear safety and quality assurance requirements and programs and resolving issues and recommendations identified by the Defense Nuclear Facilities Safety Board. 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 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> No significant change.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>concepts relevant to DOE including nuclear safety; safety and organizational culture, high reliability performance and human performance improvement.</p> <ul style="list-style-type: none"> Implement safety software quality assurance activities that provide for the maintenance of the DOE safety software central registry of approved 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. 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 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 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 to improve implementation and optimize the use of protective resources. Review data from environmental reports required by Federal and state environmental protection agencies to validate adherence to reporting requirements; evaluate the effectiveness of the 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> No change in work scope.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>Department's toxic chemical release reduction and pollution prevention efforts; produce annual reports on DOE environmental performance; and develop annual radionuclide emissions summaries submitted to the EPA under an interagency agreement.</p> <ul style="list-style-type: none"> • 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. • 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 with the use or disposition of DOE property. • 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 operational resilience. • 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 		

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>emergency response and preparedness activities associated with such incidents.</p> <ul style="list-style-type: none"> • Provide technical assistance to DOE programs, laboratories, and sites in implementing natural and cultural resource protection requirements and programs. 		
Domestic Health Programs \$27,955,000	\$27,111,000	-\$844,000
<p>Health Research \$2,970,000</p> <ul style="list-style-type: none"> • Provide for the operation and maintenance of the electronic comprehensive epidemiologic data resource, the illness and injury surveillance database, and the U.S. Transuranium and Uranium Registry. • 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 maintenance of the beryllium registry, which collects, analyzes, summarizes, and disseminates health and exposure data to improve chronic beryllium disease prevention programs. • 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. • Provide funding for the Million Person Radiation Workers and Veterans Study that will provide the most precise estimate possible of the lifetime risk of cancer resulting from low levels of chronic radiation exposure and be of significant value to workers and the public. Results also would appreciably improve the data used for compensation of workers with prior exposures to ionizing radiation. 	<ul style="list-style-type: none"> • \$2,570,000. Continuation of all FY 2021 activities. 	<p>-\$400,000</p> <ul style="list-style-type: none"> • No significant change.
<p>Former Worker Medical Screening \$19,850,000</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- 	<ul style="list-style-type: none"> • \$19,850,000. Continuation of all FY 2021 activities. 	<p>+\$0</p> <ul style="list-style-type: none"> • No change in work scope.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>specific exposures.</p> <ul style="list-style-type: none"> • 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, 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. • 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. • Support the DOE central institutional review board, jointly funded with Science and NNSA, which reviews all medical screening programs funded by DOE and/or involving the DOE workforce to ensure the risks to human participants are minimized and reasonable in relation to the anticipated benefits. 		
<p>Energy Employee Occupational Illness Compensation Program (EEOICPA) \$5,135,000</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 (DOL) and the National Institute for Occupational Safety and Health. • Provide for large-scale records research projects conducted by DOL, 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 DOL and the National Institute for Occupational Safety and Health. • Continue coordination and interface between former worker 	<ul style="list-style-type: none"> • \$4,691,000. Continuation of all FY 2021 activities. 	<p>-\$444,000</p> <ul style="list-style-type: none"> • No significant change.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>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 DOL, and the National Institute for Occupational Safety and Health to assist the agencies tasked with adjudicating claims.</p>		
International Health Program \$23,050,000	\$23,050,000	+\$0
<p>Russian Health Studies \$2,750,000</p> <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. • Publish analyses of radiation health effects assessments. 	<ul style="list-style-type: none"> • \$2,750,000. Continuation of all FY 2021 activities. 	<p>+\$0</p> <ul style="list-style-type: none"> • No change in work scope.
<p>Japanese Health Studies \$14,000,000</p> <ul style="list-style-type: none"> • Conduct epidemiologic studies and medical surveillance of the survivors of the atomic bombings of Hiroshima and Nagasaki at the Radiation Effects Research Foundation. • Assess radiation health effects of ionizing radiation. • Publish analyses of radiation health effects assessments. 	<ul style="list-style-type: none"> • \$14,000,000. Continuation of all FY 2021 activities. 	<p>+\$0</p> <ul style="list-style-type: none"> • No change in work scope.
<p>Marshall Islands Program \$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. • Provide environmental monitoring services in support of resettlement activities. 	<ul style="list-style-type: none"> • \$6,300,000. Continuation of all FY 2021 activities. 	<p>+\$0</p> <ul style="list-style-type: none"> • 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 EHSS 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. 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 2023, 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 (ITP) is intended to: deter cleared employees from becoming insider threats; detect insiders who pose a risk to personnel, assets, facilities, or classified or sensitive information; and mitigate insider threat risks through administrative, investigative, or other response actions. The Secretary of Energy designated an EHSS Senior Executive as the Designated Senior Official for the ITP to provide guidance for and oversight of DOE's enterprise-wide ITP activities. On a continuing basis, this Designated Senior Official engages with senior security and intelligence officials across the Department and advises and reports directly to the Secretary and Deputy Secretary regarding the planning, construct, and operation of the Department's ITP.

Security Operational Support

Security operational support provides technical expertise to develop safeguards and security policy requirements and guidance; assistance to DOE operations, to include foreign ownership, control and influence analysis; security technology research, development, test and evaluations to effectively mitigate current and emerging threats; and maintenance and management of 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. Corporate Security/Complex Wide initiatives provide specialized assessments and analyses of enterprise-wide security activities and issues affecting DOE safeguards and security programs and the identification of approaches to address them. Human Reliability Program, under 10 C.F.R. 712, provides trending, analysis and training to ensure compliance and a consistent enterprise approach to implementation. Funding to implement EHSS's share of program responsibilities includes 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.

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 and chemical/biological and radiological dispersal devices. Funding provides for declassification review of DOE records and the development of policies, requirements, and guidance and technical support for the protection of controlled unclassified information. Advanced Computer Tools to Identify Classified Information (ACTICI) is an artificial intelligence/machine learning initiative to develop advanced computer tools to identify classified information embedded in electronic documents and augment human classification reviews. The goals of the program are to develop and deploy advanced tools that can automatically identify the subject areas of a document, determine whether a document needs a classification review, determine if the document is classified, determine which parts of the document are sensitive, and determine which classification guides are applicable.

Security Investigations

Security investigation activities provide for background investigations conducted by the Defense Counterintelligence and Security Agency (DCSA) (formerly the National Background Investigations Bureau) of EHSS 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, 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 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Security \$70,926,000	\$75,600,000	+\$4,674,000
Insider Threat Program \$3,000,000	\$1,000,000	-\$2,000,000
<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. Assist Local Insider Threat Working Groups in the implementation of the Insider Threat Program. 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. 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"> Continuation of all FY 2021 activities except for the inter-agency Security, Suitability and Credentialing Line of Business operating budget which is being moved to Security Operational Support. 	<ul style="list-style-type: none"> Funding decrease reflects completion of Insider Threat studies and moving support for the Security, Suitability, Credentialing Line of Business from Insider Threat to Security Operational Support.
Security Operational Support \$5,940,000	\$7,591,000	+\$1,651,000
<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. 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; 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities with the addition of the inter-agency Security, Suitability and Credentialing Line of Business operating budget, which is being moved from Insider Threat. 	<ul style="list-style-type: none"> Funding increase primarily reflects moving support for the Security, Suitability, Credentialing Line of Business from Insider Threat to Security Operational Support.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<ul style="list-style-type: none"> • 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 recurring costs, and lessen environmental impacts. • 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 (FACTS) 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 (RSRT) 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. • Conduct specialized assessments and analyses of enterprise-wide security activities. • Assess systemic issues affecting DOE safeguards and security programs and identify approaches to address them. • Produce biennial reports to Congress on the status of Security of the 		

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
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Department's Category I and II Special Nuclear Materials.

Classification, Declassification and Controlled Information \$13,679,000	\$13,679,000	+\$0
<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 proliferation issues. • 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 (NDC) for review of the remaining 3 million pages at the National Archives and follow-on record collections amounting to 24 million pages; support to NDC in its Interagency Referral Center confirming potential Restricted Data/Formerly Restricted Data in documents referred to DOE/EHSS by other agencies; • 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. • Continue efforts for the Advanced Computer Tools to Identify Classified Information (ACTICI) initiative. 	<ul style="list-style-type: none"> • Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> • No change.
Security Investigations \$ 4,533,000	\$4,000,000	-\$533,000

Other Defense Activities/Environment
Health, Safety and Security

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<ul style="list-style-type: none"> Provides for initial background investigations, periodic reinvestigations, and reimbursement for fingerprint and name checks. Provide for the Defense Counterintelligence and Security Agency to conduct most background investigations of EHSS Headquarters Federal and contractor employees. Funding provides for initial single-scope background investigations, periodic reinvestigations, and initial and reinvestigation national agency checks, and continuous evaluation special agreement checks. 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 (eDISS), 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. 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. Provide for Homeland Security Presidential Directive 12 credentials for Headquarters DOE employees and contractors. 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> No significant change.
Headquarters Security Operations \$43,774,000	\$49,330,000	+\$5,556,000
<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 satellite facilities in Washington, DC, and Germantown, MD. Operate and maintain security alarms and access control systems, including 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> Funding increase primarily reflects the fixed price of the recently completed competitively awarded Protective Force Contract.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>security screening equipment, vehicle inspection scanning devices, internet protocol video, turnstiles, unmanned access/egress portals, other access control equipment; and protective force shelters.</p> <ul style="list-style-type: none"> • 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 Communications Security (COMSEC) and TEMPEST support and oversight to all of the DOE/NNSA entities; develop and implement training for the various elements of the Technical Surveillance Program (TSP); perform COMSEC Audits/Inspections; and maintain DOE policy and guidance for TSP activities. • Serve as the COMSEC Central office of record and national command and controlling authorities for classified key material. • 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. • Implement Homeland Security Presidential Directive 12 requirements related to the secure and reliable identification of DOE Federal and contractor employees. • Administer the DOE Headquarters facility clearance registration and foreign ownership, control, or influence programs for contractors granted access to classified information. • Conduct safeguards and security surveys, self-assessments, and program reviews to ensure that DOE Headquarters operations comply with Departmental and national-level requirements. • Replace and repair of Headquarters physical security systems at both the Forrestal and Germantown facilities. 		

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. Critical to achieving its vision and goals is the ability of EHSS to maintain a highly qualified workforce with the expertise and skills necessary to support, manage, and conduct its mission. EHSS will implement activities to support Executive Order 14035: Diversity, Equity, Inclusion and Accessibility in the Federal Workforce to create a respectful, inclusive, and safe workplace where employees can thrive, develop their potential and contribute to the success of their workplace that will increase productivity and morale and may reduce employee turnover.

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

The Office of the Departmental Representative to the DNFSB ensures effective cross-organizational leadership and coordination to resolve DNFSB-identified technical and management issues to ensure the health, safety, and security of the workers, public, and environment.

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, services, and DOE common operating environment fees; and executive protection and other security-related equipment.

**Program Direction
Funding (\$K)**

Program Direction Summary

Program Direction

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Salaries and Benefits	50,569	50,569	52,946	+2,377	+4.7%
Travel	2,700	2,700	3,000	+300	+11.1%
Mission Support	285	285	285	+0	+0.0%
Other Related Expenses	18,446	18,446	20,454	+2,008	+10.9%
Total, Program Direction	72,000	72,000	76,685	+4,685	+6.5%
Federal FTEs	262	262	262	+0	+0.0%

Support Service and Other Related Expenses

Support Services

Technical Support					
Defense Nuclear Facilities Safety Board Liaison Activities	285	285	285	+0	+0.0%
Total, Technical Support	285	285	285	+0	+0.0%
Total, Support Services	285	285	285	+0	+0.0%

Other Related Expenses

Working Capital Fund	11,195	11,195	12,377	+1,182	+10.6%
Tuition/Training of Federal Staff	365	365	365	+0	+0.0%
Other Services Procured	6,886	6,886	7,712	+826	+12.0%
Total, Other Related Expenses	18,446	18,446	20,454	+2,008	+10.9%

Program Direction		
Activities and Explanation of Changes		
FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$72,000,000	\$76,685,000	+\$4,685,000
Salaries and Benefits \$50,569,000	\$52,946,000	+\$2,377,000
<ul style="list-style-type: none"> Funds 262 full-time equivalent employees (FTE): Provides an Executive Protection Program in accordance with the authority of United States Code (USC) Title 42, Chapter 23, Section 161.k and 2201k (the Atomic Energy Act); 10 Code of Federal Regulation 1047; and USC Title 18, Chapter 203, Section 3053. 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 2021 activities. 	<ul style="list-style-type: none"> Funding increase reflects 4.6% pay raise,
Travel \$2,700,000	\$3,000,000	+\$300
<ul style="list-style-type: none"> Support the management and conduct of environment, health, safety, and security programs for the Department; and Support executive protection activities for the Secretary, Deputy Secretary, and other dignitaries as assigned. 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> Funding reflects inflationary travel costs.
Technical Mission Support \$285,000	\$285,000	+\$0
<i>Defense Nuclear Facilities Safety Board (Board) Liaison Activities</i> <ul style="list-style-type: none"> Coordinate resolution of Board recommendations and agreed-upon defense nuclear facility safety issues. Provide requested reports/information on defense nuclear facility safety issues. Coordinate ready access to such defense nuclear facilities, personnel, and information as are necessary for the Board to carry out its responsibilities. Provide technical evaluation and analysis of defense nuclear safety and management issues identified by the Board. Provide assistance, advice and support to DOE/NNSA Program and field offices, including line management on addressing and resolving such issues; and 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> No change in work scope.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<ul style="list-style-type: none"> Monitor Department-wide performance in addressing Board-related defense nuclear safety and management issues. 		
Other Related Expenses \$18,446,000	\$20,454,000	+\$2,008,000
<ul style="list-style-type: none"> Working Capital Fund fees 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. 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; 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. Specialized security equipment and services. 	<ul style="list-style-type: none"> Continuation of all FY 2021 activities. 	<ul style="list-style-type: none"> Funding change reflects an increase in Information Technology costs and additional Working Capital Fund (WCF) expenses.

Environment, Health, Safety and Security

Safeguards and Security Crosscut Funding (\$K)

	FY 2021 Enacted	FY 2023 Request	FY 2023 vs. FY 2021 \$ Chg.
<u>Environment, Health, Safety and Security (EHSS)</u>			
Protective Forces	33,303	40,000	+6,697
Physical Security Systems	7,379	7,379	+0
Information Security (Class/Declass)	13,679	13,679	+0
<u>Cyber Security</u>			
Identify	875	890	+15
Protect	4,144	4,245	+101
Detect	441	480	+39
Respond	73	75	+2
Recover	131	140	+9
Subtotal, Cyber Security	5,664	5,830	+166
Personnel Security	6,442	6,192	-250
Program Management (Security Operational Support)	5,940	7,591	+1,651
Security Investigations Clearances	1,183	900	-283
Total, EHSS	73,590	81,571	+7,981

Artificial Intelligence & Machine Learning Crosscut (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted
Advanced Computer Tools to Identify Classified Information (ACTICI)	1,400	1,400	1,400	0
Total, Artificial Intelligence	1,400	1,400	1,400	0

Research and Development Crosscut (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted
Nuclear Safety Research Development	1,000	1,000	1,000	0
Total, Research and Development	1,000	1,000	1,000	0

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

	FY 2021 Enacted	FY 2023 Request
<u>Environment, Health, Safety and Security</u>		
Argonne National Laboratory	945	945
Brookhaven National Laboratory	250	250
Chicago Operations Office	50	50
Consolidated Business Center	259	259
Idaho National Laboratory	150	150
Idaho Operations Office	400	400
Kansas City Plant	10	10
Lawrence Berkeley National Laboratory	0	50
Lawrence Livermore National Laboratory	3,050	3,050
Lexington Project Office	200	200
Los Alamos National Laboratory	95	95
Nevada Site Office	15	15
NNSA Service Center	1,000	1,000
Oak Ridge Institute for Science and Education	1,305	1,255
Oak Ridge National Laboratory	1,035	1,035
Oak Ridge Operations Office	2,795	2,795
Office of Scientific and Technical Information	300	300
Ohio Field Office	5	5
Pacific Northwest National Laboratory	1,905	1,905
Pantex Plant	10	10
Richland Operations Office	1,000	1,000
Sandia National Laboratory	1,210	1,210
Savannah River Operations Office	500	500
Savannah River Site	10	10
Washington, D.C., Headquarters	189,801	199,020
Y-12 National Security Complex	20	20
Total, Environment, Health, Safety and Security	206,320	215,539

Office of Enterprise Assessments

Overview

The Office of Enterprise Assessments (EA) supports the Department's mission priorities and strategic plan for the secure, safe, and efficient operation of the nuclear weapons complex, science and energy research, and environmental cleanup activities by conducting independent assessments of security and safety performance throughout the Department, holding contractors accountable for violations of security and safety regulations, and providing training programs that institutionalize enterprise security and safety lessons learned. EA activities complement, but do not replace, the responsibility of DOE line management to ensure compliance with security and safety requirements and manage the Department's programs effectively.

Because EA is organizationally independent of the DOE entities that develop and implement security and safety policy and programs it is able to provide objective and timely information to DOE senior leadership, contractor organizations, and other stakeholders on whether national security material and information assets are appropriately protected; and whether Departmental operations ensure the safety of its employees and the public. EA activities evaluate the Department's effectiveness in promoting protection strategies that are based on informed risk management decisions. EA is designated to implement statutorily authorized contractor enforcement programs pertaining to classified information security, nuclear safety, and worker safety and health. EA also operates the DOE National Training Center (NTC) in Albuquerque, New Mexico, to enhance the proficiency and competency of the Department's security and safety personnel.

EA's key activities in FY 2023 are:

Strengthening the Department's posture and ability to protect national security assets (special nuclear material [SNM], controlled unclassified information, and classified matter), its employees and the public by:

- Conducting comprehensive independent security performance assessments and follow-up assessments at DOE National Security / Category I SNM sites (those with high value assets); utilizing "limited notice" safeguards and security performance tests to provide accurate, up-to-date assessments of DOE site security response capabilities; and evaluating actions to detect insider threats from individuals who may seek to compromise national security and/or the ability of the Department to meet its mission;
- Increasing the number of assessments performed and enhancing the methods and tools used to conduct comprehensive independent cybersecurity assessments, including unannounced "red team" performance testing to identify vulnerabilities in the Department's National Security, Intelligence, scientific, and other information systems to external and internal attacks;
- Conducting nuclear safety, worker safety and health, and emergency management independent performance assessments of the Department's operations including high hazard nuclear construction projects and operations, such as those at the Los Alamos National Laboratory, Y-12 National Security Complex, Savannah River Site, Hanford Site, and Idaho National Laboratory;
- Enhancing the effectiveness of the DOE enforcement function that holds contractor organizations accountable for noncompliance with worker safety and health, nuclear safety, and classified information security regulations;
- Developing and providing training programs that promote the competency and proficiency of DOE federal and contractor employees and performing other related functions via the DOE National Training Center in Albuquerque, NM, that institutionalize security and safety data analysis and safety lessons learned in support of improved DOE security and safety performance; and
- Using risk-informed and fact-based analysis to identify emerging trends in safety, security, and cybersecurity within the Department.

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

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Office of Enterprise Assessments					
Nuclear Safety Assessments	6,892	6,892	7,621	+729	10.6%
Enforcement	435	435	435	0	0%
Security and Safety Training	17,108	17,108	19,430	+2,322	13.6%
Total, Office of Enterprise Assessments	24,435	24,435	27,486	+3,051	12.5%
Program Direction	54,635	54,635	57,941	+3,306	6.1%
Total, Office of Enterprise Assessments	79,070	79,070	85,427	+6,357	8.0%

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

	FY 2023 Request vs FY 2021 Enacted
Office of Enterprise Assessments	
Increase for: Program funding reflects Security and Safety Training current operating levels; Salaries & Benefits to support subject matter experts to include a pay raise of 4.6% and for overall ongoing personnel actions to include lump sum payouts, Permanent Change of Station (PCS), and awards.	+6,357
Total, Office of Enterprise Assessments	+6,357

Enterprise Assessments

Description

The EA Program provides for the assessment of DOE performance in nuclear safety; implementation of the statutorily authorized contractor enforcement programs for classified information security, nuclear safety, and worker health and safety; development and administration of security and safety training that reflects the most current Departmental policy and lessons learned derived from enforcement investigations, independent assessments to enhance performance of the workforce, and data analysis in support of improved DOE security and safety performance.

Nuclear Safety Assessments

Provides for the planning and execution of independent assessments of DOE high hazard nuclear facility construction projects and nuclear facilities and operations to determine performance compared with nuclear safety requirements contained in Title 10, Code of Federal Regulations (C.F.R.) Part 830, Nuclear Safety Management, and related DOE directives. EA will continue its focus of nuclear safety performance assessments on nuclear weapons complex infrastructure projects, e.g., at the Y-12 National Security Complex; and at cleanup and related operations, e.g., construction of the Hanford Site Waste Treatment and Immobilization Plant; and pit production operations at Los Alamos National Laboratory and the Savannah River Site.

Enforcement

Provides the Department with the capability to implement the DOE contractor enforcement programs specified in 10 C.F.R. Part 824, Procedural Rules for the Assessment of Civil Penalties for Classified Information Security Violations; 10 C.F.R. Part 820, Procedural Rules for DOE Nuclear Activities; and 10 C.F.R. Part 851, Worker Safety and Health Program, and 10 C.F.R. Part 1017, Identification and Protection of Unclassified Controlled Nuclear Information. These activities provide a consistent and transparent method of contractor accountability for classified information security, nuclear safety, and worker health and safety performance that complements the Department's contract management mechanisms. The goal of this activity is to enable safe and secure accomplishment of the Department's mission by promoting DOE contractor adherence to classified and unclassified controlled nuclear information security, nuclear safety, and worker safety and health requirements, and incentivize proactive performance improvement through timely self-identification, reporting, and correction of noncompliant conditions that enables contractors to achieve excellence in mission accomplishment without the need for enforcement actions.

Security and Safety Training

Security and safety training activities provide the Department a means to improve security and safety performance by developing and maintaining the proficiency and competency of DOE security and safety contractor and Federal employees. These activities also improve senior executives' performance and capabilities to fulfill security and safety leadership responsibilities through standardized training for the security of critical Departmental and national security assets, the safety and health of the workforce, and the protection of the public and the environment. The DOE National Training Center (NTC), located in Albuquerque, New Mexico, serves as the primary resource for DOE security and safety training for Federal and contractor employees. Funding provides for operation and maintenance of the NTC campus and the development and presentation of various security and safety training and certification programs at the NTC, through e-learning mechanisms, and at DOE sites via mobile training teams. The NTC is also responsible for certifying training programs in accordance with DOE Policy 364.1, Health and Safety Training Reciprocity. The NTC certifies certain health and safety training programs for those training programs to be accepted at various DOE sites and contractor organizations, thus reducing or eliminating the need for employees to complete redundant training programs before conducting work at different DOE sites. The NTC also incorporates lessons learned and best practices identified during EA enforcement investigations and independent assessments into its training programs to increase their utility, relevancy, and effectiveness.

EA is continuing to build its data analysis program, which draws upon existing DOE reporting systems and programs, as well as other potentially useful data sources, to identify and interpret emerging security and safety trends across the DOE complex, and to evaluate their potential impact on the Department's performance. A robust data analysis program will result in improved risk-based planning for EA assessments, informed regulatory enforcement decision-making, and will help DOE programs and sites make better decisions, with the goal of improving security and safety performance.

Office of Enterprise Assessments

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021Enacted
Office of Enterprise Assessments \$24,435,000	\$27,486,000	+\$3,051,000
Nuclear Safety Assessments \$6,892,000	\$7,621,000	+\$729,000
<ul style="list-style-type: none"> Conduct independent assessments of high hazard nuclear facility construction projects to ensure performance in the implementation of nuclear safety requirements; and Provide independent assessments of DOE nuclear facilities and operations to ensure performance in the implementation of nuclear safety requirements. 	<ul style="list-style-type: none"> Continuation of activities. 	No significant change.
Enforcement \$435,000	\$435,000	\$0
<ul style="list-style-type: none"> Review and analyze information 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 performance trends; and Conduct periodic outreach and training activities to communicate the Department's approach to security and safety enforcement, convey noncompliance-reporting expectations, and provide information about DOE regulatory performance. 	<ul style="list-style-type: none"> Continuation of activities. 	No change.
Security and Safety Training \$17,108,000	\$19,430,000	+\$2,322,000
<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 to enhance performance throughout the Department; Maintain and upgrade equipment and technologies to support a greater web presence and "just-in-time" online 	<ul style="list-style-type: none"> Continuation of activities. 	Continued development and implementation of training curricula including expansion of virtual learning offerings, increased protective force training in support of pit production, customer requested contractor acquisition curricula, data analysis, and activities to support a common DOE-wide Learning Management System, increased infrastructure

**Other Defense Activities/
Enterprise Assessments**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021Enacted
<p>training products, such as webcasts and topical area seminars;</p> <ul style="list-style-type: none"> • Continue recent initiatives to provide expanded nuclear safety training, expanded DOE oversight training, and Nuclear Executive leadership training, expanded protective force training and development of contractor acquisition curricula. • Support development and implementation of the DOE Learning Nucleus platform that consolidates DOE-wide employee training resources and administration; • Continue the implementation 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; • Incorporate best practices and lessons learned from EA enforcement investigations and independent assessments as well as data analysis into NTC training programs to enhance performance of the DOE workforce; and • Operate and maintain the facility, 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. 		<p>maintenance, and information technology upgrades.</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 independent assessments of the Department's performance in security, safety, and other areas; implement classified information security, nuclear safety, and worker health and safety contractor enforcement programs; and develop and administer security and safety training that reflects the most current Departmental policy on security and safety issues; and perform internal analytic functions designed to optimize the prioritization and selection of specific EA activities. 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. EA will develop a program to support Executive Order 14035: Diversity, Equity, Inclusion and Accessibility in the Federal Workforce to create a respectful, inclusive, and safe workplace where employees can thrive, develop their potential and contribute to the success of their workplace that will increase productivity and morale and may reduce employee turnover. The EA workforce is composed of security and safety professionals highly educated 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 assessment activities provide high value to the Department by assessing performance and identifying gaps and vulnerabilities in physical security and cybersecurity programs, safety (worker and nuclear safety, and emergency management), and related performance. Independent assessment activities are selected based on careful consideration and analysis of risk to Departmental operations and performance trends, and tailored to the unique missions and needs of each DOE program and site / field office. Safeguards and security, information security, and cybersecurity independent performance assessment activities are designed to determine whether special nuclear materials, classified matter (parts and information), and controlled unclassified and sensitive information are adequately protected from unauthorized or inadvertent disclosure or diversion, including from the actions of malicious insiders. Independent performance assessment activities are also designed to evaluate whether the Department's overarching management and governance structure is effective in promoting robust protection strategies based on informed risk management decisions. Safety-related independent performance assessment activities determine whether workers and the public are protected from the hazards associated with the Department's operations and identify 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 performance of the Department's security and safety 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 secure and safe manner.

Independent performance 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 for the Department that is vital to provide assurance of its security and safety performance 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 227.1A, Independent Oversight Program, independent assessment activities are performed by personnel who are organizationally independent of the DOE program and site / field offices that develop and implement policies and programs, and who can therefore objectively observe and report on the performance of 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 to provide more useful performance data and related information to DOE management.

Other Related Expenses

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

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Program Direction					
Salaries and Benefits	19,776	19,776	24,180	+4,404	+22.3 %
Travel	1,545	1,545	1,170	-375	-24.3%
Support Services	28,201	28,201	27,701	-500	-1.8%
Other Related Expenses	5,113	5,113	4,890	-223	-4.4%
Total, Program Direction	54,635	54,635	57,941	+3,306	+6.1%
Federal FTEs	94	94	100	6	0
Support Services					
Independent Assessments	28,201	28,201	27,701	-500	-1.8%
Other Related Expenses					
Working Capital Fund	2,804	2,804	2,804	0	0%
Training	116	116	116	0	0%
Other Services Procured	2,193	2,193	1,970	-223	-10.2%
Total, Other Related Expenses	5,113	5,113	4,890	-223	-4.4%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$54,635,000	\$57,941,000	+\$3,306,000
Salaries and Benefits \$19,776,000	\$24,180,000	+\$4,404,000
<ul style="list-style-type: none"> Provides for Federal staffing to manage and oversee direction and execution of the EA mission related to: independent assessments; enforcement; security and safety training; conduct enforcement investigations of DOE contractors for potential violations of security and safety requirements; develop and issue enforcement outcomes as necessary; conduct security and safety independent assessments; develop and deploy new and existing training curricula; conduct analytical activities to support EA programs; and provide infrastructure support related to EA resources and communication. 	<ul style="list-style-type: none"> The request will support 100 FTEs to perform core EA mission. 	Increase for Salaries and Benefits to support subject matter experts and for overall ongoing personnel actions to include pay raise of 4.6%, benefits, lump sum payouts, PCS and awards.
Travel \$1,545,000	\$1,170,000	-\$375,000
<ul style="list-style-type: none"> Provides for Federal employee travel in support of EA enforcement, independent assessment, training, and other mission-related activities. 	<ul style="list-style-type: none"> Continuation of activities. 	Reflects spending trends and increased use of virtual activities combined with travel, to reduce the footprint at the sites.
Support Services \$28,201,000	\$27,701,000	-\$500,000
<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 security and safety 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 security interests, including protective force tests (e.g., 	<ul style="list-style-type: none"> Continuation of activities. 	Mission requires an increase in Federal positions resulting in a decrease of required contractors.

**Other Defense Activities/Enterprise Assessments/
Program Direction**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<p>force-on-force exercises) using weapons simulation systems and a specially trained composite adversary team to assess overall 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 performance 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; • Develop new and enhanced performance testing tools capable of detecting and countering evolving cybersecurity threats to national assets and critical infrastructure; • Conduct the annual independent evaluation of DOE classified information systems security programs as required by the Federal Information Security Modernization Act; • Conduct an annual evaluation of DOE 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; 		

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<ul style="list-style-type: none"> • Conduct annual “red team” cybersecurity performance assessments of the computer networks within the National Nuclear Security Administration nuclear weapons sites and laboratories; • Undertake and/or support activities that promote accomplishing DOE Office of the Chief Information Officer and U.S. Intelligence Community strategic cybersecurity performance objectives; • Conduct targeted reviews of selected nuclear safety functional areas across the DOE complex based on such factors as performance trends, changes to applicable requirements, and/or performance information gaps; • 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 performance of emergency planning, preparedness, and response and recovery capabilities; • Conduct special reviews and studies of security and safety policies, programs, and implementation to identify needed program corrections; • Develop reports to communicate security and safety performance, findings, and opportunities for improvement; • Develop and broadly disseminate assessment report abstracts of key results to promote performance improvements; 		

**Other Defense Activities/Enterprise Assessments/
Program Direction**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
<ul style="list-style-type: none"> Continuously analyze results, and develop periodic summary reports that identify cross-cutting issues and performance trends; Conduct follow-up performance reviews to evaluate corrective action effectiveness; and Provide lessons learned and trending of assessment results to the NTC to be used to develop or amend security and safety curricula to enhance performance of the DOE workforce. 		
Other Related Expenses \$5,113,000	\$4,890,000	-\$223,000
<ul style="list-style-type: none"> Working Capital Fund (WCF) 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 EA Federal employees, assuring that Federal personnel are fully capable of performing missions of the Department; and The Energy Information Technology Services that provide a single point of contact for all common information technology systems and services at DOE Headquarters, promoting security, service, and efficiency. 	<ul style="list-style-type: none"> Continuation of activities. 	Reduced costs related to development of EA internal document development system.

**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 2021 Actual Cost	FY 2021 Planned Cost	FY 2022 Planned Cost	FY 2023 Planned Cost
National Training Center	1,278	1,720	1,771	1,824
Total, Direct-Funded Maintenance and Repair	1,278	1,720	1,771	1,824

Report on FY 2019 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 2019 to the amount planned for FY 2019, including congressionally directed changes.

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

	FY 2021 Actual Cost	FY 2021 Planned Cost
National Training Center	1,278	1,720
Total, Maintenance and Repair	1,278	1,720

Funding by Appropriation by Site (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
Enterprise Assessments			
National Training Center	150	150	300
Washington Headquarters	78,920	78,920	85,127
Total, Enterprise Assessments	79,070	79,070	85,427

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

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Cybersecurity	9,335	9,335	9,335	0
Total, Safeguards and Security	9,335	9,335	9,335	0

Legacy Management

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
\$163,059	\$163,059	\$196,146

Overview

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) protects human health and the environment by providing long-term management solutions at over 100 World War II and Cold War era sites where the federal government operated, researched, produced, and tested nuclear weapons and/or conducted scientific and engineering research. While these sites were remediated and placed in a safe condition, residual hazards remain after cleanup due to technical limitations of the remedial work. As a result, DOE maintains a post closure obligation to protect human health and the environment after cleanup is completed. LM fulfills this obligation by providing long-term stewardship (LTS) of these sites. In the next five years, LM anticipates adding over 20 new sites to its LTS portfolio.

LM's LTS activities foundationally include executing Long-Term Surveillance and Maintenance (LTS&M) at remediated sites. In addition to the LTS&M activities, LTS includes evaluating the condition and addressing physical safety hazards of Defense-Related Uranium Mines (DRUM), performing Archiving and Information Management (AIM) for LM's operations and sites, assuring post-retirement benefits to more than 10,000 former contractor workers (Legacy Benefits), and conducting Asset Management (AM), Environmental Justice (EJ), Education, Communication, History, and Outreach (ECHO), and Program Direction (PD) functions.

Highlights and Major Changes for the FY 2023 Budget Request

LM's FY 2023 request is \$33,087,000 above the FY 2021 enacted level. In addition to supporting the enhancement of core LTS activities mentioned above, \$10,075,000 will allow LM to increase its foundational Environmental Justice program activities, enabling the program to reach a larger number of affected communities. This funding also supports Executive Order (E.O.) 13985, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government," and E.O. 14008, "Tackling the Climate Crisis at Home and Abroad." Funding ensures equity and climate resilience are assessed and implemented for all LM's activities.

Additionally, \$5,992,000 supports acceleration of major maintenance and repair at sites with natural and climate-change induced degradation. In FY 2023, funding will be applied to stabilization of the North Walnut Creek hillside at Rocky Flats site in Colorado and repair of the mud pits at Amchitka site in Alaska.

The remaining \$17,020,000 supports legacy benefits for former contractor workers; transition activities related to the transfer of over 20 new sites in the next five years; inventorying, risk screening, and safeguarding of DRUM sites on Navajo Nation and other Tribal lands; appropriate implementation of mitigating actions at LM sites to enhance climate resilience; deployment and implementation of new Continuous Diagnostics and Mitigation (CDM) and Endpoint Detection and Response (EDR) tools to improve monitoring, detection and response to cyber-attacks; execution of climate mitigation and data collection activities at DOE properties such as the Regenerative Grazing Study at the Shirley Basin South site in Wyoming; extensive community interaction and outreach to support the long-term stewardship mission; and the proposed FY 2023 cost-of-living pay increase for civilian employees.

**Legacy Management
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Legacy Management					
Legacy Management					
Long-Term Surveillance and Maintenance	66,414	66,414	72,406	+5,992	+9%
Archives and Information Management	20,347	20,347	24,075	+3,728	+18%
Legacy Benefits	37,224	37,224	46,400	+9,176	+25%
Asset Management	12,196	12,196	14,162	+1,966	+16%
Education, Communication, History, and Outreach	4,124	4,124	4,553	+429	+10%
Environmental Justice	2,492	2,492	12,567	+10,075	+404%
Subtotal, Legacy Management	142,797	142,797	174,163	+31,366	+22%
Program Direction	20,262	20,262	21,983	+1,721	+8%
Total, Legacy Management	163,059	163,059	196,146	+33,087	+20%
Federal FTEs	80	80	80	0	N/A

Legacy Management
Explanation of Major Changes (\$K)

FY 2023 Request
vs
FY 2021 Enacted

<ul style="list-style-type: none"> • Long-Term Surveillance and Maintenance: The increase supports the following: the transition activities of over 20 sites in the next 5 years; inventorying and safeguarding of DRUM sites on public, Navajo Nation, other Tribal, and private lands; and major maintenance and repair activities at current sites such as the Rocky Flats site in Colorado and the Amchitka site in Alaska. 	+5,992
<ul style="list-style-type: none"> • Archives and Information Management: The increase supports improvements to the enterprise geospatial information system to assure compliance with statutes pertaining to data access, quality and use and data sharing. The increase also supports compliance with two E.O. on Artificial Intelligence E.O. 13859 (Maintaining American leadership in Artificial Intelligence (AI)) and E.O. 13960 (Promoting the Use of Trustworthy AI in the Federal Government). To bolster LM's Cyber Security posture, and fully comply with E.O. 14028 (Improving the Nation's Cybersecurity). LM will deploy and implement Continuous Diagnostics and Mitigation (CDM) and Endpoint Detection and Response (EDR) tools to bolster the prevention, detection, and management of cyber incidents across its networks. Additionally, the increase will support modernization of network infrastructure and facilitate implementation of Zero Trust Cybersecurity Principles. 	+3,728
<ul style="list-style-type: none"> • Legacy Benefits (formerly Pension and Benefit Continuity): Funding supports legacy post-retirement benefits to more than 10,000 former contractor workers. 	+9,176
<ul style="list-style-type: none"> • Asset Management: Increase supports repair and facility management of the LM Field Support Center in Grand Junction, Colorado; sustainment and climate resilience activities at leased and owned properties such as the Regenerative Grazing Study at the Shirley Basin South site in Wyoming; and modernization of the LM fleet vehicles as well as vehicle charging infrastructure. 	+1,996
<ul style="list-style-type: none"> • Education, Communication, History, and Outreach: Increase supports outreach requirements for compliance with Executive Order 13985. 	+429
<ul style="list-style-type: none"> • Environmental Justice: Increase enhances foundational EJ activities to expand the scope of engagement to a broader set of stakeholders. Additionally, increase supports equity and energy justice requirements consistent with E.O. 13985 and 14008. 	+10,075
<ul style="list-style-type: none"> • Program Direction: Increase supports the proposed 4.6% cost-of-living increase to salaries and benefits for Federal full-time-equivalents (FTEs). Also, supports additional mission essential travel, training, working capital, and DOE Information Technology (IT) services. 	+1,721
Total, Legacy Management	+33,087

Legacy Management

Overview

Long-Term Surveillance and Maintenance

LM protects human health and the environment by conducting LTS&M activities at remediated sites that have been closed. The overall goal of LTS&M activities is to ensure that environmental remedies put in place during site cleanup continue to protect human health and the environment. Sites are remediated under the following regulatory and/or functional categories before they are transferred to LM: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); Resource Conservation and Recovery Act of 1976 (RCRA); Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) Title I & II; Formerly Utilized Sites Remedial Action Program (FUSRAP); Defense Decontamination and Decommissioning (D&D) Program; Nevada Off-Sites and the Plowshare/Vela Uniform Programs; and the Nuclear Waste Policy Act (NWPA, 1984) Section 151. LM continues to conduct LTS&M activities under those regulatory and/or functional categories after sites are transferred. LTS&M activities include the following: isolation of radioactive and hazardous materials (often in engineered disposal cells), management and remediation of contaminated groundwater, and maintaining institutional controls (ICs), ranging from signs to legal instruments, such as deed restrictions.

The funding requested for FY 2023 will allow LM to conduct sustainment, repair/replace, modernization, and new requirements under LTS&M activities, as well as conducting routine functions, at over 100 sites. Routine functions include soil, water, and air monitoring, long-term treatment of contaminants, maintenance of disposal cells, facility and infrastructure maintenance, and security. By the end of FY 2027, LM will transition and perform transition activities for 20 or more sites. Some of these sites scheduled to transfer in the next five years include: the Gas Hills North Disposal site in Wyoming, the Ray Point Disposal site in Texas, the Bear Creek Disposal site in Wyoming, the Hazelwood site in Missouri, and the Kansas City Plant in Missouri. Additionally, LM has major repair and maintenance projects so sites remain protective of public health and the environment. Some of these sites require major repair and maintenance projects which include, but are not exclusive to, the Rocky Flats site in Colorado and the Amchitka site in Alaska.

LTS&M activities also include the inventorying, risk screening, and safeguarding of physical safety hazards at DRUM sites. LM led the effort to produce the 2014 Defense-Related Uranium Mines Report to Congress. The report concluded there are still numerous data gaps associated with abandoned uranium mines. The initial 5-year campaign (Campaign #1) focuses on approximately 2,500 mines on public lands. These data gaps need to be addressed to fully comply with the intent of Congress. Beginning in FY 2017, DOE participated in intergovernmental coordination efforts to begin filling the data gaps and quantifying the risks. The funding for FY 2023 will support LM's continued involvement in a multi-agency effort to validate and verify existing information at over 350 mines, collect site-specific data at each mine to identify possible hazards, perform risk scoring and ranking of these mine hazards, improve data quality and content of the national DRUM database, exchange information with federal, Tribal, and state governments, and work with partner agencies to mitigate physical hazards at DRUM sites. This effort will help DOE better define potential safety and environmental issues at DRUM sites. The funding request for FY 2023 will also support field activities at DRUM sites on Navajo Nation and other Tribal lands (Campaign #2) and begin project planning for inventorying mines on private property (Campaign 3). More specifically, the increase will support a dedicated field team to inventory mines located on Navajo Nation and other Tribal lands. It will also provide the ability to mitigate physical safety hazards at DRUM sites on public and Tribal lands. Physical hazards are numerous and recognized as an immediate threat to public health and safety.

Additionally, this activity includes supporting functions such as the Applied Studies and Technology (AS&T) program incorporating advances in science and technology to improve LTS&M capabilities; increase understanding of sites to design remedy repairs, and more effectively remediate and manage contaminated groundwater; enhance Environment, Safety, Health, and Quality (ESH&Q) and emergency management programs that are structurally integrated into the daily operations of LM's programs and projects. ESH&Q also administers LM's science-based Environmental Management Systems (EMS) for maintaining environmental compliance and sustainably managing LM sites.

A related cost, directly supporting this activity and embedded within LTS&M site-specific costs, is safeguards and security for LM properties. The costs include protective forces and physical security systems, as follows (in whole dollars): FY 2021 -

\$131,000; FY 2022 - \$131,000; and FY 2023 - \$145,000. The cost is derived from protective forces and physical security systems integral to the LTS&M strategies for the Weldon Spring (Missouri) and Fernald (Ohio) sites.

Archives and Information Management (AIM)

This activity includes LM's custodianship of legacy physical and electronic records for LM sites, such as major closure sites at Fernald, Mound, Weldon Spring, and Rocky Flats, as well as the records of the history of DOE and its predecessor agencies in support of the DOE Office of the Historian, recently transferred to LM. Additionally, this activity involves the management and security of LM's information technology (IT) infrastructure requirements. The major objectives of this activity include modernization of records management and geospatial information systems and continuous monitoring and enhancement of cyber security.

LM is responsible for approximately 119,000 cubic feet of physical records and approximately 4 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 (YMP), in compliance with the Federal Records Act.

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, records disposition processes, and activities to ensure proper documentation and validation of LM's environmental protection and compliance with hazardous waste disposition policies.

The activity includes responding to requests associated with the Freedom of Information Act, 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 approximately 1,800 requests for information each year.

This activity also provides LM's environmental data, information management, and technology solutions for mission needs. This work involves the coordination of information collection, storage, preservation, dissemination, and destruction as well as managing the policies, guidelines, and standards regarding information and data management. LM maintains its own IT infrastructure – including maintaining functional equipment, operating systems, and software capable of accessing electronic records; providing planning, design, and maintenance of an IT infrastructure to effectively support automated needs (e.g., platforms, networks, servers, printers, etc.); and providing IT security for LM's unclassified computing networks. Specific accomplishments will include advancing the maturity of LM's enterprise geospatial information system to facilitate compliance with several statutes to include the Foundations for Evidence-based Policymaking Act of 2017 and the Geospatial Data Act of 2018. Additionally, this activity will provide database enhancements for the DRUM sites and added storage/manipulation of increasing drone-related data documenting a baseline aerial survey for future use in the early detection of changes in site disposal cell performance.

This funding request will support the modernization of the Geospatial Environmental Mapping System (GEMS) using commercial off-the-shelf software tools to ensure the long-term sustainability and operability of a critical mission and stakeholder outreach support system. Additionally, the request will support implementation of Executive Order 14028, Modernizing Federal Government Cybersecurity, by deploying and implementing new Continuous Diagnostics and Mitigation (CDM) and Endpoint Detection and Response (EDR) tools to improve the monitoring, detection, and response to various cyber-attacks and incidents across LM networks. Other EO 14028 implementing measures include enhancing software supply chain risk assessment capability and furthering the transition from IPv4 to IPv6 internet protocols across the LM networks. Additionally, the increase will enable LM to move toward compliance with OMB Memorandum M-22-09 (Develop a Zero Trust Architecture) by moving toward implementation of Zero Trust Cybersecurity Principles.

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

Modernization Act of 2014. The cost of the embedded cyber security and information security functions are as follows (in whole dollars): FY 2021 - \$1,248,000; FY 2022 - \$1,248,000, and FY 2023 - \$1,449,000

Legacy Benefits (formerly Pension and Benefit Continuity)

This activity fulfills the Department's commitment to former contractor employees who previously worked at sites prior to closure. For sites that have been closed, following the end of active programs and completion of site remediation, LM is responsible for ensuring former contractor employees, their dependents, and their beneficiaries 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, health reimbursement account stipends, Medicare Part B reimbursement, and life insurance.

In FY 2023, LM will continue to support the administration of PRB (healthcare and insurance) for the following sites: Fernald (Ohio), Grand Junction (Colorado), Mound (Ohio), Paducah (Kentucky), Pinellas (Florida), Portsmouth (Ohio), and Rocky Flats (Colorado). There are more than 10,000 participants, including spouses, covered under the retiree medical plans. The total number of participants in these plans decreases over time, due to a closed participant population and normal mortality. The FY 2023 request includes funding to meet these requirements.

Asset Management (AM)

LM manages a portfolio of more than 60,000 acres of land and other assets. This activity focuses on management of those acres and other assets in support of the LM mission including: the administration of fleet, personal property and aviation management; awarding and administering leases to house programmatic functions; facility management and security of owned and leased facilities; infrastructure management; emergency management, and the beneficial reuse or transfer of real and personal property to other agencies, underserved communities, or public/private interests. Disposition of excess assets to non-DOE ownership is a priority. Disposing land to an underserved community or public/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. LM has disposed of more than ten properties since being created in FY 2004 and continues to evaluate assets for future property disposition.

This activity also includes management of lease tracts for royalties paid to the U.S. government from production on U.S. Bureau of Land Management (BLM) managed lands in Colorado. Lease management continues to strengthen LM's ability to demonstrate responsible lifecycle mining, supports the production of critical minerals, and provides a domestic supply of uranium and vanadium, vital to U.S. national and energy security. Leases include the option for reclamation in lieu of royalties, which allows lessees to perform reclamation activities of legacy or pre-law abandoned mine sites on the lease tracts in lieu of annual royalty payments. Additionally, this activity includes stewardship and preservation responsibilities under § 3061010 of the National Historical Preservation Act (NHPA).

In addition to supporting the activities above, the request will also support the sustainment and repair activities at the LM Grand Junction, Colorado Field Support Center annex, as well as projects required to modernize 1950's era site infrastructure. Additionally, the request will support sustainment and climate resilience activities at leased and owned properties such as the Regenerative Grazing Study at the Shirley Basin South site in Wyoming. The study aids in the discovery of potential enhanced land management practices that will promote healthier vegetation and ecological systems along with combating climate change by enhancing climate mitigation efforts and providing key climate science information. Finally, this request will support the modernization of LM fleet vehicles and infrastructure in response to the electrification of fleet.

A related cost directly supporting this activity within program-wide asset management costs is safeguards and security for LM properties and emergency management. The costs include protective forces, physical security systems, personnel security, information security, and program management, as follows (in whole dollars): FY 2021 - \$1,054,000; FY 2022 - \$1,054,000; and FY 2023 - \$1,081,000

Education, Communication, History, and Outreach (ECHO)

LM's success depends on connecting and effectively communicating with the public, other government organizations, and Tribal Nations. Accordingly, ECHO provides the integral activities for proactive outreach to the public, intergovernmental collaboration, and effective dialogue with state and local partners, and Tribal Nations connected to LM's mission. Additionally, to ensure that important information is shared consistently across the broad spectrum of LM's public, intergovernmental, and Tribal Nations, ECHO continuously enhances vertical integration of outreach activities within the organization. Together these activities ensure Tribal Nations are consulted and stakeholders are involved and informed of LM's long-term solutions.

ECHO's consultation with Tribal Nations includes working with the State and Tribal Government Working Group (STGWG), and an array of Native American and Alaska-Native officials who share our commitment to long-term monitoring and surveillance. ECHO's FY 2023 request will support outreach requirements consistent with E.O. 13985.

In addition to supporting activities mentioned above, the FY 2023 request supports the integration of public participation specialists to each of the site operations teams. The integration of public participation specialists will help ensure outreach and communication proactively addresses the questions or concerns of affected communities.

Environmental Justice

Foundationally, this activity includes administration of the Department's Environmental Justice (EJ) mission in accordance with E.O. 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." E.O. 12898 required agencies to make achieving EJ part of its mission. Accordingly, EJ activities are centered around meaningfully increasing community involvement and participation in the decision-making processes. These foundational EJ activities include EJ and Tribal training, education, and internships; EJ community-driven activities; capacity building; public participation; agency, public, private industry partnerships; and fostering opportunities for minority populations, low-income populations, and American Indian and Alaska Natives. An example of EJ fostering opportunities includes the administration of the DOE EJ Mentors for Environmental Scholars (MES) Program, a summer internship providing exposure to laboratory research in Science, Technology, Engineering, and Mathematics (STEM) education programs. The MES program actively recruits qualified undergraduates from Historically Black Colleges and Universities, Tribal Colleges, Hispanic Serving Institutions, and other Minority Serving Institutions (MSIs) for extension training that will pilot them toward gainful employment in various research and management positions within DOE.

The FY 2023 request will begin strengthening EJ activities and expanding the scope of engagement to a broader set of stakeholders using current models of implementation. To strengthen EJ activities and reach a larger number of stakeholders, the EJ program will work with Tribal Nations and existing partners to expand community outreach, public participation, and environmental education. Additionally, the EJ program will utilize multiple outreach tools to establish new partnerships and engagement. For example, some of these EJ activities will include enhancing university-related programs in areas such as building the skills, resources, and knowledge within engineering and science academic researchers to conduct research and development in service of environmental and energy justice communities; expanding outreach to MSIs; and establishing new activities for an EJ training program with the National Institute of Environmental Health Sciences; and assist rural and other historically underserved communities in accessing much needed resources to improve their economic viability, health, environmental conditions, and overall quality of life.

In addition to its foundational activities, EJ activities includes equity and energy justice activities consistent with E.O. 13985 and 14008. An example of these activities includes the participation in eight or more STEM events on the Navajo Nation. Participation includes in-person and virtual demonstrations of a variety of hands-on activities for students that promote STEM careers.

**Legacy Management
Activities and Explanation of Changes**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Long-Term Surveillance and Maintenance- \$66,414,000	\$72,406,000	+\$5,992,000
<ul style="list-style-type: none"> • Accept responsibility for surveillance and maintenance of 103 sites by the end of FY 2022. • Conduct transition actions for sites prior to their transfer to LM. • Continue to support an interagency effort to inventory and safeguard defense-related uranium mines on public and Tribal lands. • Support major maintenance and repair projects. 	<ul style="list-style-type: none"> • Accept responsibility for surveillance and maintenance of 106 sites by the end of FY 2023. • Conduct transition actions for 17 sites prior to their transfer to LM. • Continue to support an interagency effort to inventory and safeguard defense-related uranium mines on public and Tribal land. • Support major maintenance and repair projects. 	<ul style="list-style-type: none"> • Transition activities regarding the transfer of over 20 new sites in the next 5 years. • Enhance human health and environmental protections of disadvantaged communities by executing major maintenance and repair at LM sites such as Rocky Flats, Colorado and Amchitka, Alaska. • Provide dedicated DRUM field team for inventorying, risk screening, and safeguarding of defense-related uranium mines located on Navajo Nation and other Tribal lands.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Archives and Information Management- \$20,347,000	\$24,075,000	+\$3,728,000
<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. Continue to preserve Yucca Mountain Project records and information systems in compliance with the Federal Records Act. Restoration and modernization of records management systems. 	<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. Continue to preserve Yucca Mountain Project records and information systems in compliance with the Federal Records Act. Restoration and modernization of records, environmental, and geospatial data management systems. 	<ul style="list-style-type: none"> Additional archives and information management activities at 3 new sites, Modernize the Geospatial Environmental Mapping System (GEMS) to ensure long-term sustainability and operability, Advance the maturity and sustainability of the enterprise geospatial information system to facilitate compliance with several statutes, and Implement Continuous Diagnostics and Mitigation (CDM) and Endpoint Detection and Response (EDR) tools to improve the monitoring, detection, and response to cyber-attacks and incidents.
Legacy Benefits- \$37,224,000	\$46,400,000	+\$9,176,000
<ul style="list-style-type: none"> Continue to reimburse contractor costs for PRB administration for seven sites. Continue efforts to reduce DOE's liabilities for retiree PRB while maintaining commitments to DOE's legacy contractor workforce. 	<ul style="list-style-type: none"> Continue to reimburse contractor costs for PRB administration for seven sites. Continue efforts to reduce DOE's liabilities for retiree PRB while maintaining commitments to DOE's legacy contractor workforce. 	<ul style="list-style-type: none"> FY 2023 increase will fund required levels for management of retirements benefits per the actuary recommendations.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Asset Management- <div style="text-align: right;">\$12,196,000</div>	<div style="text-align: right;">\$14,162,000</div>	<div style="text-align: right;">+\$1,966,000</div>
<ul style="list-style-type: none"> • Initiate asset management support for incoming sites. • Continue infrastructure and facilities management at LM sites and Departmental properties. • Continue to increase and manage beneficial reuse initiatives at sites available for reuse. • Establish public land withdrawals with the Department of the Interior that are associated with incoming sites. • Management of program's aviation activities and requirements. • Management of the Minerals Leasing Program. • Continue activities towards DOE's stewardship and preservation responsibilities under § 3061010 NHPA. 	<ul style="list-style-type: none"> • Initiate asset management support for incoming sites. • Continue infrastructure and facilities management at LM sites and Departmental properties. • Continue to increase and manage beneficial reuse initiatives at sites available for reuse. • Establish public land withdrawals with the Department of the Interior that are associated with incoming sites. • Management of program's aviation activities and requirements. • Management of the Minerals Leasing Program. • Continue activities towards DOE's stewardship and preservation responsibilities under § 3061010 NHPA. • Manage the expansion of real property requirements at LM Field Support Center and the LM Operations Center and other Departmental properties. • Recapitalization of the LM Field Support Center in Grand Junction, Colorado, • Climate resiliency and sustainability at leased and owned properties such as the Regenerative Grazing Study at the Shirley Basin South site in Wyoming, and • Modernization of fleet vehicles and infrastructure to support electrification of fleet. 	<ul style="list-style-type: none"> • Recapitalization of the LM Field Support Center in Grand Junction, Colorado, • Climate resiliency and sustainability at leased and owned properties such as the Regenerative Grazing Study at the Shirley Basin South site in Wyoming, and • Modernization of fleet vehicles and infrastructure to support electrification of fleet.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Education, Communications, History, and Outreach- \$4,124,000	\$4,553,000	+\$429,000
<ul style="list-style-type: none"> Continue to increase stakeholder awareness and engage the public. 	<ul style="list-style-type: none"> Continue to increase stakeholder awareness and engage the public. Support outreach requirements regarding Executive Order 13985. 	<ul style="list-style-type: none"> Support outreach requirements regarding Executive Order 13985.
Environmental Justice- \$2,492,000	\$12,567,000	+10,075,000
<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. Enhance education and Science, Technology, Engineering, and Mathematics (STEM) outreach activities. Strengthen foundational EJ activities and expand the scope of engagement to a broader set of stakeholders. Support equity and energy justice requirements according to Executive Order 13985. 	<ul style="list-style-type: none"> Enhance education and Science, Technology, Engineering, and Mathematics (STEM) outreach activities to meet the community demands and operational requirements of 3 interpretive centers. Strengthen foundational EJ activities and expand the scope of engagement to a broader set of stakeholders. Support equity and energy justice requirements according to Executive Order 13985.

Program Direction

Overview

The LM mission is carried out in the field by a workforce composed mainly of contractors paid from program funds. Oversight, policy, and inherently governmental functions (e.g., human capital, facility management, site management, contract administration, and budget management) are provided by a federal workforce funded from program direction. Program direction includes overhead costs associated with Federal personnel such as salaries, benefits, travel, training, administrative support services, DOE IT Services, and DOE Working Capital.

Highlights of the FY 2023 Budget Request

The request is an increase of \$1,721,000 from the FY 2021 Enacted level. The request includes supporting overhead costs for 80 Federal FTEs. Overhead support for Federal FTEs includes activities to implementation activities consistent with E.O. 14035 “Diversity, Equity, Inclusion, and Accessibility (DEIA) in the Federal Workforce.” The increase will also support the proposed 4.6% cost-of-living increase to salaries and benefits for Federal FTEs.

**Program Direction
Funding (\$K)**

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
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Washington Headquarters

Salaries and Benefits	14,699	14,699	15,685	+986	+7%
Travel	230	230	750	+520	+226%
Support Services	2,615	2,615	2,725	+110	+4%
Other Related Expenses	2,718	2,718	2,823	+105	+4%
Total, Program Direction	20,262	20,262	21,938	+1,721	+8%
Federal FTEs	80	80	80	0	0

Support Services

Management Support	2,615	2,615	2,725	+110	+4%
Total, Support Services	2,615	2,615	2,725	+110	+4%

Other Related Expenses

Other Services and Supplies	607	607	651	+44	+7%
DOE IT Services	395	395	410	+15	+4%
Working Capital Fund	1,716	1,716	1,762	+46	+3%
Total, Other Related Expenses	2,718	2,718	2,823	+105	+4%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction- \$20,262,000	\$21,983,000	+\$1,721,000
Salaries and Benefits- \$14,699,000	\$15,685,000	+\$986,000
<ul style="list-style-type: none"> Continue functions to execute LM's mission and achieve LM's program goals. Maintain a level of 80 Federal FTEs to meet the increased site management responsibilities such as addressing physical hazards posed by defense-related uranium mines. 	<ul style="list-style-type: none"> Continue functions to execute LM's mission and achieve LM's program goals. Maintain a level of 80 Federal FTEs to meet the increased site management responsibilities such as addressing physical hazards posed by defense-related uranium mines. Provide 4.6% cost-of-living increase to salaries and benefits for 80 FTEs. 	<ul style="list-style-type: none"> Funds proposed 4.6% cost-of-living increase.
Travel- \$230,000	\$750,000	+520,000
<ul style="list-style-type: none"> Resume normal travel activities to support mission functions such as surveillance, maintenance, operations, and oversight at a growing number of closed sites. 	<ul style="list-style-type: none"> Continue to resume normal travel activities to support mission functions such as surveillance, maintenance, operations, and oversight at a growing number of closed sites. 	<ul style="list-style-type: none"> Support the program resuming normal mission-related traveling and additional travel demands related to increased site portfolio and field responsibilities (surveillance, monitoring, and transition responsibilities).
Support Services- \$2,615,000	\$2,725,000	+\$110,000
<ul style="list-style-type: none"> Continue effort to prepare more analyses and reports with Federal staff. 	<ul style="list-style-type: none"> Continue effort to prepare more analyses and reports with Federal staff. 	<ul style="list-style-type: none"> For additional administrative services in support of operations and timely responses to data inquiries.
Other Related Expenses- \$2,718,000	\$2,823,000	+\$105,000
<ul style="list-style-type: none"> Continue supporting individual development staff training, procurement of supplies, contributions to Working Capital Fund (WCF) and the energy IT support. 	<ul style="list-style-type: none"> Continue supporting individual development staff training, procurement of supplies, annual lease agreements, program allocation of WCF and the energy IT support. 	<ul style="list-style-type: none"> Increased mission related training, and Increased WCF and DOE IT support cost.

**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 2021 Actual Cost	FY 2022 Planned Cost	FY 2023 Planned Cost
Office of Legacy Management			
Comprehensive Environmental Response, Compensation, and Liability Act			
(CERCLA) Sites	2,981	4,725	4,905
Non-CERCLA Sites	964	1,099	1,042
Total, Direct-Funded Maintenance and Repair	3,945	5,824	5,947

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 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Protective Forces	649	649	670	+21
Physical Security Systems	120	120	127	+7
Information Security	71	71	72	+1
Cyber Security	1,183	1,183	1,383	+200
Personnel Security	75	75	76	+1
Material Control and Accountability	0	0	0	0
Program Management	335	335	347	+12
Security Investigations	0	0	0	0
Transportation Security	0	0	0	0
Construction	0	0	0	0
Total, Safeguards and Security	2,433	2,433	2,675	+242

Highlights:

The total increase represents additional cyber security restoration and modernization requirements.

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 Alternative Dispute Resolution Office (ADRO). In its continued development of its staff of attorneys and professionals, OHA has also sought to incorporate Diversity, Equity, Inclusion, Accessibility into its operational processes.

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

Highlights of the FY 2023 Budget Request

The FY 2023 Budget Request supports a staff of 24 FTEs needed to accomplish OHA's primary mission of adjudicating security clearance cases, adjudicating exception relief from DOE product efficiency regulations, and providing ADR support for the Department.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request t vs FY 2021 Enacted Request (%)
Program Direction					
Salaries and Benefits	2,700	2,838	2,949	+249	+9%
Travel	82	50	50	-32	-39%
Support Services	100	100	100	0	0%
Other Related Expenses	1,380	1,368	1,378	-2	-1%
Total, Program Direction	4,262	4,356	4,477	+215	+5%
Federal FTEs	22	22	24	2	+9%
Support Services					
Legal Research Support	100	100	100	+5	+5%
Other Related Expenses					
Energy IT Services	185	173	150	-35	-19%
Working Capital Fund	1,100	1,100	1,128	+28	+3%
Total, Other Related Expenses	1,380	1,368	1,378	-2	-1%

Program Direction Activities and Explanation of Changes

	FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs. FY 2021 Enacted
Program Direction	\$4,262,000	\$4,477,000	+\$215,000
Salaries and Benefits	\$2,700,000	\$2,949,000	+\$249,000
<ul style="list-style-type: none"> Supports staffing level of 22 FTEs. 		<ul style="list-style-type: none"> Supports staffing level of 24 FTEs. 	<ul style="list-style-type: none"> Increase of 2 FTEs maintain OHA staffing requirements, 4.6% civilian pay raise, and FERS increase.
Travel	\$82,000	\$50,000	-\$32,000
<ul style="list-style-type: none"> Supports travel to conduct security hearings and ADR training activities and services at DOE field locations. 		<ul style="list-style-type: none"> Continuation of FY21 activities. 	<ul style="list-style-type: none"> Decrease due to improved virtual training techniques since COVID -19 pandemic onset.
Other Related Expenses	\$1,380,000	1,378,000	-\$2,000
<ul style="list-style-type: none"> Funding supports the Working Capital Fund (WCF), which provides for shared service costs and Departmental overhead expenses; Energy IT Services; and other services. 		<ul style="list-style-type: none"> Continuation of FY 2022 activities. 	<ul style="list-style-type: none"> No significant change.

DEPARTMENT OF ENERGY
Funding by Site Detail
Other Defense Activities FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Argonne National Laboratory

Environment, Health, Safety & Security	945	945	945
Environment, Health, Safety, and Security	945	945	945
Total Argonne National Laboratory	945	945	945

Brookhaven National Laboratory

Environment, Health, Safety & Security	250	250	250
Environment, Health, Safety, and Security	250	250	250
Total Brookhaven National Laboratory	250	250	250

Chicago Operations Office

Environment, Health, Safety & Security	50	50	50
Environment, Health, Safety, and Security	50	50	50
Total Chicago Operations Office	50	50	50

Consolidated Business Center

Environment, Health, Safety & Security	259	259	259
Environment, Health, Safety, and Security	259	259	259
Total Consolidated Business Center	259	259	259

Fernald Site

Legacy Management Activities - Defense	11,902	11,902	11,988
Legacy Management	11,902	11,902	11,988
Total Fernald Site	11,902	11,902	11,988

Grand Junction Office

Legacy Management Activities - Defense	40,101	40,101	41,856
Legacy Management	40,101	40,101	41,856
Total Grand Junction Office	40,101	40,101	41,856

Idaho National Laboratory

Environment, Health, Safety & Security	150	150	150
Environment, Health, Safety, and Security	150	150	150
Total Idaho National Laboratory	150	150	150

Idaho Operations Office

Environment, Health, Safety & Security	400	400	400
Environment, Health, Safety, and Security	400	400	400
Total Idaho Operations Office	400	400	400

Kansas City National Security Complex (KCNSC)

Environment, Health, Safety & Security	10	10	10
Environment, Health, Safety, and Security	10	10	10
Total Kansas City National Security Complex (KCNSC)	10	10	10

Lawrence Berkeley National Laboratory

Environment, Health, Safety & Security	0	0	50
Environment, Health, Safety, and Security	0	0	50
Total Lawrence Berkeley National Laboratory	0	0	50

DEPARTMENT OF ENERGY
Funding by Site Detail
Other Defense Activities FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Lawrence Livermore National Laboratory

Environment, Health, Safety & Security	3,050	3,050	3,050
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 & Security	200	200	200
Environment, Health, Safety, and Security	200	200	200
Total Lexington Office	200	200	200

Los Alamos National Laboratory

Environment, Health, Safety & Security	95	95	95
Environment, Health, Safety, and Security	95	95	95
Total Los Alamos National Laboratory	95	95	95

Miamisburg Site

Environment, Health, Safety & Security	5	5	5
Environment, Health, Safety, and Security	5	5	5
Total Miamisburg Site	5	5	5

Mound Site

Legacy Management Activities - Defense	12,738	12,738	12,083
Legacy Management	12,738	12,738	12,083
Total Mound Site	12,738	12,738	12,083

National Energy Technology Lab

Legacy Management Activities - Defense	2,403	2,403	1,976
Legacy Management	2,403	2,403	1,976
Total National Energy Technology Lab	2,403	2,403	1,976

Nevada Field Office

Environment, Health, Safety & Security	15	15	15
Environment, Health, Safety, and Security	15	15	15
Total Nevada Field Office	15	15	15

NNSA Albuquerque Complex

Enterprise Assessments	150	150	300
Office of Enterprise Assessments	150	150	300
Environment, Health, Safety & Security	1,000	1,000	1,000
Environment, Health, Safety, and Security	1,000	1,000	1,000
Total NNSA Albuquerque Complex	1,150	1,150	1,300

Oak Ridge Institute for Science & Education

Environment, Health, Safety & Security	1,305	1,305	1,255
Environment, Health, Safety, and Security	1,305	1,305	1,255
Total Oak Ridge Institute for Science & Education	1,305	1,305	1,255

Oak Ridge National Laboratory

Environment, Health, Safety & Security	1,035	1,035	1,035
Environment, Health, Safety, and Security	1,035	1,035	1,035
Total Oak Ridge National Laboratory	1,035	1,035	1,035

DEPARTMENT OF ENERGY
Funding by Site Detail
Other Defense Activities FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Oak Ridge Office

Environment, Health, Safety & Security	2,795	2,795	2,795
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 & Security	300	300	300
Environment, Health, Safety, and Security	300	300	300
Total Office of Scientific & Technical Information	300	300	300

Pacific Northwest National Laboratory

Environment, Health, Safety & Security	1,905	1,905	1,905
Environment, Health, Safety, and Security	1,905	1,905	1,905
Total Pacific Northwest National Laboratory	1,905	1,905	1,905

Pantex Plant

Environment, Health, Safety & Security	10	10	10
Environment, Health, Safety, and Security	10	10	10
Total Pantex Plant	10	10	10

Pinellas Site

Legacy Management Activities - Defense	4,535	4,535	4,164
Legacy Management	4,535	4,535	4,164
Total Pinellas Site	4,535	4,535	4,164

Portsmouth Gaseous Diffusion Plant

Legacy Management Activities - Defense	5,000	5,000	4,300
Legacy Management	5,000	5,000	4,300
Total Portsmouth Gaseous Diffusion Plant	5,000	5,000	4,300

Richland Operations Office

Environment, Health, Safety & Security	1,000	1,000	1,000
Environment, Health, Safety, and Security	1,000	1,000	1,000
Total Richland Operations Office	1,000	1,000	1,000

Rocky Flats Site

Legacy Management Activities - Defense	26,875	26,875	40,735
Legacy Management	26,875	26,875	40,735
Total Rocky Flats Site	26,875	26,875	40,735

Sandia National Laboratories

Environment, Health, Safety & Security	1,210	1,210	1,210
Environment, Health, Safety, and Security	1,210	1,210	1,210
Total Sandia National Laboratories	1,210	1,210	1,210

Savannah River Site

Environment, Health, Safety & Security	10	10	10
Environment, Health, Safety, and Security	10	10	10
Total Savannah River Site	10	10	10

DEPARTMENT OF ENERGY
Funding by Site Detail
Other Defense Activities FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Savannah River Site Office

Environment, Health, Safety & Security	500	500	500
Environment, Health, Safety, and Security	500	500	500
Total Savannah River Site Office	500	500	500

Washington Headquarters

Legacy Management Activities - Defense	35,151	35,151	51,930
Legacy Management	35,151	35,151	51,930
Program Direction - Office of Enterprise Assessments	54,635	54,635	57,941
Enterprise Assessments	24,285	24,285	27,186
Office of Enterprise Assessments	78,920	78,920	85,127
Program Direction - Environment, Health, Safety and Security	72,000	72,000	76,685
Environment, Health, Safety & Security	117,801	117,801	122,335
Environment, Health, Safety, and Security	189,801	189,801	199,020
Specialized Security Activities	283,500	283,500	306,067
Office Of Hearings And Appeals	4,262	4,262	4,477
Total Washington Headquarters	591,634	591,634	646,621

Weldon Spring Site Office

Legacy Management Activities - Defense	4,092	4,092	5,131
Legacy Management	4,092	4,092	5,131
Total Weldon Spring Site Office	4,092	4,092	5,131

Y-12 Site Office

Environment, Health, Safety & Security	20	20	20
Environment, Health, Safety, and Security	20	20	20
Total Y-12 Site Office	20	20	20

Undesignated LPI

Defense-Related Administrative Support	183,789	183,789	170,695
Program Direction - Legacy Management	20,262	20,262	21,983
Legacy Management	20,262	20,262	21,983
Total Undesignated LPI	204,051	204,051	192,678

Total Funding by Site - Other Defense Activities	920,000	920,000	978,351
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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.), \$497,781,000, to remain available until September 30, 2024, 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 \$100,578,000 in fiscal year 2023 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 2023 appropriation from the general fund estimated at not more than \$397,203,000.

Explanation of Change

In FY 2023, the Request will allow DOE to provide historic support for underserved communities, including \$34 million for the Office of Economic Impact and Diversity to play a critical role in implementing the Department’s Justice40 efforts and equity action plan. The Request invests \$62 million through the Office of International Affairs to accelerate international climate progress, deploy American innovation, and support economic prosperity at home and abroad. The Request includes \$18 million for the Net Zero World initiative and \$4 million to increase multilateral engagement. The Office of Management is requesting \$16 million for electric vehicles and charging infrastructure. To address vulnerabilities identified after the December 2020 SolarWinds intrusion, the Department is requesting \$93 million for cyber response and recovery management through the Office of the Chief Information Officer for the DOE enterprise.

Departmental Administration
((\$K))

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
166,000	166,000	397,203	+231,203

Overview

The Departmental Administration (DA) appropriation funds 14 management and mission support programs that have enterprise-wide responsibility for administration, accounting, budgeting, contract and project management, human resources management, congressional and intergovernmental liaison, international cooperation and coordination, information management, life-cycle asset management, legal services, energy jobs, energy justice, workforce diversity and equal employment opportunity, ombudsman services, small business advocacy, sustainability, arctic energy coordination, and public affairs.

DA supports Strategic Partnership Projects that are reimbursed by customers of the DOE laboratories; and receives Miscellaneous Revenues that offset the costs of the overall program of work. Additionally, the DA program of work operates by executing Defense-Related Administrative Support (DRAS) funding, appropriated within Other Defense Activities (ODA). This accounts for the support DA programs provide for the Defense portion of DOE.

Highlights of the FY 2023 Budget Request

In FY 2023 the DA Budget increase of \$231.2 million reflects a dedication to strengthen enterprise-wide management and mission support functions, per the Administration's priorities, as the highlights below outline:

- **Office of the Secretary (OSE):** Funding will continue to support leadership and policy direction at the Department.
- **Office of the Chief Financial Officer (CFO):** Funding will continue to support corporate business systems to meet and comply with updated cyber security requirements and initiatives; fund operation in a Cloud environment; continued implementation of the Robotic Process Automation (RPA) initiative across the CFO activities and enhance systems supporting enterprise business processes and systems.
- **Economic Impact & Diversity (ED):** Funding will support ED's role as central coordinator and departmental subject matter expert on equity and justice, to include technical assistance to minority businesses, Minority Serving Institutions, and third-party evaluation of Justice40 benefits. Funding continues support for direct oversight of Civil Rights/Employment Equal Opportunities (EEO) to support increased Civil Rights Enforcement, Compliance, and Technical Assistance for the DOE enterprise (except for NNSA), and to directly oversee the affirmative employment and diversity and inclusion functions for the DOE enterprise (except for NNSA and the PMAs). Staffing level supports EEO consolidation, energy justice, diversity, equity, and inclusion activities.
- **International Affairs (IA):** Funding will support the Administration's efforts to accelerate international climate progress, deploy American innovation, and support economic prosperity at home and abroad and continue to pursue international climate and clean energy cooperation through key multilateral and bilateral forums with the objective to reduce global greenhouse gas emissions, create good paying American jobs, enhance U.S. competitiveness, protect those most vulnerable to climate change. IA's investment in the Net Zero World Initiative, DOE's signature contribution to the Presidents Build Back Better World Initiative, provides comprehensive technology and investment roadmaps to help key large emitters across the globe achieve net zero emissions by 2050.
- **Office of the Chief Information Officer (OCIO):** Funding will support OCIO's continued modernization of DOE's IT infrastructure and IT services to provide the capacity, flexibility, and resiliency required of a modern and secure enterprise. Proposed modernization initiatives will continue to reduce cybersecurity risk through improved cybersecurity technology and automation, scale capacity commensurate with demand, and establish IT enterprise capabilities. Further, this will allow for commercial/managed IT service implementation with engineered and inherent cybersecurity capabilities and provide foundational requirements for enhanced cybersecurity tools, products, and capabilities. Vulnerabilities identified by the SolarWinds intrusion incident of December 2020, will

continue to be addressed through funds specifically dedicated to cyber incident response and recovery management in the FY 2023 Request.

- **Management (MA):** Funding will support MA's mission fulfillment, and expansion of the Department's electric vehicle fleet and charging infrastructure as part of a transition from GSA-leased gas-powered vehicles to GSA-leased Zero Emission Vehicles.
- **Office for Human Capital (HC):** Funding will support current operational levels, maintain HC's vital customer service mission, and support ongoing initiatives related to developing more agile, cost-effective operations and modernizing hiring practices to improve the DOE workforce's ability to deliver mission outcomes. Additional funding will support hiring increases related to Bipartisan Infrastructure Law, build upon Talent Teams and dedicated resources to provide HR and hiring managers with new tools and capabilities that are needed to effectively support mission needs.
- **Office of Policy (OP):** Funding supports performance of priority analyses and policy work across the Department's activities, focused on technology; infrastructure; state, local, and tribal activities; energy jobs, and supports the Arctic Energy Office.
- **Artificial Intelligence Technology Office (AITO):** Funding will strengthen DOE AI capabilities and applications, invest in AI systems R&D, and build multi-sector collaboration that will maintain American AI leadership.

Bipartisan Infrastructure Law

Up to one-tenth of one percent of Bipartisan Infrastructure Law (BIL) funding as appropriated may be transferred to DA for management and mission support. In FY 2023, the DA offices will support BIL implementation by, in part, ensuring that staffing, IT, and other needs are promptly addressed and that equity considerations are integrated into all levels of implementation.

Departmental Administration
Funding by Congressional Control (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2022 Request vs. FY 2021 Enacted
Departmental Administration				
Office of the Secretary	5,582	5,582	6,642	+1,060
Congressional & Intergovernmental Affairs	5,000	5,000	7,142	+2,142
Chief Financial Officer	53,590	53,590	62,283	+8,693
Economic Impact & Diversity	10,169	10,169	34,140	+23,971
International Affairs	26,825	26,825	62,141	+35,316
Artificial Intelligence and Technology Office	2,500	2,500	2,608	+108
Chief Information Officer	140,200	140,200	233,731	+93,531
Subtotal, DA	243,866	243,866	408,687	164,821
Other Departmental Administration				
Management	54,358	54,358	86,317	+31,959
Project Management Oversight and Assessments	13,000	13,000	13,550	+550
Chief Human Capital Officer	24,918	24,918	35,366	+10,448
Office of Small & Disadvantaged Business Utilization	3,386	3,386	3,825	+439
General Counsel	35,000	35,000	43,722	+8,722
Office of Policy	7,000	7,000	31,073	+24,073
Public Affairs	4,000	4,000	5,936	+1,936
Office of Technology Transitions	17,639	17,639	0	-17,639
Subtotal, Other DA	159,301	159,301	219,789	+60,488
Strategic Partnership Projects (SPP)	40,000	40,000	40,000	-
Total, Departmental Administration (Gross)	443,167	443,167	668,476	+225,309
Defense-Related Administrative Support (DRAS)	-183,789	-183,789	-170,695	+13,094
Subtotal, Departmental Administration	259,378	259,378	497,781	+238,403
Miscellaneous Revenues				
Revenues Associated with SPP	-40,000	-40,000	-40,000	-
Other Revenues	-53,378	-53,378	-60,578	-7,200
Subtotal, Miscellaneous Revenues	-93,378	-93,378	-100,578	-7,200
Total, Departmental Administration (Net)	166,000	166,000	397,203	+231,203

Outyear Funding (\$K)

	FY 2023 Request	FY 2024	FY 2025	FY 2026	FY 2027
Total, Departmental Administration	397,203	406,000	415,000	425,000	435,000

Defense-Related Administrative Support

Overview

Beginning in FY 1999, funding has been provided within the Other Defense Activities appropriation to offset expenses that support defense-related activities. This offset addresses the significant level of administrative support performed within DA offices in support of the Department's defense-related programs. 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 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
Defense-Related Administrative Support	-183,789	-183,789	-170,695

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 reimbursable work for non-federal entities where the sponsor is precluded by law from providing advance funding.

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, which satisfies the needs of our non-federal customers. 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 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Consolidated Service Center	-	-	21,745	+21,745
Argonne National Laboratory	100	100	-	-100
Brookhaven National Laboratory	275	275	-	-275
Lawrence Berkeley Laboratory	3,308	3,308	-	-3,308
Oak Ridge National Laboratory	12,227	12,227	-	-12,227
Idaho Operations Office	1,000	1,000	2,000	+1,000
National Energy Technology Laboratory	150	150	150	-
National Renewable Energy Laboratory	500	500	500	-
NNSA Complex	8,918	8,918	4,305	-4,613
Richland Operations Office	100	100	100	-
Savannah River Ops Office	6,700	6,700	11,200	+4,500
Washington DC HQ Undistributed	6,722	6,722	-	-6,722
Total, Strategic Partnership Projects	40,000	40,000	40,000	-

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

Description of FY 2022 Activities	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
Consolidated Service Center	-	-	21,745
<ul style="list-style-type: none"> • Argonne National Laboratory - Work with universities and state and local governments that are precluded by law in giving a cash advance; and cover anticipated work with Small Business Innovation Research federal awarded sponsors. • Brookhaven National Laboratory - Primarily to cover anticipated work with small businesses on Small Business Innovation Research/Small Business Technology Transfer and Research SPP. In addition, to cover work with universities and state & local governments that are precluded by law to provide a cash advance. • Lawrence Berkeley National Laboratory <ul style="list-style-type: none"> ○ Additional university support for Composite for Basic Science Research; ○ Independent Technical Assistance for Management and Treatment of Groundwater and Drinking Water; ○ Fabricate the components in the ALICE (A Large Ion Collider Experiment)-USA scope and ALICE ITS (Inner Tracking System) upgrade; ○ University of Washington for comprehensive Identification of Worm and Fly Transcription Factors; and ○ National Laboratory High Energy Physics for Particle Data Group. ○ 21st Century Indiana Energy Policy Development Task Force and Comprehensive Study. • Oak Ridge National Laboratory support for Early-Time Signatures of a Nuclear Detonation in Urban Areas; Tennessee REVV Program; Tip-Enhanced Raman Spectroscopy (TERS) as a Screening Tool; Understanding Cellular Transformation and Chemical Responses Linking Type 2 Diabetes and Amyotrophic Lateral Sclerosis; Neutron Scattering Studies of Human AChE; Computational Support for Protein Structure and Quantum Advantage; Joint Faculty Agreements; General Employee Loan Agreements; etc. • SLAC National Accelerator Laboratory support to U.S./Japan Cooperative Program in High Energy Physics; • Oak Ridge Institute for Science and Education (ORISE) support to/for Radiation Emergency Assistance Center/Training courses, and Beryllium Lymphocyte Proliferation Testing; and • Pacific Northwest National Laboratory (PNNL) work with universities and state and local governments in the areas of Biomedical, High Performance Computing, Grid Modernization, Security and Incident Response, Nuclear and Reactor Technologies, Advance Material Development, Marine Sciences research and development, Build Back Better solicitations, and State Clean Energy fund, Advance Material Development, and Advance Manufacturing. 			

Description of FY 2022 Activities	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
Idaho Operations Office	1,000	1,000	2,000
<ul style="list-style-type: none"> • Work with universities state and local governments. • To cover anticipated work with small businesses on Small Business Innovation Research/Small Business Technology Transfer and Research SPP. 			
National Energy Technology Laboratory	150	150	150
<ul style="list-style-type: none"> • Work with state and local governments. 			
National Renewable Energy Laboratory	500	500	500
<ul style="list-style-type: none"> • Work with state and local governments. 			
NNSA Complex	8,918	8,918	4,305
<ul style="list-style-type: none"> • Consolidated Nuclear Solutions (CNS) National Security Complex support to long-term supply contracts with foreign governments to provide uranium fuel; • CNS - NA-23 Material Management & Minimization Nuclear Material Removal program - cost of recovery operations subsequently reimbursed by foreign customers; • CNS support for Universities precluded by law from providing advance funding. • Sandia National Laboratory support to state & local governments; and • Lawrence Livermore National Laboratory support to state and local governments 			
Richland Operations Office	100	100	100
<ul style="list-style-type: none"> • Work with Universities, State, and Local governments. 			
Savannah River Operations	6,700	6,700	11,200
<ul style="list-style-type: none"> • Savannah River National Laboratory support to universities & institutions, state and local governments, and non-profit organizations; and • Savannah River site support for the receipt and management of foreign research reactor spent nuclear fuel 			
Washington DC HQ Undistributed	6,722	6,722	-
<ul style="list-style-type: none"> • Funding kept in reserve to support SPP activities 			
Total, Revenues Associated with Strategic Partnership Projects	40,000	40,000	40,000

Miscellaneous Revenues

Overview

The Departmental Administration account receives Miscellaneous Revenues from the following:

- Revenues received from the sale of by-products that have no cost associated with the Departmental Administration program of work. 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.
 - 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.
 - Nuclear Production Office – Revenues generated from shipment of surplus Highly Enriched Uranium and Low Enriched Uranium for use in foreign research and test reactors.
 - 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 refueling and defueling of the core. 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.
 - Other Revenues, including Timber Sales – Estimate based on current rate of collections for various miscellaneous revenues collected at all Department sites, including timber sales at Savannah River Site.

Miscellaneous Revenues

Funding (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted
Revenues Associated with Strategic Partnership Projects	-40,000	-40,000	-40,000	-
Other Revenues	-53,378	-53,378	-60,578	-7,200
Federal Administrative Charges	-29,467	-29,467	-30,803	-1,336
Nuclear Production Office	-4,044	-4,044	-4,044	-
Pittsburgh Naval Reactors Office	-15,167	-15,167	-20,931	-5,764
Other Revenues, including Timber Sales	-4,700	-4,700	-4,800	-100
Total, Miscellaneous Revenues	-93,378	-93,378	-100,578	-7,200

**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 its commitment to advance U.S. national security and economic growth through transformative science and technology innovation that promotes affordable and reliable energy through market solutions and meets our nuclear security and environmental cleanup challenges. The funding supports OSE staff in achieving the Department's priorities of Combating the Climate Crisis, Creating Clean Energy Union Jobs, and Promoting Energy Justice. The Department also plans to continue to make progress in achieving each of its strategic goals through continued investments in scientific research, technology innovation, nuclear security, arctic energy coordination and environmental cleanup.

The FY 2023 Budget Request of \$6,642,000 is a \$1,060,000 increase above the FY 2021 Enacted Budget, supports up to 33 full time equivalent employees and administrative services and support. The additional resources support interagency coordination on efforts to address the climate crisis. It also will enable the Department of Energy to increase coordination with climate-focused programs at other agencies to maximize the benefits of U.S. government investments and take advantage of synergies between agencies to better utilize public dollars. Funding will support staff and coordinated stakeholder engagement.

**Office of the Secretary
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	4,952	4,952	5,012	60	1%
Climate Change Coordination	0	0	1,000	1,000	0
Travel	529	529	529	0	0
Support Services	0	0	0	0	0
Other Related Expenses	101	101	101	0	0
Total, Program Direction	5,582	5,582	6,642	1,060	19%
Federal FTEs	33	33	33	0	0
Other Related Expenses					
Training	6	6	6	0	0
Other Services	95	95	95	0	0
Total, Other Related Expenses	101	101	101	0	0

**Explanation of Changes Table
Office of the Secretary
Funding (\$K)**

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$5,582	\$6,642	+\$1,060
Salaries and Benefits \$4,952	\$5,012	+\$60
Funding supports up to 33 FTEs in the Office of the Secretary, Deputy Secretary, Office of the Under Secretary, and the Office of the Under Secretary for Science and Energy.	Continued funding supports payroll costs of up to 33 FTEs in the Office of the Secretary, Deputy Secretary, Office of the Under Secretary for Infrastructure (S3), and the Office of the Under Secretary for Science and Innovation (S4).	+\$60 Assumes 4.6% pay raise, FERS increase, within grade increases, promotions, and awards allocation,
Climate Change Coordination \$0	\$1,000	+\$1,000
N/A	Funding supports staff and coordinated stakeholder engagement for interagency coordination on efforts to address the climate crisis.	+\$1,000 Funding supports staff and coordinated stakeholder engagement for interagency coordination on efforts to address the climate crisis.
Travel \$529	\$529	\$0
Funding for the Office of the Secretary, Deputy Secretary, Under Secretary, Under Secretary for Science and Energy, and Special Assistants to travel in support of the Department's mission.	Continued funding for the Office of the Secretary, Deputy Secretary, Under Secretary for Infrastructure, and the Under Secretary for Science and Innovation, as well as Special Assistants to travel in support of the Department's mission.	No change
Other Related Expenses \$101	\$101	\$0
Funding supports training and course registration cost for OSE employees for essential training activities and support for security clearance investigations	Continued funding supports training and course registration cost for OSE employees for essential training activities and support for security clearance investigations.	No change

Congressional and Intergovernmental Affairs Program Direction

Overview

The Office of Congressional and Intergovernmental Affairs (CI) delivers accurate and timely communication of Administration and Departmental objectives and activities with Congress, state, local, and Tribal governments, and other stakeholder organizations.

In FY 2023, CI will direct, manage, and ensure timely coordination between Departmental organizations and their external stakeholders. This includes timely notifications to Members of Congress, Governors, Mayors, and Tribal officials on Department of Energy (DOE) matters of specific interest including pending awards/grants/contracts that may affect the states, Tribal nations, congressional districts, and other constituencies. CI will ensure the Department provides timely and complete responses to inquiries and requests for information. In addition, CI will engage with Governors, staff, local elected and appointed officials, and consult Tribal leaders on DOE activities and decisions; and to elicit concerns and interests for consideration in DOE decision processes.

CI will recommend legislative strategies and engagements in alignment with Administration policy and DOE program initiatives. This includes both monitoring and developing legislative activity on behalf of the Department, as well as working with Congress to define and advance the Administration's position on pending legislation. CI will prepare Departmental officials for Congressional hearings, briefings, and meetings, as well as gubernatorial and Tribal consultations and events. This includes directing and coordinating the preparation of congressional testimony, transcripts, pre- and post-hearing questions and answers, and other information provided for the record.

Highlights of the FY 2023 Budget Request

The Department requests \$7,142,000 in FY 2023 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 stakeholders.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	3500	3500	5166	+1666	48%
Travel	30	30	300	+270	900%
Support Services	181	181	390	+209	115%
Other Related Expenses	1289	1289	1286	-3	-.23%
Subtotal, Washington Headquarters	5,000	5,000	7,142	+2,142	43%
Total, Program Direction	5,000	5,000	7,142	+2,142	43%
Federal FTEs	24	24	31	+7	29%
Support Services					
Management Support					
Print and electronic subscription services	46	46	75	+29	63%
Contractor Support	130	130	300	+170	131%
Other Support Services	5	5	15	+10	200%
Total, Support Services	181	181	390	+209	115%
Other Related Expenses					
Training	0	0	50	+50	-
Energy IT Services	254	254	201	-53	-21%
Working Capital Fund	1035	1035	1,035	-	-
Other Services	0	0	0	-	-
Total, Other Related Expenses	1289	1,289	1286	-3	-.23%

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$5,000,000	\$7,142,000	+\$2,142,000
Salaries and Benefits \$3,500,000	\$5,166,000	+\$1,666,000
Provides funding for 24 FTEs to include salaries and benefits.	Provides funding for 31 FTEs to include salaries and benefits, pay raise adjustments, and performance award pool.	FY 2023 Request increases FTE level closer to historic level required to adequately perform mission and objectives and includes new IGEA Regional Specialist FTE positions as advised by the Office of the Secretary and reflected in approved staffing plan. Assumes 4.6% pay increase in civilian salaries, FERS increase, and supplemental funds for performance award pool increase in FY 2023.
Travel \$30,000	\$300,000	+\$270,000
Funding for travel requirements to support the Department's engagements with congressional, intergovernmental, and other stakeholders.	Funds travel at historic level required to support Departmental engagements as well as additional activities essential to new IGEA Regional Specialist positions	Increase funds the additional travel critical to performing IGEA Regional Specialist job duties as liaisons between the Department and localities.
Support Services \$181,000	\$390,000	+\$209,000
Most costs are related to the acquisition of annual subscriptions to information sources essential to ensure staff is well-informed of congressional and intergovernmental activities and interests, and contractors required for support roles.	Funds essential administrative and executive support services, costs associated with background investigations, and access to subscription platforms critical to staff performance	Increase expands subscription services to add new staff and continues critical contractor support services at the required level of effort.
Other Related Expenses \$1,289,000	\$1,286,00	-3,000
Funds support business costs associated with the Department's Working Capital Fund; IT equipment and support.	Continuation of FY 2022 WCF and EITS activities. Additional funding allocated toward staff training.	Decrease due to rate adjustments from the OCIO cost model.

**Office of the Chief Financial Officer
Program Direction**

Overview

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

- Serves as the principal advisor to the Secretary and other DOE officials on matters relating to the Department's financial resources and performance management.
- Oversees the formulation, execution, analysis, and financial integrity of the Department's annual and multi-year budget, including the Bipartisan Infrastructure Law and other supplemental spending bills.
- Develops and maintains an integrated agency-wide financial accounting system.
- Prepares reports including a description and analysis of the status of financial management in the annual financial statements, audit reports, the Digital Accountability and Transparency Act of 2014 (DATA Act) reporting, and internal accounting and administrative controls systems at DOE.
- Manages the activities and execution of DOE's Working Capital Fund (WCF) and prepares annual budget documentation.
- Serves as the enterprise risk management office to provide data for risk by systematically identifying, assessing, and managing strategic, financial, and programmatic risks across the DOE.
- Develops program performance measures, manages the performance tracking system, and serves as the Performance Improvement Officer, the Department's principal advocate for improved performance and management.
- Coordinates and leads the development and implementation of the DOE Strategic Plan, Agency Priority Goals (APGs), and the requirements of the GPRA Modernization Act, including quarterly assessment meetings.
- Manages and supports the administration and the operations and maintenance of the Department-wide enterprise corporate business systems (e.g., Foreign Travel Management System, Data Warehouse).
- Leads the implementation of program management policies and strategies for developing highly qualified program managers required by the *Program Management Improvement Accountability Act of 2016 (PMIAA)*.

Highlights of the FY 2023 Budget

The Fiscal Year (FY) 2023 Request is \$62,283,000, an increase of \$8,693,000 from the FY 2022 Annualized CR budget. It maintains the FY 2022 level of full time equivalent (FTE) employees at 230 including the 4.6% pay raise for federal employees and Federal Employees Retirement Systems (FERS) benefits. With the additional funding, OCFO will continue to support the effective management and ensure the financial integrity of 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.

In FY 2023, OCFO is requesting additional funds for corporate business systems to meet and comply with updated cyber security requirements and initiatives; operate in a Cloud environment; and enhance systems supporting enterprise business processes, including agency financial report automation and audit management projects. The requested funding will allow upgrades to the MoveLINQS Government Relocation Accounting System and the Departmental Audit Reporting Tracking System (DARTS), as well as permit continued implementation of the Robotic Process Automation (RPA) initiative within OCFO and DOE.

In FY 2023, the Program Management Improvement Officer (PMIO) continues implementation of OMB's five-year PMIAA Strategy to enhance the role of program managers, including training and educational opportunities, improved career paths and career opportunities, a plan to recruit and retain highly qualified individuals, collecting and disseminating best practices and lessons learned, and common templates and tools to support improved data collection and analysis for project and program management and oversight purposes. The OCFO will continue to oversee the implementation of DOE Policy (P) 410.3, Program Management, which was issued September 23, 2021, and established expectations and principles for program management – as well as program evaluation and evidence-based decision making – to accomplish the Agency's

mission and goals efficiently and effectively per various statutory, regulatory, administrative, and agency requirements. The OCFO will also oversee the rollout of the Department's Competency Model and Career Path for Program Manager, both of which were developed and informed based on input from Program Management subject matter experts across the Agency.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	32,770	32,770	36,202	+3,432	+10%
Travel	100	100	100	-	0%
Support Services	9,724	9,724	14,035	+4,311	+44%
Other Related Expenses	10,996	10,996	11,946	+950	9%
Total, Program Direction	53,590	53,590	62,283	+8,693	+16%
Federal FTEs - OCFO	230	230	230	-	0%
Federal FTEs - WCF	22	22	22	-	0%
Support Services					
Management Support					
Corporate Business Systems	4,300	4,300	6,635	+2,335	+54%
System Support/Other Support Services	5,424	5,424	7,400	+1,976	+36%
Total, Support Services	9,724	9,724	13,035	+4,311	+44%
Other Related Expenses					
Energy IT Services	2,100	2,100	3,100	+1,000	+48%
Security Clearance Investigations	100	100	100	-	0%
Training	300	300	225	-75	-25%
Interagency Agreements	345	345	370	+25	+7%
Working Capital Fund	8,151	8,151	8,151	-	0%
Total, Other Related Expenses	10,996	10,996	11,946	+950	9%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Salaries and Benefits \$32,770,000	\$36,202,000	+\$3,432,000
Funds 230 full-time equivalent employees (FTE).	Funds 230 FTEs.	Increase reflects a 4.6% pay raise for federal employees and FERS benefits increase in FY 2023, as well as in grade and next grade promotions.
Travel \$100,000	\$100,000	\$0
Supports travel requirements for 230 FTE and minimally projected Congressional travel.	Supports travel requirements for 230 FTE and estimated Congressional travel.	Reflects current travel requirements for the CFO, Deputy CFO and Congressional staff.
Support Services \$9,724,000	\$14,035,000	+\$4,311,000
The FY 2021 Corporate Business Systems (CBS) budget funds the operation and maintenance, and cyber security requirements of the DOE enterprise financial, procurement, and human capital business systems, including the Data Warehouse, Foreign Travel Management System, automaton of the agency financial report, Robotic Processing Automation (to meet the PMA Cross-Agency Priority (CAP) goal), and the Audit automation tasking system. Funding is also provided for technical system support and other services (to include PMIAA).	The FY 2023 Corporate Business Systems (CBS) budget funds the operation and maintenance, and cyber security requirements of the DOE enterprise financial, procurement, and human capital business systems, including the Data Warehouse, Foreign Travel Management System, Robotic Processing Automation project (to meet the PMA CAP goal), and upgrades to the MoveLINQS Government Relocation Accounting System and the Departmental Audit Reporting Tracking System (DARTS). Funding is also provided for technical system support and other services (to include PMIAA).	Increase reflects operating in a Cloud environment, continued implementation of the Robotic Processing Automation project; upgrades to the MoveLINQS Government Relocation Accounting System and the Departmental Audit Reporting Tracking System (DARTS); and continued work on the budget formulation system.
Other Related Expenses \$10,996,000	\$11,946,000	+\$950,000
Funding supports employee training, interagency agreements, IT desktop technical support requirements, security clearance investigations, and WCF.	Funding supports IT desktop technical support requirements including remote staff support, employee training, interagency agreements, security clearance investigations, and WCF.	Increase reflects changes to the costs for interagency agreements and the IT support services for remote staff.

**Office of Economic Impact and Diversity
Program Direction**

Overview

Established in 1979, the Office of Economic Impact and Diversity (ED) is tasked with increasing minority participation in energy sector programs, pursuant to Section 641, Title VI, Part 3 of the National Energy Conservation Policy Act of 1978. ED also ensures compliance with Titles VI and VII of the Civil Rights Act of 1964; Title IX of the Education Amendments Act of 1972; and other anti-discrimination statutes.

Pursuant to its legislative mandate, ED advises the Secretary on (1) the effect of energy policies, regulations, and other actions of the Department of Energy (DOE) and its components on minorities and minority business enterprises, and on ways to ensure that minorities are afforded an opportunity to participate fully in the energy programs of the Department; and (2) Departmental compliance with civil rights and equal employment opportunity (EEO) laws, regulations, and related directives and Executive Orders (EO's) that prohibit workplace discrimination and discrimination in programs receiving federal financial assistance from DOE, ensuring integration of EEO into DOE policies and decisions, overseeing intake and processing of complaints of discrimination; and (3) promoting a diverse DOE workforce and inclusive work environment.

Highlights of the FY 2023 Budget Request

The Department requests \$32 million in FY 2023, an increase of \$22 million from the FY 2021 Enacted budget, for ED to continue driving initiatives to achieve energy equity and environmental justice across the DOE complex and labs in accordance with Biden-Harris Administration directives and priorities. These overarching initiatives include ensuring 40% of the overall benefits of DOE's investments are targeted to help disadvantaged communities (Justice40 Initiative); helping to create climate and clean energy jobs and accelerate clean energy business creation in historically marginalized and overburdened communities; providing technical assistance (TA) to minority serving institutions (MSIs) and minority business enterprises (MBEs) to increase their participation in DOE programs and opportunities; augmenting training programs geared towards helping the historically disadvantaged population, including the formerly incarcerated, those in impoverished communities, and our minority stakeholders; and identifying and eradicating systemic barriers to DOE opportunities and benefits for people of color and other underserved groups.

In FY 2023, ED will recruit new subject matter experts and support staff to: (1) better advise the Secretary on energy policies; (2) enhance technical assistance being provided to MSIs and MBEs; (3) support oversight of DOE strategic action plans; and (4) support agency-wide implementation of equity, environmental and energy justice activities across the Department. ED's staff will increase from 69 as budgeted in FY 2022 to 90 full-time equivalent (FTEs) employees in FY 2023 to include 5 FTEs to support equity, environmental and energy justice (EEEJ) and Justice40 Initiative technical assistance to DOE program offices, 8 FTEs to support increased Civil Rights/EEO Enforcement, Compliance, and TA, as well as barrier analysis support for the DOE enterprise, and 5 FTEs to support ED's strategic analysis and administration.

In FY 2023, ED's Office of Energy Justice Policy and Analysis will execute a research, policy analysis, and technical assistance program that includes third party evaluations, to advance EEEJ initiatives and activities, including the Justice40 Initiative. Research will seek to determine the effects (including socio-economic and environmental effects) of national energy programs, policies, and regulations of the Department on minority and other disadvantaged communities. Consistent with ED's mandate, this office will continue research on relevant DOE and other federal policies that lessen energy burdens for disadvantaged individuals and communities and increase access to clean energy technology. Policy analysis and technical assistance efforts will include collaboration with DOE program offices to develop programs that accelerate the adoption of clean energy technologies in historically marginalized populations. This office will provide technical assistance and support across DOE in accordance with ED's congressional mandate. These efforts will coordinate EEEJ initiatives and activities more effectively within DOE, the National Laboratories, with other Federal partners, and external stakeholders.

ED's Office of Diversity, Equity, Inclusion, and Accessibility (ODEIA) will, in coordination with relevant stakeholders, oversee implementation of DOE's DEIA strategic plan that currently includes 31 crosscutting departmental goals. This office will continue developing competencies for diversity and inclusion training, including unconscious bias mitigation within talent processes, building and sustaining inclusive work environments, and developing DEIA training modules specifically for SES and supervisors/managers. The new office will support the priorities of the Administration, as outlined in the Federal Government-wide DEIA Strategy and ensure that DEIA is a priority component of DOE's management agenda and strategic planning.

In FY 2023, ED will continue leading DOE's Equity in Energy initiative to expand the inclusion and participation of minorities, women, veterans, and formerly incarcerated persons, across all department programs. DOE supports this national initiative through Minority Education (STEM enhancement), Workforce Development, and Training (MEWT) related projects and by creating partnerships with federal, state, non-profit, and private agencies engaged in sustaining our nation's energy sector and, thereby, promoting a more secure and stable U.S. economy. ED will engage with stakeholders to increase awareness of and commitment to the principles of equity and diversity as they relate to the DOE workplace and to recipients of DOE financial assistance.

In FY 2023, ED's Office of Minority Programs (OMP) will amplify execution of its statutory mandates as outlined in Public Law 95-619 that includes providing technical assistance to minority educational institutions and MBEs to enable these enterprises and institutions to participate in the research, development, demonstration, and contract activities of the Department. FY 2023 funding will allow OMP to increase MEWT projects in disadvantaged communities within STEM and energy fields. These projects will support hundreds of minority students and faculty members in Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI), and other MSIs. Pursuant to Public Law 95-619 FY 2023 OMP will provide technical assistance programs that encourage, promote, and assist minority business enterprises in establishing and expanding energy-related business opportunities which are in disadvantaged communities and that can provide clean energy jobs to workers in these communities.

In FY 2023, ED's Office of Civil Rights & Equal Employment Opportunity (OCR-EEO) will directly oversee EEO complaint processing for the entire DOE enterprise (except for the National Nuclear Security Administration (NNSA)),¹ as well as directly oversee the affirmative employment and diversity and inclusion functions for the entire DOE enterprise (except NNSA, Power Marketing Administrations), and three collateral duty locations, and will also expand external civil rights enforcement and compliance activities in the areas of Limited English Proficiency, TA, and will stand up a pre-award assurance pilot to evaluate grant applications received by the Department. OCR-EEO implements the statutory requirement of administering departmental policies, practices, and procedures under Title VI and VII of the Civil Rights Act of 1964, the Age Discrimination in Employment Act, Sections 501/504 of the Rehabilitation Act of 1973, the Genetic Information Nondiscrimination Act, Title IX of the Education Amendments of 1972, the Age Discrimination Act, and related statutes and EO's which prohibit discrimination, including those that prohibit discrimination in programs and activities that receive federal financial assistance from DOE.

¹ The Department notes that the National Nuclear Security Administration (NNSA) Office of Civil Rights processes NNSA EEO complaints.

Program Direction Funding (\$K)

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
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**Economic Impact and
Diversity**

Salaries and Benefits	6,031	6,031	17,011	10,980	182.06%
Travel	190	190	300	110	57.89%
Support Services	2,310	2,310	10,354	8,044	348.23%
Other Related Expenses	1,638	1,638	4,335	2,697	164.65%
Total, Program Direction	10,169	10,169	32,000	21,831	214.68%
Federal FTEs	37	37	90	53	143.24%
Contractor Headcount	4	4	4	0	0

Support Services

Office of Minority Programs (OMP)	1,442	1,442	4,500	3,058	212.07%
Office of Civil Rights & Equal Employment Opportunity	868	868	921	53	6.11%
EEO Field Site Services	0	0	583	583	100%
Office of Energy Justice Policy/Analysis	0	0	4,000	4,340	100.00%
Office of Diversity, Equity, & Inclusion	0	0	350	350	100%
Total Support Services	2,310	2,310	10,354	8,384	362.94%

Other Related Expenses

Working Capital Fund	1,038	1,038	2,800	1,762	169.75%
Energy Information Technology System	600	600	1175	575	95.83%
Training	0	0	360	360	100%
Total, Other Related Expenses	1,638	1,638	4,335	2,697	164.65%

Program Direction
Activities and Explanation of Changes

Subprogram Funding (\$K)

FY 2021 Enacted Level	FY 2023 Request	Explanation of Changes FY 2021 Enacted Level vs FY 2023 Request
\$10,169 Program Direction	\$34,140	\$23,971
\$6,031 Salaries and Benefits	\$19,151	\$13,120
Provides funding for 37 FTEs who directly support the ED mission.	Provides funding for 100 FTEs who directly support ED's execution of its statutory mission.	
\$190 Travel	\$300	\$110
Provides funding for travel associated with outreach activities related to the launch of the national Equity in Energy initiative and increase in compliance/enforcement activities of the Office of Civil Rights and Diversity. Mission outreach and regulatory activities undertaken with increased coordination with Agency programmatic activities.	Provides funding for travel associated with energy justice, stakeholder outreach, and ED's Equity in Energy initiative outreach activities, as well as increased compliance/enforcement activities of the Office of Civil Rights and Diversity.	
\$2,310 Support Services	\$10,354	\$8,044
\$1,442 -- Funding supports OMP's Minority Education and Workforce Development Training program (MEWT) focused on, but not limited to: <ul style="list-style-type: none"> Minority Education: Increasing the participation of students enrolled in MSIs across the nation in STEM. 	\$4,500 -- Funding supports OMP's Minority Education and Workforce Development Training Program (MEWT) focused on, but not limited to: <ul style="list-style-type: none"> \$2,250 - Supports Minority Serving Institutions Technical Assistance (TA) that will strengthen STEM capabilities of MSIs and support increasing the pipeline of minority students participating DOE programs and supporting the U.S. energy sector. 	\$3,058 -- Funding increase enables ED to execute new funding opportunities in support of MEWT projects that provide technical assistance to MSIs and MBEs to increase opportunities to participate in DOE programs and the clean energy industry.

<ul style="list-style-type: none"> o Workforce/Pipeline Analysis: research project to identify and quantify energy related economic opportunities, challenges, and recommendations for increased minority access and inclusion. 	<ul style="list-style-type: none"> o \$2,500 - Supports Minority Businesses Technical Assistance and Workforce Development Training: technical assistance will include innovative training and projects that complements and/or enhances Minority Business Enterprises (MBEs) participation in DOE programs and opportunities. 	
<ul style="list-style-type: none"> o Workforce Development: providing formerly incarcerated individuals with knowledge, skills, and training to improve their opportunities for employment in the energy sector. o Technical Assistance/Workforce Training: technical assistance for innovative projects that support educational/business activities which complements and/or enhances workforce training to meet the nation's need for job creation in diverse communities in the high-energy growth sector. o Capacity Building: Strengthening the STEM capabilities of MSIs by collaborating with the Department's national laboratories and scientific facilities. 		
\$868 - Office of Civil Rights and EEO: Provides funding for EEO support services contracts for DOE Headquarters related to EEO investigative services and draft final agency decisions, as well as docket control and administrative services.	\$921 - Continuation of FY '21 activities. Also provides funding for civil rights database and EEO demographic database in support of barrier analysis efforts.	\$53
	\$4,000,000 - Funding supports contracting 3rd-party evaluation for the massive undertaking of measuring, tracking, and reporting DOE's Justice40 benefits to disadvantaged communities for the Department's over 120 covered programs.	\$4,000

	\$350 - Funding supports implementation of DOE's DEIA strategic goals, including consultation and technical assistance to program offices for execution of DOE and organizational plans.	\$350
\$1,638 Other Related Expenses	\$4,335	\$2,697
Funds Working Capital Fund (WCF), Energy IT Services (EITS), and staff training and development, and other services for 37 FTE.	Continuation of FY 2022 support for WCF, EITS, and staff training for 90 FTEs.	

Office of International Affairs

The Department of Energy's (DOE) Office of International Affairs (IA) has primary responsibility for setting international energy policy and leading all bilateral and multilateral energy collaborations involving the Secretary, Deputy Secretary, and other DOE senior leadership, including connecting DOE's program offices and its 17 National Labs to partner countries. IA is also responsible for protecting critical U.S. industries and technological innovation by tracking and investigating all foreign investment in U.S. energy companies or other firms with energy interests, as well as foreign contracts with the National Labs.

Building on the work of FY 2022, in FY 2023, IA will pursue international energy cooperation through key bilateral and multilateral forums, with the objective to accelerate the transition to net zero greenhouse gas emissions, create good paying American jobs, enhance U.S. competitiveness on critical energy technologies, address the distributional impacts of foreign policy decisions (consistent with the Foreign Policy for the Middle Class agenda) and build out the capacity and execution of the President's Build Back Better World initiative.

Highlights of the FY 2023 Budget Request

IA's priorities for the coming year are to:

- 1) Strengthen DOE's key bilateral relationships, regional and multilateral platforms to accelerate the transition to a global clean energy economy and expand market opportunities for U.S. clean energy goods and services;
- 2) Provide technical and diplomatic assistance to partners to ensure their energy and national security and accelerate the transition to net-zero emissions;
- 3) Reinforce critical supply chains via the United States and its partners to ensure we can cost-effectively deploy the technologies needed for the clean energy transition and avoid weaponization of those materials and technologies in the future; and
- 4) Track and investigate foreign investment in the U.S. and contracts with national labs to protect U.S. national security interests.

IA's FY 2023 Request of \$62,141,000, (an increase of \$35,316,000 from the FY 2021 Enacted), will support IA's program funding to support the above priorities. This request would also support approximately 14 additional FTEs above FY 2021 Enacted. Of this Request:

- \$18 million will support the Net Zero World Initiative, DOE's signature contribution to the President's Build Back Better World Initiative, which will provide comprehensive technology and investment roadmaps paired with technical assistance to help strategically important large emitters decarbonize their economies by 2050.
- \$8 million will support technical assistance via key multilateral organizations to reassert U.S. leadership and influence and ensure that each institution's work aligns with the U.S. energy and climate agenda.
- \$2.5 million for clean energy deployment and commercialization in emerging economies.
- \$1 million for market development.

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Energy Security and Clean Energy Initiatives	1,025	1,025	1,025	-	0%
Technical Assistance	1,485	1,485	2,485	+1,000	+67%
Market Development			1,000	+1,000	NEW
Clean Energy Deployment and Commercialization in Emerging Economies			2,500	+2,500	NEW
Multilateral Engagement			8,000	+8,000	NEW
Net Zero World/Build Back Better World			18,000	+18,000	NEW
U.S.-Israel Energy Center of Excellence	4,000	4,000	4,000	-	0%
BIRD Energy Program	2,000	2,000	2,000	-	0%
TOTAL PROGRAM SUPPORT	8,510	8,510	39,010	+30,500	+358%
Salaries and Benefits	13,530	13,530	17,341	+3,811	+28%
Travel	400	400	925	+525	+131%
Support Services					
Subscriptions/Publications	100	100	125	+25	+25%
Management Support Services	85	85	100	+15	+18%
Other Related Expenses					
Working Capital Fund	3,000	3,000	3,375	+375	+13%
Energy IT and Other Services	1,170	1,170	1,235	+65	+6%
Training	30	30	30	-	0%
TOTAL PROGRAM DIRECTION	18,315	18,315	23,131	+4,816	+26%
Total, International Affairs	26,825	26,825	62,141	+35,316	+132%
Federal FTEs	75	75	89	+14	+19%

International Affairs

Description

IA requests \$39.0 million to fund Build Back Better World/Net Zero World (\$18 million); Multilateral Engagement (\$8 million); the United States-Israel Energy Center of Excellence (\$4 million); the BIRD Energy Program (\$2 million); Technical Assistance (\$2.5 million); Clean Energy Deployment and Commercialization (\$2.5 million); Energy Security and Clean Energy Initiatives (\$1.0 million) and Market Development (\$1 million). These activities are implemented through the National Laboratories or Headquarters contracts. In addition, IA requests \$23.1 million to fund the salary, benefits, travel, support services, and other related expenses for 89 federal staff to develop, coordinate, and implement the Administration's international energy policy objectives. Our people are our most important asset - this increase of 14 federal staff from FY 2021 Enacted will support bilateral and multilateral relationships, market development and international economic opportunities, especially for American-made clean energy technologies.

Net Zero World and Build Back Better World (B3W)

B3W is a new whole-of-government global infrastructure initiative launched by the President of the United States and G7 leaders to coordinate in mobilizing private-sector capita focused on four pillars - climate, health and health security, digital connectivity, and gender equity and equality.

DOE's flagship contribution to the climate pillar of B3W is the Net Zero World Initiative (NZW). NZW is an interagency and DOE National Laboratory network-based initiative to accelerate decarbonization efforts toward net zero, resilient, and inclusive energy systems in strategically important countries. It will strengthen partner countries' ability to achieve their stated goals by creating and implementing highly tailored, actionable technology road maps and investment strategies at both the national- and subnational-levels that put net zero within reach. This work will also include targeted and sustained technical support across sectors. It will enable technology pilots, testing and incubators, policy and regulatory support, infrastructure modernization, investment partnerships and programs, workforce development, and other near- and long-term actions tailored to country contexts and priorities. In addition, NZW will help foster peer-to-peer learning. NZW aims to create new clean energy jobs and to mobilize at least \$10 billion in clean energy infrastructure and project investment. It aims to grow the market for U.S. clean energy goods and services, create jobs, and expand U.S. influence.

Funds would also be leveraged to support work in B3W's digital connectivity pillar to advance infrastructure projects focused on smart grid-related hardware and software deployment and promotion of smart cities. Implementation under the digital connectivity pillar will focus on elevating the city as a laboratory for advancing resilience and adaptation in the response to climate change. Funding resources will enable utilization of the National Laboratories' expertise to help partner cities address climate risks by instituting resilience and adaptation solutions. Funds will also support trade promotion activities for U.S. companies that offer advanced clean energy technologies and resilience tools, products, and services in partnership with the Department of Commerce.

Funds would also allow for expansion upon the \$100,000 seed funding provided to Argonne National Laboratory in 2021 to develop an energy project valuation and performance assessment (VPA) tool. Additional funds would enable application in performing various country and regional-level clean electricity deployment plans to demonstrate the cost-effectiveness of clean alternatives to traditional fossil fuel generation assets.

Multilateral Engagement

The Office of Multilateral Climate and Clean Energy Engagement seeks to advance U.S. leadership and DOE mission objectives, especially related to energy security and clean energy innovation and deployment, through international organizations and multilateral forums including (but not limited) the International Energy Agency, Clean Energy Ministerial, Energy Efficiency Hub, Mission Innovation, G7, G20, the Global Power System Transformation Consortium (G-PST) and UN Agencies.

The Office is DOE's conduit for leveraging key multilateral engagement platforms and related workstreams to enhance the impact of U.S. energy policy at home and abroad. Key efforts include:

- Rationalizing the international energy architecture. DOE is engaging with entities like the G7, G20, UN, IEA, and other key multilateral forums to make big bets on clean energy innovation, development, and deployment through developing centers of gravity across the multilateral landscape.

- Streamlining the clean energy innovation to deployment timeline: Through engagement with forums such as the Clean Energy Ministerial and Mission Innovation, DOE will address problems such as gaps in scaling up technologies, identifying appropriate incentives, market rules, and risk mitigation, and implementing appropriate clean energy standards. All of these actions are taken against a backdrop of engagement with industry to prioritize finance on an appropriate energy transition time horizon.
- Pursuing a sectoral approach to clean technology deployment: DOE will cluster multilateral initiatives by sector as appropriate across key multilateral forums as natural centers of gravity.
- Sustained action on critical minerals: Acknowledging that critical minerals are the fuel that will power the clean energy transition, IA will further U.S. values through multilateral cooperation, addressing clean energy supply chains, including critical minerals and materials, and acting on opportunities for collective action to manage risks.

Clean Energy Deployment and Commercialization in Emerging Economies

This program will support the development of tools to identify areas of greatest feasibility for advanced energy technology deployment in less-electrified areas of the world based on novel estimation of unmet electricity demand, technology-specific resource mapping, and economic, social, and political factors. These tools will help accelerate the deployment of clean energy technologies through programmatic engagement, including solar deployment in North Africa, carbon capture, utilization, and storage (CCUS) technology in coal dependent regions such as South Africa, and small modular nuclear reactor (SMR). It will also advance nuclear energy continent-wide. The request for this effort is \$2.5 million.

Energy Security and Clean Energy Initiatives

Energy Security and Clean Energy Initiatives aim to protect the security of energy infrastructure in strategic U.S. partner countries through collaboration with DOE's National Laboratories and other experts, with a focus on country-appropriate technologies or policy solutions. Initiatives are designed to decarbonize and improve resiliency of energy systems, reduce vulnerability in the supply of critical materials, secure markets for clean energy resources, and build cooperation among trading partners in nearly every region of the world. IA requests \$1.0 million for continued support of these initiatives in FY 2023.

Technical Assistance

Multilateral institutions help drive global action and are an important (and efficient) tool for expanding U.S. influence, driving global change and creating opportunities for U.S. industry in every corner of the planet. IA serves as DOE's focal point for all clean energy engagement through these multilateral institutions, ensuring alignment between institutional and U.S. efforts, and reducing unnecessary duplication of efforts or lost opportunities to maximize the responsible and efficient use of U.S. energy investments in these institutions. In FY 2023, IA requests \$2.5 million for technical assistance to key multilateral organizations to expand U.S. leadership globally.

Market Development

In FY 2023, IA requests \$1 million for the Office of Market Development. The Office of Market Development's mission is to advance policies that foster incentives for decarbonization of the global energy sector while bolstering U.S. jobs, enhancing our innovation edge against our key competitors, and fostering resilient, secure energy markets and supply chains. The Office of Market Development aims to enhance and revitalize U.S. competitiveness in the rapidly expanding global clean energy and infrastructure marketplace, while creating clean energy jobs in the U.S. economy across the country, and for fossil-dependent and disadvantaged communities. In FY 2023, Market Development will use the funding to advance three main objectives:

- Mobilizing for Near-Term Energy Transition Investment Needs: EO 14008 calls on DOE to advance international collaborations on innovation and deployment of clean energy. Market Development will coordinate a technology and finance-driven approach to support other countries meet their climate objectives through deployment of U.S.-sourced energy technologies and solutions.
- Harnessing Over-the-Horizon Energy Transition Opportunities: Through close partnerships with programmatic offices and National Labs, Market Development will identify policy levers and strategic partnerships to enhance U.S. competitiveness in net-zero energy technologies and develop frameworks to leverage international market demand pull capable of maturing technologies from developmental to commercial deployment.
- Addressing Climate Adaptation, Resilience, and Security: Market Development will lead engagements to help other countries improve the resilience of their energy systems and supply chains, including a focus on critical minerals,

and prepare communities to adapt to a rapidly changing climate, guided by just transition and alleviating energy poverty goals.

BIRD Energy Program

The Binational Industrial Research and Development Foundation (BIRD Foundation) was established by the U.S. and Israel governments in 1977 to generate mutually beneficial cooperation between U. S. and Israeli companies. IA requests \$2 million for the BIRD Energy Program, which is an offshoot of the endowed parent BIRD Foundation and was authorized in 2007 and first appropriated funds in 2009. Since 2009, the BIRD Energy Program has resulted in commercialization of seven new clean energy technologies and attracted more than \$800 million in venture capital and other follow-on investments to commercialize clean energy technologies.

United States-Israel Energy Center of Excellence

IA requests \$4 million to contribute as matching funds to the U.S. – Israel Energy Center of Excellence (Energy Center) on behalf of the U.S. Government. Matching contributions are also provided by the Israeli Government and private partners from the U.S. and Israel. The goal of the Energy Center is to promote energy security and economic development through the research and development (R&D) of innovative energy technologies, while facilitating cooperation between U.S. and Israeli companies, research institutes and universities. The Energy Center will facilitate joint R&D activities on energy areas by teams of scientists and engineers from the U.S. and Israel.

Committee on Foreign Investment in the U.S. (CFIUS)

IA ensures the Department’s compliance with the Foreign Investment Risk Review and Modernization Act of 2018 (FIRRMA), which modernizes CFIUS’ process to better enable timely and effective reviews of covered transactions. This ensures that the U.S. maintains an open policy on foreign investment while properly screening inbound investments to ensure U.S. vital national security interests are protected.

Under FIRRMA, DOE CFIUS assists at a technical level with capacity building among U.S. friends and allies overseas, especially in Europe among NATO partners and member states of the European Union. DOE CFIUS intends to increase and expand international outreach focused on ensuring partner governments are able to maintain a proper balance between open foreign investment regimes to attract high quality investment, while ensuring vital national security interests are protected from increasingly aggressive predatory investment practices by countries less friendly to the U.S.

International Clean Energy Policy Development and Coordination

IA serves as DOE’s representative on internationally focused Policy Coordination Committees (PCCs) managed by the National Security Council (NSC) and the National Economic Council (NEC); and serves as the conduit for energy policy and technical expertise across DOE and other Agencies. To achieve its mission, IA collaborates with DOE Senior Leadership, program offices, and the DOE National Laboratory complex, coordinating across the enterprise to leverage technical, policy, and market expertise with international partners. IA develops policies and provides senior-level advice on international energy matters in line with Administration goals and priorities. IA works to coordinate the U.S. Government’s international energy relationships with foreign governments, energy ministries, and International Organizations, working in concert with the Departments of State, Defense, Interior, Commerce and other relevant federal agencies to promote the clean energy transition to net-zero emissions by 2050, advance universal energy access, spur technological innovation, open international clean energy markets to U.S. businesses, and promote energy security fundamentals and practices.

International Working Groups, Meetings, and Activities

IA supports US government leadership through a network of international relationships with energy partners that further our nation’s international energy goals. The request fully funds IA participation in and implementation of interagency working groups, international meetings, activities, and policy areas, including:

International Energy Agency	U.S.-Mexico Energy Business Council
U.S.-EU Energy Council	Japan-U.S. Strategic Energy Partnership
UN meetings, including the COP	U.S.-Korea Energy Policy Dialogue
Partnership for Transatlantic Energy Cooperation	U.S.-Indonesia Energy Policy Dialogue
Three Seas Initiative	U.S.-Poland Energy Dialogue

Clean Energy Ministerial/Steering Committee
 Conference on Critical Minerals
 Mission Innovation Ministerial/Steering Committee
 U.S.-Israel Energy Meetings
 U.S.-Brazil Energy Forum
 U.S.-India Strategic Clean Energy Partnership
 G-7 Working Groups and Ministers Meetings
 G20 Working Groups and Ministers Meetings
 Global Methane Pledge

 U.S.-Ukraine Energy Cooperation

Asia-Pacific Economic Cooperation (APEC) Energy Working
 Group and Ministers Meetings
 North American Energy Ministerial
 East Mediterranean Gas Forum
 Gulf of Aqaba Energy Dialogue
 Iraq Initiatives
 Net Zero Producers Forum
 Quad Climate Working Group
 Association of Southeast Asian Nations (ASEAN) - U.S.
 Energy Ministerial

Foreign Engagements with National Laboratories

IA also manages and reviews the DOE approval process for DOE’s 17 National Laboratories’ international partnerships, which include, *inter alia*, Strategic Partnership Projects (SPP); Cooperative Research and Development Agreements (CRADA); Agreements for Commercializing Technology (ACT); and other mechanisms. IA reviews these agreements to ensure that the foreign engagements of the laboratories meet the requirements of DOE Order 485.1A to: (1) align consistently with the strategic interests and foreign policies of the United States, (2) be legally sound and compliant with U.S. laws and regulations, and (3) address research security and counterintelligence considerations.

Interagency Appropriations Transfers and Reimbursable Work

IA federal staff historically implement projects funded by other agencies through appropriations transfers or reimbursable work. The received funds occasionally fund IA federal staff travel and support services contracts, but not salaries, benefits, or administrative expenses.

Activities and Explanation of Change

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Energy Security and Clean Energy Initiatives \$1,025,000	\$1,025,000	\$0
Energy Security and Clean Energy Initiatives provides technology innovation, resilience, sector development, training, and other activities through National Laboratories or headquarters contracts.	FY 2023, initiatives are designed to decarbonize and improve resiliency of energy systems, protect energy infrastructure, reduce vulnerability in the supply of critical materials, secure markets for clean energy resources, build cooperation among regional trading partners in the Arctic, Americas, Africa, Middle East, Europe and Eurasia, and Asia and the Pacific.	No change.
Technical Assistance \$1,485,000	\$2,485,000	L,000
Technical Assistance funds participation through dues, contributions, and other activities in multilateral organizations to improve alignment with U.S. goals.	Continuation of FY 2021 activities in key multilateral organizations include, but are not limited to: Arctic Council, G-7, G20, International Energy Agency, Organization for Economic Cooperation and Development, Clean Energy Ministerial, Nuclear Power Ministerial, Nuclear Energy Agency, International Atomic Energy Agency, Clean Energy Ministerial, Asia-Pacific Economic Cooperation (APEC), International Renewable Energy Agency, and International Framework for Nuclear Energy Cooperation, etc.	More Activities with Key Multilateral Organizations.
Market Development \$0	\$1,000	+\$1,000
	Advance policies that foster incentives for decarbonization of the global energy sector while bolstering U.S. jobs, enhancing our innovation edge against our key competitors, and fostering resilient, secure energy markets and supply chains.	New
Clean Energy Deployment and Commercialization in Emerging Economies \$0	\$2,500	+\$2,500
	Advanced energy technology feasibility and market development: development of a tools to identify areas of greatest feasibility for advanced energy technology deployment in less-electrified areas of the world based on novel estimation of unmet electricity demand, technology-specific resource mapping, and economic, social, and political factors.	New
Multilateral Engagement \$0	\$8,000	+\$8,000
	Fund substantive workstreams under both the Clean Energy Ministerial and Mission Innovation, which are intended to drive innovation and build markets for several sectors, including hydrogen,	New

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
	super-efficient appliances and carbon dioxide removal technologies, amongst others, that are lynchpin technologies to address the climate crisis and where US industry has a competitive advantage.	
Net Zero World/Build Back Better World (B3W) \$0	\$18,000	-\$18,000
	B3W is a new global infrastructure initiative focused on four pillars - climate, health and health security, digital connectivity, and gender equity and equality.	New
	Net Zero World harnesses DOE's world class research complex and leverages inter-agency efforts to decarbonize the energy systems in strategically critical countries – growing the market for US clean energy goods and services, creating jobs and expanding US influence.	
U.S. – Israel Energy Center of Excellence \$4,000,000	\$4,000,000	\$0
U.S. – Israel Energy Center of Excellence funding is provided to the Center on behalf of the United States Government. Matching contributions are also provided by the Israeli Government and private partners from the United States and Israel. The Energy Center will facilitate joint R&D activities on energy areas by teams of scientists and engineers from the U.S. and Israel.	Continuation of FY 2021 activities.	No change.
BIRD Energy Program \$2,000,000	\$2,000,000	\$0
BIRD Energy Program supports commercialization of new clean energy technologies.	Continuation of FY 2021 activities.	No change.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Salaries and Benefits \$13,530,000	\$17,341,000	+\$3,811,000
Use of prior year balances increases the FY 2021 Salary and Benefits of Federal Employees expense to \$14.4 million, funding 75 FTEs.	Continuation of FY 2021 activities with 89 FTEs.	Increase supports additional federal staffers to support bilateral and multilateral relationships, market development, and international economic opportunities. Assumes a 4.6% pay raise for federal employees and FERS benefits increase in FY 2023.
Travel \$400,000	\$925,000	+\$525
Travel to support the President, the Secretary, and others supporting meetings and events pertaining to energy policy, science and technology, and multilateral national security engagements.	Continuation of FY 2021 activities.	COVID-19 curtailed travel in FY 2021. In FY 2023, IA requests a return to historical travel levels.
Support Services \$185,000	\$225,000	+\$40
Subscriptions and Publications Management Support Contracts for administrative functions.	Continuation of FY 2021 activities.	No significant change.
Other Related Expenses \$4,200,000	\$4,640,000	+\$440
Working Capital Fund, Building Rent, IT Equipment and Services, Training, Secure Communications, Translation Services, Security Investigations, Supplies, Training, and Registrations.	Continuation of FY 2021 activities.	No significant change

**International Affairs
Research and Development (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted
Applied Research (Direct)				
U.S.-Israel Energy Center of Excellence	4,000	4,000	4,000	0
BIRD Energy Program	2,000	2,000	2,000	0
Total, R&D	6,000	6,000	6,000	0

Artificial Intelligence and Technology Office Program Direction

Overview

The Artificial Intelligence and Technology Office (AITO) is the principal organizer of cross-cutting Artificial Intelligence (AI) and Machine Learning (ML) activities including research, development, demonstration, strategy, and AI activities for the U.S. Department of Energy (DOE). AITO leads as well as participates in internal and external facing initiatives that advance the DOE mission through innovations that include AI for cyber defenses, economic and national security, workforce development, and institutionalization of findable, accessible, interoperable, and reusable (FAIR) data principles. Internally, AITO works to identify and working in collaboration with the program offices and national laboratories to address gaps in research, development, implementation, and deployment of AI investments. AITO leads development of the DOE AI Strategy, and identifies and provides analysis, training, tools, and leads programs to improve successful adoption and integration of AI solutions from mathematical and algorithmic proposals to prototypes and department-wide implementation. AITO provides stewardship of the AI Advancement Council (AIAC), a vehicle created to ensure continuous decision-making regarding departmental needs and the future state of the evolutionary AI and ML technology. AITO provides capabilities in support of cross-cutting research and development of solutions that address the DOE mission and the Administration's goals, including climate resiliency, energy justice, and clean energy. Implementation of AI tools across these activities will support more effective decisions that will protect citizens, the nation, and our international alliances.

Highlights for the FY 2023 Budget Request

The FY 2023 request includes supporting four FTE's salaries, benefits, official travel, training, and overhead expenses. The increase of \$100,000 will support associated support services contracts, and administrative expenses to execute the AITO mission, refine the DOE AI strategy, and coordinate AI activities across the Department and its National Laboratories. Also, the contractor will support work product development and activities required by the AI advancement council, participate in developing/maintaining the product that is used to improve DOE-wide AI workforce talent management, and assist with system improvements to support the AITO responsibility as the principal organization for delivery of cross-cutting AI initiatives.

Artificial Intelligence and Technology Activities

Communications

In FY 2022, AITO began amplification of success stories from across the DOE complex and developed communications to identify and showcase AI innovations internal and external to DOE. These facilitate cross-pollination and demonstration of the impacts of the program offices' and National Laboratories AI investments. AITO also facilitated as well as participated in Intelligence and inter-agency briefings on AI use for adversarial purposes as well as a defender of the nation's critical infrastructure. FY 2023 funding supports continued communications including intelligence and inter-agency briefings on AI.

AI Portfolio Analysis, Optimization and Advanced Reporting

AITO conducts and facilitates DOE-wide review and analysis of planned and target AI investments and projects on classified and unclassified networks. This is a complex, continuous, and necessary activity to ensure that the

maximum potential of research, development, delivery, and acquisition of AI solutions is realized at the speed required to remain competitive nationally. Each program office has a portfolio of investments and projects. AITO, through advanced analysis and reporting, identifies gaps and recommends critical AI scientific and technology programs. The outcome is cross-cutting investment optimization and better tracking of AI initiatives and project inventory, as required by Executive Order (EO) 13970: Promoting the Use of Trustworthy Artificial Intelligence. AITO will continue implementation efforts in FY 2023 with deeper analysis into the impacts on the administration and agency wide goals including but not limited to energy and climate resilience.

Information Technology and Process Modernization

Expanded capabilities including additions of knowledge graphs and process improvements are required to support the growth of DOE AI investments. This encompasses project data and meta-data and upgrades to AI technologies that are used to conduct portfolio analysis, optimization trending and advanced reporting for predictive analytics through machine and/or deep learning in support of the programmatic offices' activities. The IT modernization will enhance the current portfolio system and enable better scale of solutions and easier extrapolation of data for use across the department, across other federal, state, and local agencies as well as industry, academia and others including disadvantaged communities. AITO will continue to mature the AI Risk Management Playbook to align with departmental needs and inter-agency feedback.

AI Targeted Stakeholder Outreach and Partnering

Outreach and partnering efforts from the local to the global scale permit the exchange of AI assets and inform the DOE AI direction, support the evolution of the department's AI strategy, and guide the planning that ensures national security, critical infrastructure protections including cybersecurity, and relevant mission outcomes. Outreach has included science, technology, engineering and math challenges, and participation in committees with the White House Office of Science and Technology Policy. AITO is an active member of the Networking and IT Research and Development (NITRD) AI working group, Machine Learning and AI subcommittee (MLAI-SC), Equity AI Interagency Policy Council (IPC), and the Interagency Task Force on Military and Veterans Mental Health. International partnerships will forge ahead in education and training, and listening sessions and collaborations will expand to mitigate energy vulnerabilities and climate risks, in partnership with International Affairs (IA). Within DOE, AITO is sought out for AI information, solving problems in the DOE mission areas with AI tools, coordination to accelerate mission achievement through basic research and applied AI, and provides independent test and evaluation support for program offices, guiding responsible and trustworthy AI outcomes. AITO also leads special projects that facilitate department-wide legislative compliance in AI/ML.

AI Workforce Skilling/Upskilling and Talent Management

AITO plans to launch an AI/ML cohort for a minimum of five student researchers (undergraduate and graduate levels) in support of AI workforce skilling/upskilling and talent management and associated Executive Orders. This effort builds upon the success of the Frontiers Development Lab (FDL) challenge that AITO led across DOE in FY 2022. AITO will continue the popular DOE leadership and practitioner training on AI, machine learning, and deep learning. These programs specifically provide post doctorate and graduate students experience in the application of AI to address the administration needs that include AI for cyber security, robotics, conversational AI that supports program offices such as the loan program office with secured and responsible principles, and other critical mission areas. The external facing challenges and internal facing AI educational programs benefit all participants by enhancing education and training in AI technology, increases AI leadership and applied capabilities, strengthens marketability in the scientific disciplines, and allows non-governmental students to gain

deeper insights into the federal government's role in the creation and implementation of AI policies and adoption.

AI Advancement Council (AIAC) Leadership and Advancements

The DOE cross-cutting AIAC will continue in FY 2023 and is an example of the responsibility DOE takes in operating as a leading agency in the civilian use and advancement of AI. Established by AITO in 2022, the AIAC is co-chaired by the Undersecretary of Science and Innovation and the Administrator of the National Nuclear Security Administration. AITO is the founding member and architect of the AIAC, serving as steward of operations and the executive secretariat. AIAC will be instrumental for department wide information flow, risk management, and deliberative, informed AI decision making for investment in initiatives and outcomes. The AIAC task force on Responsible and Trustworthy (R&T) AI is comprised of Program Office representatives including the national labs. The R&T AI task force is establishing ethical and equity AI principles and practices for the department and integration into workforce development efforts. The R&T AI task force is also responsible for AI Verification and Validation (AI-V&V) practices to facilitate equity. Additional task forces are planned that will support implementation of the DOE AI strategy at the speed of relevancy to the mission.

**Program Direction
Funding (\$K)**
(Dollars in Thousands)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	2,000	2,000	2,000	0	0%
Travel	100	100	10	-90	-90%
Support Services	200	200	390	+190	+95%
Other Related Expenses	250	250	200	+0	0%
Total, Program Direction	2,500	1,435	2,600	+100	+4%
Total FTEs	4	4	4	0	0%

**Artificial Intelligence and Technology Office
Funding**

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$2,500,000	\$2,600,000	+\$100,000
Salaries and Benefits \$2,000,000	\$2,000,000	+\$0
<ul style="list-style-type: none"> Funding supports 4 FTEs to manage AITO, including AI strategic outreach for partnership development and new program pilots. AITO will organize and lead working groups and committees, in partnership with other entities, to determine DOE AI priority issues. AITO will identify and facilitate partnerships with the private sector, academia, national laboratories, other agencies, international partners and entities to support US competitiveness in AI. 	<ul style="list-style-type: none"> Funding supports 4 FTEs to manage AITO, including AI strategic outreach for partnership development and new program pilots. AITO FTEs determine the priority needs of the DOE in AI through workshops, inter-agency coordination and private sector engagement. AITO partners with the private sector, academia, national laboratories, other agencies, international partners and entities to support US competitiveness in AI. AITO FTEs organize and lead, via working groups, assemblies and committees, DOE AI priority issues in partnership with other entities and agencies. 	<ul style="list-style-type: none"> No Change

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Travel \$100,000	\$10,000	-\$90,000
<ul style="list-style-type: none"> Funding supports travel requirements associated with DOE's Artificial Intelligence and Technology Office, such as AITO's engagement with the labs, meetings, international collaborations, outreach at industry events, workshops and conferences, and AITO's participation in lab events. 	<ul style="list-style-type: none"> Funding supports travel requirements associated with DOE's Artificial Intelligence and Technology Office, such as AITO's engagement with the labs, meetings, international collaborations, outreach at industry events, workshops and conferences, and AITO's participation in lab events. 	<ul style="list-style-type: none"> Decrease to shift funding to support services.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Support Services \$200,000	\$390,000	+\$190,000
<ul style="list-style-type: none"> • Funding supports contractor and consulting support services to assist Federal staff in the coordination of AI activities between DOE and the national labs for the development of tools and information to advance AI. • Funding advances the integration and co-design of AI memory and hardware technologies. • Funding supports coordination of data resources and AI testbeds across the national laboratories. • Funding supports periodic AI related workshops to determine priority needs of DOE in AI and expand strategic multi-sector partnerships with the private sector, academia, national laboratories, other agencies, international partners and entities to support US competitiveness in AI. 	<ul style="list-style-type: none"> • Funding supports contractor and consulting support services to assist Federal staff in the coordination of Artificial Intelligence activities between DOE and the national labs for the development of tools and information to advance AI. • Funding advances the integration and co-design of AI memory and hardware technologies. • Funding supports coordination of data resources and AI testbeds across the national laboratories. • Funding supports periodic AI related workshops to determine priority needs of DOE in AI and expand strategic multi-sector partnerships with the private sector, academia, national laboratories, other agencies, international partners and entities to support US competitiveness in AI. 	<ul style="list-style-type: none"> • Increase supports expansion of existing activities: robust analytical support, including market and supply chain analysis efforts, furthering operationalization of the AI council, system improvements that provide the infrastructure as the AI convening authority and principal organization for cross-cutting AI initiatives; support AI4Cyber and Trustworthy AI mission, enhance risk management practices/policy, and program management support and National Laboratories effort to enhance AI workforce skilling/upskilling/ talent management.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Other Related Expenses \$200,000	\$200,000	+\$0
<ul style="list-style-type: none"> • Funding supports the costs associated with the DOE's WCF (office space, infrastructure, phones, utilities, supplies etc.); EITS (IT equipment and support); specialized software licensing; and security investigations. • Funding includes formulating AI training modules for the education and training of DOE staff in AI and opportunities created by AI related technologies. • Additional expenses for staff development, recruiting, succession planning, and training to maintain and enhance AI work related skills and capabilities. 	<ul style="list-style-type: none"> • Funding supports the costs associated with the DOE's WCF (office space, infrastructure, phones, utilities, supplies etc.); EITS (IT equipment and support); specialized software licensing; and security investigations. • Funding includes formulating AI training modules for the education and training of DOE staff in AI and opportunities created by AI related technologies. • Enhance upskilling and talent management programs to leverage AI emerging capability by ensuring staff, the USA and international partners advance at the same pace or faster than competition (national and international). 	<ul style="list-style-type: none"> • No Change.

Office of the Chief Information Officer

Overview

The Office of the Chief Information Officer (OCIO) leads information technology (IT) and cybersecurity coordination across the entire DOE enterprise.

Highlights of the FY 2023 Budget Request

The FY 2023 Request is \$233,731,188 which is a increase of \$93,531,188, or 67 percent from the FY 2021 Enacted amount. Included in the FY 2023 Request is \$59,006,000 to address Cyber Modernization / SolarWinds Response and Recovery. The funding request targets critical cybersecurity needs across DOE, prioritizing cybersecurity enhancements, including: cloud security, Security Operations Center (SOC) enhancements, encryption, Multi-Factor Authentication (MFA), increased logging functions, and enhanced monitoring tools. DOE's maturation levels were reviewed to determine the most critical gaps that require additional funding.

The FY 2023 Request continues to support the President's Management Agenda priorities of IT Modernization and Cybersecurity initiatives that leverage process improvements focused on digital services. OCIO's priority is to continue the modernization of DOE's IT infrastructure and IT services to provide the capacity, flexibility, and resiliency required of a modern and secure enterprise. The proposed modernization initiatives included in the FY 2023 Request will continue to reduce the threat of cyber attacks through technology and automation, scaling capacity commensurate with demand, and establish enabling IT enterprise capabilities. This will allow for commercial/managed IT service implementation with engineered and inherent cybersecurity capabilities and provide foundational requirements for enhanced cybersecurity tools, products, and capabilities. Vulnerabilities identified by the SolarWinds intrusion incident of December 2020, will continue to be addressed through funds specifically dedicated to cyber response and recovery management in the FY 2023 Request.

The OCIO will focus on opportunities to increase DOE enterprise-wide visibility through real-time information availability, integrated incident reporting data and metrics, and tool modernization to increase data integration; strengthening enterprise risk management practices and execution of enterprise-wide assessments and risk register reporting; and delivering improved cybersecurity training, education, and awareness.

Office of the Chief Information Officer
(\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Chief Information Officer					
Cybersecurity					
Protecting Networks and Information (Protect)	31,370	31,370	30,985	-385	-1%
Detect, Analyze, and Mitigate Intrusions (Detect and Respond)	26,950	26,950	31,431	4,481	17%
Shaping the Cybersecurity Environment (Identify and Recover)	13,480	13,480	29,945	16,465	122%
Total, Cybersecurity	71,800	71,800	92,361	20,561	29%
Cyber Modernization / SolarWinds Response and Recovery	0	0	59,006	59,006	100%
Corporate IT Program Support					
IT Portfolio Summary	17,529	17,529	22,881	5,352	31%
IT Infrastructure	3,781	3,781	4,170	389	10%
End User-Energy Information Technology Services (EITS)	3,996	3,996	4,184	188	5%
Total, Corporate IT Program Support	25,306	25,306	31,235	5,929	23%
Program Direction					
Salaries and Benefits	25,232	25,232	30,963	5,731	23%
Travel	304	304	336	32	11%
Support Services	3,325	3,325	3,325	0	0%
Other Related Expenses	14,233	14,233	16,505	2,272	16%
Total, Program Direction	43,094	43,094	51,129	8,035	19%
Total, Chief Information Officer	140,200	140,200	233,731	93,531	67%
Federal FTEs	124	124	142	18	15%

OCIO Sources for Funding Activities	FY 2023 Request	WCF	Customer (EITS)	Total
CYBERSECURITY				
Protecting Networks and Information (Protect)	30,985	0	2,680	33,665
Detect, Analyze, and Mitigate Intrusions (Detect and Respond)	31,431	0	4,361	35,792
Shaping the Cybersecurity Environment (Identify and Recover)	29,945	0	7,513	37,458
TOTAL, CYBERSECURITY	92,361	0	14,554	106,915
CYBER MODERNIZATION / SOLARWINDS RESPONSE AND RECOVERY	59,006	-	-	59,006
CORPORATE IT PROGRAM SUPPORT				
IT Portfolio Summary ¹	22,881	8,822	-	31,703
IT Infrastructure	4,170	-	-	4,170
End User –Energy Information Technology Services (EITS)	4,184	40,023	78,769	122,976
TOTAL, CORPORATE IT PROGRAM SUPPORT	31,235	48,845	78,769	158,849
PROGRAM DIRECTION				
Federal Salaries & Benefits	30,963	-	-	30,963
Travel	336	-	-	336
Support Services	3,325	-	-	3,325
Other Related Expenses	16,505	-	-	16,505
TOTAL, PROGRAM DIRECTION	51,129	-	-	51,129
OCIO payments into Shared Services and WCF ²		(2,973)	(6,610)	(9,583)
Total, Chief Information Officer	233,731	45,872	86,713	366,316
Federal FTEs	142	3	-	145

¹ The WCF Corporate IT Program Support reflects the WCF request for \$48,844,493 which is comprised of \$5,822,000 for the Inter-Agency Transfers business line and \$3,000,000 OPM credit monitoring under IT Portfolio Summary and \$40,022,493 is for End User – EITS Telecommunications business line.

² OCIO provides funds to Shared Services and WCF as a customer as well as the rest of the contributing program offices. In order to not double count those payments in the totals available, a bottom line adjustment was made.

Office of the Chief Information Officer

Cybersecurity

Overview

The OCIO leads the Department's Cybersecurity program on behalf of the Secretary and in accordance with the Federal Information Security Modernization Act of 2014; and unclassified network services to DOE Headquarters and participating field sites. This includes protecting DOE networks and information; detecting, analyzing, and mitigating intrusions; providing continuous monitoring of the network and infrastructure; and managing the DOE cybersecurity environment. of the following summarizes the Cybersecurity portfolio of work and provides information on the anticipated activities.

Highlights of the FY 2023 Budget Request

- Increase enterprise-wide visibility of the Department through increased real-time information availability, integrated incident reporting data and metrics, and tool modernization to increase data integration. (Protect, Detect, and Respond)
- Strengthen enterprise risk management practices to support defensible business decisions through sustainment of the Enterprise Cybersecurity Risk Management program, Supply Chain Risk Management program, and execution of enterprise-wide assessments and risk register reporting. (Identify and Recover)
- Deliver improved cybersecurity training, education, and awareness through enriched cybersecurity training curriculums, awareness and learning opportunities, and collaboration with internal and external cybersecurity communities of interest. (Protect)
- Continue migration of data center applications to the cloud and optimization of multi-cloud (the distribution of cloud resources over a number of clouds) operations and application workloads. (Identify and Recover)
- Continue implementation of Trusted Internet Connection (TIC) 3.0 and Zero-Trust Networking capabilities. (Protect)
- Deploy new capabilities in Customer Relationship Management (CRM), Workforce Enablement, Digital Worker Services, Identity Management, Infrastructure Services, and IT Service Management. (Protect)

Funding Breakout and Analysis

This section summarizes the program and activities associated with the overall projected OCIO cybersecurity budget. It captures activities under three budget lines aligned to the NIST Cyber Security Framework (CSF):

- Protect – Awareness and Training, Information Protection Processes, and Protective Technology
- Detect and Respond – Response Planning, Detection, Analysis, Mitigation, and Improved Communication
- Identify and Recover – Continuous Monitoring, Risk Assessment/Management, Business Processes, Governance, Asset Management, Recovery Planning, and Improvements

Budget Line: Protecting Networks and Information - Protect (\$30,985,000 – Request; \$2,679,676 – Customer) (TOTAL = \$33,664,676)

Provide programs to protect DOE networks and the information which resides on them.

Activity: Data Center Modernization (\$2,700,000)

Funding is being requested to continue the migration of on-premises data center workloads to the DOE enterprise cloud Infrastructure as a Service (IaaS), Software as a Service (SaaS), Platform as a Service (PaaS) environments in Amazon AWS and Microsoft Azure. Funding will also support the optimization of poly-cloud operations and applications within the cloud environments to include deployment of additional PaaS and SaaS solutions within the AWS and Azure environments. This initiative also supports and is aligned with the federal Data Center Optimization Initiative (DCOI) and will assist in driving the Department towards compliance while driving down Total Cost of Ownership (TCO) by leveraging cloud native solutions to automate workflow.

Activity: Infrastructure IT Modernization (\$2,500,000)

This initiative will focus on new capabilities in the focus areas of Customer Relationship Management (CRM), Workforce Enablement, Digital Worker Services, Identity Management, Infrastructure Services, and IT Service Management as part of the overall DOE IT Modernization. Modernizing DOE's IT infrastructure, services, and operations to a level consistent with the needed capacity, flexibility, and resiliency of a modern secure enterprise remains a key priority. This funding will support continued identification and implementation of new technologies, managed services, and commercial cloud services solutions to improve cybersecurity, scale capacity commensurate with demand, and establish IT enterprise capabilities in support of DOE enterprise users and the DOE mission.

Activity: Design and Engineering (ICC) (Previously Policy and Development- IT Modernization) (\$2,573,000)

This request is to fund continued Google Cloud Platform (GCP) Operations and Maintenance to further develop the platform and maintain a security Authorization to Operate (ATO). As part of the OCIO effort to expand cloud services to the Enterprise, OCIO is leading a project to integrate Google Cloud Platform (GCP) as an additional Cloud offering in the OCIO portfolio to complement current offerings such as Amazon AWS and Microsoft Azure. GCP is a FedRAMP authorized Cloud platform with a set of management tools, identity and security services, and modular cloud products for commodity and advanced IT deployments such as Analytics, Machine Learning, and Artificial Intelligence. Specifically, the offering provides governed access to the suite of GCP cloud computing products, including high-level services like Containers that may not be available in other OCIO offerings, to support the missions of the Innovation Community Center (ICC) and the broader Department of Energy Offices and Labs.

Activity: Network Modernization - DOEnet/ESnet (Energy Sciences Network) & Trusted Internet Connection (TIC) 3.0 (\$2,395,000)

The Department maintains a corporate business Wide Area Network (WAN), DOEnet, supporting enterprise business services. DOE continues to evolve from a decentralized entity to one focused on integration and collaboration, which requires modernization of the DOE wide area network. This funding will continue the efforts to improve operational performance, security, and resiliency, while expanding opportunities for multi-site collaborations through modernization of the Department's wide area network architecture. This funding will support DOE's efforts to transition to Internet Protocol Version 6 (IPv6). Identify and implement additional Trusted Internet Connection (TIC) 3.0 and Zero-Trust Network (ZTN) capabilities and solutions aligned with the Department of Homeland Security (DHS) guidance in support of the continued shift from on-premises TIC infrastructure to commercially-managed services and solutions to deliver an improved mobile/remote access experience for DOE users and support the expanded use of cloud services.

Activity: Identity, Credential, and Access Management (ICAM) (\$4,500,000)

Funding supports the increased requirement for PIV or equivalent Identity Assurance Level (IAL)/Federation Assurance Level (FAL)/Authenticator Assurance Level (AAL) credentials for network access for privileged and un-privileged accounts. DOE has achieved the OMB goal to require PIV or equivalent to access un-privileged network user accounts and will focus efforts on the OMB goal for privileged network user accounts. Funding will enable expansion of the digital identity repository of DOE sites. The DOE identity management service supports 377,546 identities of which 236,868 are current active identities. Funding will expand authentication services directly supporting a current total of 170 DOE applications in production or in process as well as federated to 4 authentication hubs and expansion of authentication services to DOE sites which will result in raising the requirement for use of the proper credential based on a role-based risk assessment. Funding also supports continued federation services with MAX.gov and Login.gov, ongoing cloud infrastructure costs, enterprise service support for the DOE-wide global address list including exchange of encryption certificates and physical access for a number of sites, and enterprise licensing of identity and access management commercial products.

Activity: Managing DOE Spectrum Program (\$1,553,000)

Funding will provide Spectrum Management technical, logistical, and administrative support, as well as ongoing oversight and advocacy at an inter-agency level in the National Capital Region. The DOE Spectrum Program is mandated under Title 47, U.S. Code of Federal Regulations, 901, et. seq., and manages DOE radio frequency spectrum-dependent resources for NNSA, Power Marketing Administrations (PMAs), Office of Secure Transportation, and National Laboratory spectrum-dependent assets. DOE is the 9th largest holder of radio frequencies with more than 7,300 individual radio assignments across 34 sites receiving services from OSM including Headquarters, the National Labs, the PMAs, and NNSA sites. Critical DOE missions and essential functions utilizing Spectrum services include the National Power Grid, Interstate Electricity Transmission, Satellite Missions, Nuclear Emergency Search, Radiological Assistance, Secure Transportation and Safeguards, and Protective Force Communications.

Activity: Coordinate Cyber Response, Cybersecurity Awareness, and Role-Based Training (\$4,600,000)

This funding supports the continuation of role-based training to ensure the Department's authorizing officials, system owners and information systems security officers have the best training available to provide critical risk management support. The Cyber Forensics and Incident Response Exercise (FIRE) program is a flagship training program that develops cyber incident responder specialized skills needed to defend information technology (IT) and operational technology (OT) infrastructure, to mitigate cyber threats through extensive training and enables the development of advanced teams of incident responders. This funding provides for two events per year, bringing together incident responders from across DOE, the public sector, private sector, and international partners. Smaller events are held with members of the private sector and academia. Funding in this activity is to develop and improve cybersecurity training and awareness by:

- Developing world-class cyber leadership and workforce to improve recruitment and retention;
- Building a cybersecurity community within DOE and externally through partnerships with other Federal stakeholders;
- Improving Authorizing Official (AO) and risk-based investment training for DOE leader enablement;
- Improving cyber professional workforce through education and training opportunities via community moderated forums, cloud-based technology, and hands-on education channels; and
- Enhancing workforce engagement through enriched cybersecurity training curriculums; awareness and learning opportunities; and collaboration with internal and external cybersecurity communities of interest.

Activity: Operations Technology (OT)/ Control Systems (CS) Technology (\$1,000,000)

This funding will support testing of new processes and piloting of technologies that improve the Department's ability to detect, monitor and protect these critical systems. As a member of the DHS CISA-led Control Systems Interagency Working Group and the responsibility to manage and oversee a vast number of industrial control systems and critical infrastructure supporting the electrical grid, DOE is expected to engage and act on Executive Order (EO) 3920, *Securing the United States Bulk-Power System*. DOE has commissioned an internal Control Systems Working Group to define the DOE control systems environment and execute a strategy to remediate cybersecurity control gaps and institute process improvements to ensure the security of the nation's Bulk-Power System while maintaining compliance with the North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection standards.

Activity: Control Systems (CS) and Operational Technology (OT) Modernization (\$2,158,000)

Funding will provide expansion of cloud based data storage, analytics platforms, communications links to move data, sensors and analytical tools designed for CS/OT and training from industry experts in the field of control systems and operational technology to improve visibility, increase monitoring, shared situational awareness, and collaboration.

Activity: Emerging Technologies (\$1,800,000)

Funding will support strategy and architecture activities for the Department through the Innovation Community Center (ICC). The Emerging Technology architects gather and analyze business opportunities; establish and validate risk mitigation strategies; identify use cases; develop architecture designs that show efficiencies in areas such as business processes, decision making, and cost reductions; and pass technical specifications to ICC build teams. The effort will help the agency align with the objectives outlined in EO 13859, *Maintaining American Leadership in Artificial Intelligence*, and will assist in the adoption of new technologies. This activity includes the following:

- Provide technical evaluations and recommendations
- Identify promising technologies for possible Departmental integration
- Recommend ways to integrate products and services into an operational environment

This will accelerate the review of all commercial software deployed across DOE to identify software at risk. Software that is not at the latest release or has been developed by a foreign manufacturer must be reviewed through the four lenses of the Supply Chain Risk Management (SCM) program. Each commercial software product and version must be reviewed against a known list of Critical Vulnerabilities and Exposures (CVE) to identify and eliminate software that is at risk, including those associated with software developed by adversary nation states or organized crime. It will also assure that software with known vulnerabilities are identified and removed. The most common cyber attack vector is for bad actors to compromise systems and networks using known vulnerabilities which must be mitigated. These activities will reduce the risk of exposure which in turn reduces the costs associated with remediation as well as reduce the potential for exposure of sensitive and personal information.

Activity: Cybersecurity Program Management Support (\$581,000)

Funding will provide support for OCIO leadership in the areas of cybersecurity program management and administrative support for cybersecurity projects to include tracking, monitoring, and reporting project status and providing strategic guidance and recommendations to OCIO leadership to accomplish the strategic goals of the organization.

Activity: Program Management Oversight for Cybersecurity (\$2,625,000)

Funding will provide program integration and innovation support for managing IT Support Services strategic sourcing vehicle for OCIO contracts in the areas of Cybersecurity:

- Provide program management in support of projects, including tracking, monitoring, and reporting project status and providing strategic guidance and recommendations to OCIO leadership to support evidence-based and data-driven decision-making to accomplish strategic goals of the organization.
- Support IT projects assessing and shaping the demand pipeline for services across the agency to enable the OCIO to streamline the investment decision process for new IT products and services.
- Provide strategic design and innovation in order to clearly define and map issues, uncovering the customer pain points at project onset and developing an understanding of customer needs, preferences, and behaviors to design future state operations and enhance service delivery.
- Provide organizational change management in support of IT projects in order to account for the impact new initiatives have on operations, culture, and employees; and ensures the capability to sustain continual IT refresh and innovation.

Activity: Anonymized Browser (\$500,000)

Funding is for Anonymized Remote Browser Isolation solution to provide an additional layer of protection for DOE users and assets by separating browsing activity from endpoint hardware, thereby reducing the device's and the organization's attack surface. If a user clicks on a malicious link in a browser session, that payload would be executed in the Remote Browser instance and not on the DOE user's desktop and when the session is ended, anything malicious is deleted.

Activity: Platform Engineering (\$1,500,000)

Funding will support the Platform Engineering work required for the following:

- Near-term: Bring the EITS Azure cloud environment into parity with the EITS Amazon Web Services environment to ensure that current state capabilities, security configuration, governance, and monitoring are consistent across platforms.
- Longer-term: Develop and implement standardized policies, procedures, and governance to mature current state EITS cloud platform services into a Polycloud capability end state.

Initial maturity efforts will include: developing a Polycloud strategy to ensure consistency in operational security implementation of vulnerability scanning and configuration compliance monitoring; developing automation opportunities with cloud offering to increase the efficiency and further reduce compliance risk by minimizing opportunities for human error; expanding existing Infrastructure as a Service (IaaS) services to include Platform as a Service (PaaS) and Marketplace offerings; leveraging opportunities to securely offer containers, and developing policies and capabilities for leveraging data at rest encryption across Polycloud capabilities. The Platform Engineering effort work is necessary to move away from segmented cloud service implementations and into an EITS Polycloud services that caters to many needs but delivers and offers those services and capabilities in a secure, compliant, and consistent manner.

Customer funding provided as part of Energy Information Technology Services (EITS) (\$2,679,676)*

*Cyber for EITS Protect (\$2,679,676)**

Funds secure data transmissions to include credentialing and access management, data safeguarding, secure data transmission, and system security testing and analysis for EITS customers.

** WCF and customer fund dollars include OCIO contributions*

Budget Line: Detect, Analyze, and Mitigate Intrusions – Detect and Respond (\$31,431,000 – Request; \$4,360,652 Customer) (TOTAL= \$35,791,652)

**Departmental Administration/
Chief Information Officer**

FY 2023 Congressional Budget Justification

Expand operational visibility of the DOE complex through increased real-time information availability, integrated incident reporting data and metrics, and tool modernization to increase data integration. Visibility into cybersecurity operations across the DOE sites, labs, and offices is a critical component of ensuring strong cybersecurity. Oversight into current processes will help identify gaps and vulnerabilities in our systems. Programs being able to create this visibility and plug those gaps will be critical in the Department's cybersecurity strategy moving forward.

Activity: SOC Assessment/Pursuit/Hunt (\$250,000)

Establishing a standardized SOC assessment model to evaluate SOC maturity across the DOE enterprise and enable better visibility of gaps and prioritization of requirements across the enterprise. The funding will be used to establish, train and test concepts for cybersecurity incident response Pursuit/Hunt teams which will significantly enhance our ability to proactively respond to and defeat a wide range of cybersecurity threats.

Activity: Integrated Joint Cybersecurity Coordination Center (iJC3) (\$14,300,000)

Enhancing and maturing the iJC3 will lead to greater enterprise visibility to stay ahead of adversaries and cyber threats. iJC3 leads the coordination of all cyber information for the Department, identifies trends, and gains significant insight into cyber operations, helping to inform critical decision making and enhance situational awareness. This will enable stronger stakeholder awareness and cross-collaboration amongst the various department elements, ensuring that resources are being allocated efficiently across the Department.

Activity: Automated Indicator Sharing Modernization (\$900,000)

Funding for this activity enables sustainment of a commercial off-the-shelf solution supporting machine-to-machine sharing of cyber threat intelligence, speeding up proactive defense and distributed detection for the DOE enterprise. This will provide automated signature delivery and indicators of compromise to automatically update cyber defenses, such as intrusion detection systems, intrusion prevention systems, and firewalls.

Activity: Big Data Platform (\$9,181,000)

Continuing maturation of Big Data Platform (BDP) and incremental planned growth for Amazon Web Services GovCloud storage and compute will enable improved data analytics and visualization of Department-wide cybersecurity threats and trends. The funding will add storage enabling the Department to meet the increased logging requirements by aggregating the most critical data needed to support Department-wide incident response and threat hunting. This will allow OCIO to be more accountable to the Department and the broader federal government through performance metrics and improved reporting.

Activity: Cybersecurity Tools and Licensing (\$4,200,000)

Funding supports sustainment, modernization, and operationalization of cybersecurity products or services, such as hardware, software, applications, and equipment designed to protect the DOE IT infrastructure and improve the iJC3's ability to detect, report, respond, and recover. Operationalizing cybersecurity products and services will enable more timely access to critical data and automated process support.

Activity: Deployable Incident Response Teams, Network Modeling, and Enhanced Exercise Program (\$248,000)

Funding supports the identification, exercising, and equipping of incident responders across the DOE enterprise that can support crisis action planning and virtual or on-site incident response support during a major cybersecurity incident. Providing enhanced tools to perform on-site network modeling of effected networks.

Activity: Cyber Modernization Continuation/Maturity (\$2,000,000)

Funding will be used to fund prioritized efforts in the Departmental Elements and National Laboratories to conduct pilots of new technology and sustain current efforts aligned to building a Zero Trust Architecture and securing cloud infrastructure across the Department to better defend DOE's critical information and infrastructure. Based on intent to fund numerous pilots in FY22, planning for a small amount to continue in FY23.

Activity: FireEye PCAP (\$202,000)

FireEye PCAP (Packet Capture) is an application programming interface for capturing network traffic. In keeping with the White House OMB Memo 21-31, PCAP is the requirement for Enterprise Logging Level 1 application-level traffic. The network forensic tool will help detect a broad array of security incidents, assist in investigations to determine

scope and impact, effectively contain threats, and provide quicker recovery from events. The equipment is for monitoring and analyzing network traffic and protocol-based communications.

Activity: Encase (\$150,000)

Encase is used in forensics to recover evidence from compromised hard drives. It allows the OCIO to conduct in-depth forensic analysis of user files to collect evidence such as documents, pictures, internet history and Windows Registry information. Encase is also vital to preserve the chain of custody in an event that evidence is needed for litigation purposes. Encase also plays a critical role in all incident response investigations by allowing the incident response team to remotely triage workstations that may have malicious code, potential compromise, attempted intrusions, etc. It is also used during classified data spillage incidents to remotely keyword search workstations. The requested funding will be dedicated to licensing renewal for cybersecurity software used for digital forensics analysis and reporting by Enterprise Assurance Incident Response Team.

Customer funding provided as part of EITS (\$4,360,652)*

Cyber for EITS Detect (\$4,360,652)*

Funding anti-phishing and malware defense, intrusion prevention and incident management and response for EITS customers.

** WCF and customer fund dollars include OCIO contributions*

Budget Line: Shaping the Cybersecurity Environment – Identify and Recover (\$29,945,000 – Request; \$7,513,615 Customer) (TOTAL = \$37,458,615)

To enable DOE to identify, assess, select, monitor, and report on risks, DOE will continue to mature its cybersecurity risk methodology to blend qualitative and quantitative risk management principles and demonstrate business use cases to answer tough questions. DOE will sustain and improve its supply chain as a service program, continue to improve business processes, streamline the security authorization process, and continue to emphasize operational risk versus compliance gaps.

Activity: Vulnerability Disclosure Program/Crowdsourced Penetration Testing (Sustain Bug Bounty) (\$3,100,000)

In accordance with DHS/OMB requirements, the Department will continue to mature its Vulnerability Disclosure Program (VDP) across all public facing systems and websites. This funding will sustain the existing contract to manage the DOE VDP solution. Providing the portal for responsible vulnerability disclosure, triage of submissions, coordination of remediation and communication with researchers and sustain crowd source penetration testing. VDP and crowd source penetration testing are critical assessment tools that enable the identification, remediation and/or mitigation of vulnerabilities before they can be exploited by our adversaries.

Activity: Cybersecurity Modernization (\$2,700,000)

Funding supports modernizing DOE's infrastructure and cloud based security through a secure, robust, and capable infrastructure and network, built on interoperable standards and architecture principles. Projects that make up the initiative, when completed, will support continued maturation and automation of the EITS Site Security Operations Center (SOC) capabilities in alignment with the overall DOE Enterprise. Specifically, FY 2023 funding will support continued modernization and automation of cybersecurity operations capabilities, including the transition from legacy on-premises capabilities and technologies to cloud native tools and capabilities, deployment of Artificial Intelligence (using Machine Learning) solutions to support automated log correlation activities, implementation of controls and methodologies to align with the DOE Controlled Unclassified Information (CUI) Order, support for enterprise initiatives, such as Metadata Taxonomy and Risk Management dashboards.

Activity: Supply Chain Risk Management as a Service (\$4,000,000)

This funding is to sustain the enterprise Supply Chain Risk Management (SCRM) program that provides proactive supply chain security support for the DOE Enterprise. The program provides critical capabilities that guide, educate, and manage supply chain risks to National Security Systems and Information and Communications Technology (ICT) components and includes shared services, a common lexicon, and best practice procedures in procurement, delivery, and deployment of IT products and services that are used across the enterprise and select Federal

Departments/Agencies. This program is a critical enabler in supporting the Department's ability to meet FITARA requirements as well as regulatory requirements levied on the Power Marketing Administrations by NERC and FERC.

Activity: Enterprise Architecture (Previously Requirements Analysis and Integration) (\$1,450,000)

Funding this activity supports maturing the DOE Enterprise Architecture Program initially focusing on management of the Technical Reference Model (TRM) on commercial off the shelf (COTS) software and expansion and Application Rationalization. This activity will continue furthering Business Architecture through DOE Business Reference Modeling, defining and integrating the Application Reference Model and defining a DOE Security Reference Model. A major objective of the Enterprise Architecture program is to conduct application rationalization to incrementally consolidate and retire systems and applications performing similar functions. The goal of the Enterprise Architecture program is to have a clear line of sight from the business and mission drivers to applications supported by COTS products captured in the Technical Reference Model. Funding will also support the expansion of the Enterprise Architecture repository tools to the broader DOE community.

Activity: Cybersecurity Strategic Communication Support (\$720,000)

This funding is to add contractor support to help to drive cybersecurity by advancing our priorities through enhancing OCIO public advocacy/diplomacy and communications (including via social media and multimedia), executing thorough communications research, crafting quality briefing materials, and supporting various other executive-level actions. This activity provides cybersecurity strategic communications support to OCIO leadership in advancing the Department's cybersecurity missions through policy, standards, and services for the enterprise information system.

Activity: Cybersecurity Emergency Management Support (\$300,000)

Operational and mission support for continuity of operations (COOP) and disaster recovery (DR) planning. Support includes planning and training for a comprehensive array of potential emergencies or disasters that may impact the continuity of operations and the performance of mission essential functions. This includes the development of tabletop exercises, SOPs, creating metrics to measure success and inform decision-making, updating portfolio plans, testing emergency communications and personnel accountability, maintaining vital records, and preparing for devolution and reconstitution contingencies.

Activity: Enterprise (EITS Customer Base) Identity (\$2,369,000)

Funding is requested to provide additional licenses for the Saviynt Identity Governance and Administration system. Saviynt will provide for centralized collection of user identity data, full identity lifecycle management, and automated account provisioning. The new system will replace the legacy Management Information System (MIS) identity management data collection system. Scope of this system increased from an initial user base of EITS active directory (AD) users to a larger user base that accommodates all users of EITS systems including DAYS (ServiceNow) and Azure Active Directory. It also includes customers outside the EITS user base who use the contractor sponsorship workflow in MIS. Expansion of the scope of the project allows us to be a service provider to customers beyond our AD user base. Additional licenses are needed to support the expanded user base. This is a recurring annual fee for Saviynt SaaS services. This funding request accounts for both licensing and labor associated with implementing Identity and Access Management (IAM) driving towards compliance with EO 14028.

Activity: Strategy and Program Management, Security Authorization and Physical/Personnel Security Support and Planning, Policy and Enterprise Risk Management (\$12,890,000)

Funding is requested to provide increased contractor labor capacity to account for increased tasking and demand related to: Mature and expand Enterprise Cyber Risk Management (ECRM) program; Mature Security Authorization Process; Optimize DOE- sponsored authorizations under the FedRAMP program; Compliance and Oversight Process Improvements; EO implementation Program Management and the continued management of the OCIO led Control Systems Working Group (CSWG) to develop a holistic roadmap to secure Operational Technology systems.

Activity: Continuous Diagnostics and Mitigation (CDM) Modernization CM License Lifecycle Maintenance of Enterprise Renewals (\$1,616,000)

As responsibilities shift from DHS to DOE, funding is required to sustain enterprise licenses for critical CDM capabilities. Improving operational visibility and continuous monitoring relies heavily on our ability to know what is on our networks and the attack surfaces associated with those networks. DOE, in partnership with DHS and their CDM program office,

has made major investments in hardware and software asset management, continuous monitoring and reporting capabilities for the Department. The CDM program provides critical resources to help DOE comply with federal monitoring and reporting requirements through capability deployments and centralized data.

Activity: CDM Contract labor FTEs (\$800,000)

In accordance with M-20-04, agencies are required to submit separate, CDM-specific line items in budget submissions. The funding request is for contract labor to support Software Asset Management, continuous monitoring, and reporting requirement in FY23 as the program grows.

Customer funding provided as part of EITS (\$7,513,615)*

Cyber for EITS (\$7,513,615)*

Funding provides for authorization and policy and continuous diagnostics and mitigation (CDM) for EITS customers.

** WCF and customer fund dollars include OCIO contributions*

Cybersecurity

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Cybersecurity \$71,800,000	\$92,361,000	+\$20,561,000
Protecting Networks and Information (Protect) \$31,370,000	\$30,985,000	-\$385,000
Funds will support a Coordinated Cyber Response, Network Security Modernization- Infrastructure IT Modernization, Network Security Modernization- Data Center Modernization, Network Security Modernization- DOE/Esnet (Energy Sciences Network) & Trusted Internet Connections (TIC)/ Independent Assessment, Identity Credential and Access Management (ICAM), IT Modernization Support, Cybersecurity Training and Awareness, Bug Bounty, Program Management Oversight Emerging Technologies, Spectrum, and Cybersecurity Program Management are the planned initiatives.	Continue FY 2021 program activities with new requests for FY 2023: Anonymized Browser (Isolation) (+\$500,000); Emerging Technologies (+\$1,800,000); Coordinated Cyber Response/Cyber Training and Awareness (+4,600,000); Control Systems (CS) and Operational Technology Modernization (site Assessment & Tools) (+\$2,158,000); Operations Technology (OT) / Control Systems (CS) Initiatives (+\$1,000,000); Platform Engineering (+\$1,000,000)	New initiatives of Anonymized Browser (Isolation) (+\$500,000); Emerging Technologies (+\$1,800,000); Coordinated Cyber Response/Cyber Training and Awareness (+4,600,000); Control Systems (CS) and Operational Technology Modernization (site Assessment & Tools) (+\$2,158,000); Operations Technology (OT) / Control Systems (CS) Initiatives (+\$1,000,000); Platform Engineering (+\$1,500,000). Increases for: ICAM (+\$671,000); Design and Engineering (ICC) (+\$2,063,000); Managing DOE Spectrum Program (+\$250,000). Decreases for Coordinated Cyber Response (-\$3,100,000); Network Security Modernization- Infrastructure IT Modernization (-\$1,807,000); Network Security Modernization- Data Center Modernization (-\$4,107,000); Network Security Modernization-DOE/Esnet & TIC 3.0/ Independent Assessment (-\$1,913,000); Cybersecurity Training and Awareness and Role Based Training (-\$1,500,000); Sustain Bug Bounty/Crowdsourced Penetration Testing (Vulnerability Disclosure Program/ Crowd Source Pen Testing (-\$2,500,000).

Activities and Explanation of Changes Continued

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Detect, Analyze, and Mitigate Intrusions (Detect and Respond) \$26,950,000	\$31,431,000	+\$4,481,000
Funds will support the following initiatives: Integrated Joint Cybersecurity Center, Big Data Platform, Cybersecurity Tools and Licensing, Deployable Incident Response Teams, and Automated Indicator Sharing Modernization.	Continue FY 2021 program activities with new initiatives in FY 2023 include the following: SOC Assessment/ Pursuit/ Hunt (iJC3) (+\$250,000); EO Cyber Reserve Pilot Continuation/Maturity (+\$2,000,000); FireEye PCAP (+\$202,000); Encase (+\$150,000).	<p>New initiatives of SOC Assessment/ Pursuit/ Hunt (iJC3) (+\$250,000); EO Cyber Reserve Pilot Continuation/Maturity (+\$2,000,000); FireEye PCAP (+\$202,000); Encase (+\$150,000).</p> <p>Increases for: Big Data Platform (iJC3) (+\$3,181,000).</p> <p>Decreases for Integrated Joint Cybersecurity Coordination Center (iJC3) (-\$100,000); Automated Indicator Sharing Modernization (iJC3) (-\$600,000); Cybersecurity Tools and Licensing (iJC3) (-\$300,000); Deployable Incident Response Teams, Network Modeling and Enhanced Exercise Program (iJC3) (-\$302,000).</p>

Activities and Explanation of Changes Continued

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Shaping the Cybersecurity Environment (Identify and Recover) \$13,480,000	\$29,945,000	+\$16,465,000
Funds will support the following initiatives: Planning, Policy and Enterprise Risk Management; Cyber Supply Chain, MEGABYTE Act Tool, Requirements Analysis and Integration; iJC3 Cyber Operational Technology (OT) Protection; Strategy and Program Management; Security Authorization and Physical/Personnel Security Support; Data Center Optimization Initiative; 21 st Century IDEA Act; Cybersecurity Strategic Communication; and Cybersecurity Emergency Management.	Continues FY 2021 program activities with new initiatives in FY 2023 Includes funding for new initiatives: CDM Contract Labor FTEs (+\$800,000); Cybersecurity Modernization (+\$2,700,000); Enterprise Identity (EITS Customer Base) (+\$2,369,000); Strategy and Program Management, Security Authorization and Physical/Personnel Security Support and Planning, Policy and Enterprise Risk Management (+\$12,890,000); Vulnerability Disclosure Program/ Crowd Source Pen Testing (+\$3,100,000).	New initiatives for CDM FTEs (+\$800,000); Cybersecurity Modernization (+\$2,700,000); Enterprise Identity (EITS Customer Base) (+\$2,369,000); Strategy and Program Management, Security Authorization and Physical/Personnel Security Support and Planning, Policy and Enterprise Risk Management (+\$12,890,000); Vulnerability Disclosure Program/ Crowd Source Pen Testing (+\$3,100,000). Increases for CDM Security Modernization- CDM License Lifecycle Maintenance of Enterprise Licenses Renewals (+\$1,566,000); Supply Chain Risk Management as a Service (+\$1,050,000). Decreases for Strategy and Program Management, Security Authorization and Physical/Personnel Security Support and Planning, Policy and Enterprise Risk Management (-\$7,460,000); Enterprise Architecture (-\$550,000).

Cyber Modernization / SolarWinds Response and Recovery

Overview

The FY 2023 President's Budget requests \$59,006,000 to address the impacts of the SolarWinds incident at the Department of Energy. The purpose of the funding is to address response needs and does not focus on wholesale replacement of IT systems at this time. The funding request targets critical cybersecurity needs and prioritizes basic cybersecurity enhancements, including: cloud security, Security Operations Center (SOC) enhancements, encryption, Multi-Factor Authentication (MFA), increased logging functions, and enhanced monitoring tools.

Funding Breakout and Analysis

This section summarizes the program, activities, and the budget lines associated and aligned with the overall projected OCIO Cyber Modernization/ SolarWinds Response and Recovery:

- Cloud Adoption
- Detection and Response (EDR/Logging)
- Multifactor Authentication (MFA) and Data Encryption
- Zero Trust Architecture

Budget Line: Cloud Technology Adoption - (\$18,800,000 – Request) (TOTAL = \$18,800,000)

Activity: Cloud Adoption (\$18,800,000)

Funding will be used to migrate applications to the cloud to meet the requirements of EO 14028. This effort will define cloud adoption standards and commonly used cloud architecture patterns for the major Cloud Service Providers (Amazon Web Services, Azure, and Google Cloud Platform). The cloud architecture patterns will be based off common migration use cases derived from asset inventories and discovery and will consider different stages of cloud maturity. An integrated platform service offering and enterprise repository will be established for pre-configured architecture components to allow for re-usable accelerators for cloud adoption. Development, security, and operations (DevSecOps) is the approach for automation and platform design to integrate security with cloud migrations. Funding will be used to implement DevSecOps tools to ensure consistent standards are applied for cloud migrations and runtimes. Funding will support defining cloud policy and governance, including cloud services configuration, integration, and authorized use to maintain security and compliance standards across providers. Funds will be used to establish a Cloud Center of Excellence (CoE) to support Cloud adoption understanding and planning. This effort will enable the front door for enterprise cloud knowledge management, providing the cloud education and expert support necessary for customers.

Budget Line: Detection and Response (EDR/Logging) - (\$20,700,000 – Request) (TOTAL = \$20,700,000)

Activity: Upgrade Boundary Monitoring Sensors (\$3,350,000)

IM-33 will increase the footprint of network sensors, and further facilitate the tech refresh of the Cooperative Protection Program (CPP) legacy hardware solution. Funding will be used to procure security monitoring sensors and AWS Gov cloud infrastructure to serve as phase one of a full technology refresh of the Cooperative Protection Program (CPP) custom government-off-the-shelf (GOTS) system. The tech refresh will include 43 sensors to support 22 DOE field sites, National Laboratories, and PMA sites, as well as retain sufficient inventory to pre-stage new sensors and support the replacement of faulty equipment.

Activity: Endpoint Detection and Response (EDR) (\$11,350,000)

Funding will be used for integrated endpoint security solution that combines real-time continuous monitoring and collection of endpoint data to mitigate cybersecurity threats. Integrating automation throughout these capabilities will improve the response to these threats and provide analytic tools to thwart future attacks. Funds will support monitoring services and provide enterprise visibility into infrastructure and applications to continuously monitor vulnerabilities. Funds will also be allocated towards implementing cyber analytic tools that analyze anomalous behavior to improve threat detection. Funds will be allocated towards implementing user and entity behavior analytics using commercial tools. Cyber Analytics will assist in baselining user traffic, perform anomaly detection, insider threat detection and enable custom alerting. Using analytics, teams can act on detection, automate quarantine, and review user behavior history. Funds will be used to implement logging as a service with event correlation for incident and problem management to enable visibility into data for security and operations. Standardizing logging for applications will simplify monitoring and alerting layers placed on top of the logging data.

Activity: Operational Technology (OT) Cybersecurity (\$1,500,000)

Funds will support the establishment of operational technology (OT) cybersecurity maturity assessment as well as development of OT cybersecurity best practices and governance. Funding will be used to document and assess the current state and establish governance for OT cybersecurity. Funds will also support developing an Authorization to Operate (ATO) program for OT systems, leveraging National Institute Standards and Technology (NIST) guidance and cross-industry collaboration. Funds will also support OT education and training to address any knowledge gaps.

Activity: Security Operations Centers (SOC) Capability Maturity (\$4,500,000)

Funds will support implementing Security Information and Event Management (SIEM) and Security Orchestration, Automation, and Response (SOAR) capabilities to aid DOE in preventing, detecting, assessing, responding, and investigating cyber incidents. Assessments of the current SOC maturity will inform areas of improvement. Funds will be allocated towards streamlining SOC operations and improving maturity. This effort also aligns with the Information Sharing EO category.

Budget Line: Multifactor Authentication (MFA) and Data Encryption - (\$8,003,000 – Request) (TOTAL = \$8,003,000)

Activity: Identity Services (\$8,003,000)

Funding will enable enterprise sites and entities to utilize mature enterprise identity offerings for application integration. Funds will support completion of the roadmap for enterprise identity services in support of AWS, Azure, and Google Cloud Platform (GCP), including application integration and Privileged Access Management (PAM). Providing a suite of capabilities to strengthen identity proofing for temporary staff not included in the scope of HSPD-12 to elevate all staff to the highest Identity Assurance Level (IAL3) defined by NIST in Special Publication 800-63-3. To acquire software licenses promulgated by USAccess to issued derived PIV credentials which are impersonator resistant to both mobile devices and Yubikey containers, expand PKI impersonator resistant software certificates, develop requirements to integrate internal identity service with USAccess, acquire Yubikey devices to replace legacy smartcards, accelerate adoption of single sign-on using multifactor authentication, license and support enterprise privilege access management (PAM) solution to protect accounts with elevated rights, implement PKI key recovery services for USAccess and internal DOE PKI, and modernize the Energy Global Directory Service exchanging PKI certificates DOE-wide supporting encryption of sensitive information.

Budget Line: Zero Trust Architecture - (\$11,503,000 – Request) (TOTAL = \$11,503,000)

Activity: Implement Zero Trust Principles (\$11,503,000)

Funding will be used to develop a Zero Trust (ZT) Framework and Maturity Assessment Model. The ZT framework will be used as a guide for applications adopting ZT in accordance with EO 14028 and ZT standards. After ZT maturity assessments are conducted, ZT technical roadmaps will be developed for applications. A standard ZT adoption progress report will be developed for applications to report progress. Activities will also include establishing and promoting cyber workforce training opportunities and developing ZT related shared services. This effort will include implementing ZT pilots and support network engineering and configuration for network segmentation. Zero Trust Principles also aligns with the Unclassified data EO category.

Activities and Explanation of Changes Continued

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Cyber Modernization / SolarWinds Response and Recovery \$0	Cyber Modernization / SolarWinds Response and Recovery \$59,006,000	+\$59,006,000
Funding will be targeted to support cloud security, Security Operations Center (SOC) enhancements, encryption, multifactor authentication, increased logging functions, and enhanced monitoring tools.	Continue FY 2022 program activities in FY 2023 for the following: Cyber response and recovery needs at the Department and enhances DOE's security posture to ensure protective measures are in place to prevent further incidents like SolarWinds.	Increase for Cyber Modernization / SolarWinds Response and Recovery (+\$59,006,000)

Corporate IT Program Support

Overview

OCIO is requesting \$31,235,000 for Corporate IT Program Support, which provides capital planning guidance, robust privacy and records management, IT products and services, and an efficient and effective IT platform. This request is an increase of \$5,929,000 from the FY 2021 Enacted.

Highlights of the FY 2023 Budget Request

- Enhanced services and automation in Enterprise Governance and FITARA operations
- Increased support for information technology service management platforms and engineering skills for new projects
- Preparation of cloud based tools and FedRamp sponsorship for expanded enterprise use of EITS Cloud Network
- Increased support for building business architecture models and Innovation Community Center (ICC) Development
- Additional funding for professional services for sandbox subscriptions, tools, and advanced configurations.

Budget Line: IT Portfolio Summary (\$22,881,000 – Request; \$8,822,000 – WCF) (TOTAL = \$31,703,000)

Activity: IT Investments for Mission Delivery and Management Support (\$1,410,000)

Funding supports enterprise-wide solution delivery and transformation with improved data ingestion, curation, usage and sharing of solutions ensuring compliance with the Federal Data Strategy, Geospatial Data Act, and Foundations for Evidence-Based Policymaking Act. Outcomes include agile methodology and assist with transitioning from legacy practices through approaches, such as Learning Agendas. The Innovations Community Center (ICC) will help DOE entities to adopt new ways of doing business through both technology and processes. This funding supports product management and enterprise-wide adoption and transformation of products and services, online capabilities such as knowledge bases, communities of interest, and exchanges that allow for information to be shared across the agency. Geospatial Fabric: Infrastructure and Implementation of Geospatial Act.

Activity: Program Management Oversight (\$4,875,000)

Funds will provide Program Integration and Innovation support for managing IT Support Services (ITSS) strategic sourcing vehicle for OCIO contracts in the areas of IT Management; Systems Development and Engineering; and IT Service Operations. Specifically, funds will support:

- Providing program management on projects, including tracking, monitoring, contractor oversight, and reporting project status and providing strategic guidance and recommendations to OCIO leadership to support evidence-based and data-driven decision-making to accomplish strategic goals of the OCIO.
- Supporting IT projects, assessing and shaping the demand pipeline for IT services across the agency, which will enable the OCIO to streamline the investment decision process for new IT products and services.
- Providing strategic design and innovation in order to clearly define and map issues, uncovering the root cause of customer pain points at project onset and developing an understanding of customer needs, preferences, and behaviors to design future state operations and enhance service delivery.
- Providing organizational change management in support of IT projects in order to account for the impact new initiatives have on operations, culture, and employees; and ensuring the capability to sustain continual IT refresh and innovation.

Activity: Proof of Concepts and Pilots (\$557,000)

The project drives Innovation by using technology in new ways to create a more efficient organization and improve alignment between technology initiatives and business goals. Funding is requested for resources to develop use cases and to showcase next generation IT solutions to the DOE enterprise such as by using Artificial Intelligence for service automation. The resources will perform customer outreach, prototype high-level IT solutions, and determine the path to production. Existing governance and OCIO cloud offerings will be leveraged, if feasible, to provision the environment and deploy the solution.

Activity: IT Investments for Governance, Federal Information Technology Acquisition Reform Act (FITARA), IT Portfolio Management, Technology Business Management (TBM) Implementation, and IT Budget Acquisition Management (\$6,528,000)

This activity supports the following:

- Directing DOE's operationalization of FITARA through IT governance; managing Department's IT investment; leading the Department's implementation of Technology Business Management (TBM) methodology; directing Departmental IT budgeting and acquisition management; and enhancing enterprise value-based IT investment decision-making.
- Leading IT planning, policy, and performance evaluation and managing strategic and tactical IT policy development, maintenance, and implementation through coordination with internal and external governance groups; and ensuring DOE compliance with e-Government requirements.
- Providing DOE enterprise oversight, support, and coordination on cybersecurity and information management legislative requirements to include Paperwork Reduction Act (PRA), FITARA, Section 508, and Enterprise tracking of IPv6 implementation; and providing technical and administrative services for governance organizations to yield effective, efficient, and secure application of information and IT for mission enhancement, operational excellence, and risk management.
- Enhancing operational efficiency through Digital Transformation to support strategic business decisions and agency compliance.

Activity: Policy and Performance Management (\$4,045,000)

Funding will support the DOE Enterprise Records Management Program and enterprise Privacy Programs, as described in the sub-activities below.

Sub-Activity: Records Management (\$2,280,000)

Funding supports preserving individual rights, keeping mission critical information available to the Department, and preserving the history of the United States by managing DOE's federal records in accordance with National Archives and Records Administration (NARA) and other Federal agency requirements. Additional funds requested for stand up of an Enterprise-wide electronic records management solution, as mandated by NARA and OMB. The solution will enable the Department to manage all permanent electronic records, including e-mail, in an automated manner. Funding is needed to continue supporting the deployment of the selected records management solution to cover all e-mail users that are provisioned by EITS, the Headquarters-based IT service provider. The records management solution will support Departmental elements, both as they currently operate and as they participate in the consolidation to Office 365. The end result will be a secure and scalable enterprise-wide solution, providing a consistent, accessible, and automated approach to electronic document and records management requirements.

Sub- Activity: Privacy Information Management (\$1,765,000)

Funding fosters the protection of individual privacy interests and the promotion of fair information practice principle by supporting HQ-driven enterprise-wide privacy information management activities in accordance with Privacy Act, E-Government Act, and OMB Privacy directives to ensure compliance with federal laws, regulations, and standards, under the direction of the DOE Senior Agency Official for Privacy (SAOP), who is also the CIO. Additional funds are requested to procure an automated privacy compliance workflow management solution that will service the DOE enterprise. An automated solution is necessary to ensure that privacy documentation is compliant with federal requirements for the creation and management of electronic information and forms. In addition, the SAOP established the Department's Privacy Compliance Monitoring Program (PCMP) to review and assess DOE Element compliance with DOE Order 206.1 and other applicable Federal privacy laws and OMB privacy requirements. The PCMP will use site visits to meet with key field personnel, provide training, and conduct preliminary compliance evaluations.

Activity: FedRAMP (\$650,000)

Funding will foster automation of privacy enhancing technology and records management tools by supporting FedRAMP preparation, compliance and sponsorship for expanded enterprise use on EITS Cloud Network of cloud based tools.

Activity: ePMO Tools (\$486,000)

Funding supports increased agile adoption, utilizing resources to perform tool assessments and pilot Project Management tools. Funding will also support developing and maintaining the IT Project Management Dashboard and project analysis and prioritization.

Activity: Folio/eCPIC Tools (\$330,000)

Funding supports the Folio IT Portfolio management tool.

Activity: CUI Implementation (\$1,500,000)

The CUI program provides the means to identify and protect the Department's most sensitive unclassified information. The program was created by Executive Order and is codified at 32 CFR part 2002. The Department's near-term completion of its internal Directive for CUI implementation accelerates implementation activities. The request will support the development of guidance to DOE programs and officers, the development and delivery of enterprise-wide outreach and training, and the acquisition and implementation of novel technological solutions to support records identification and digital marking capabilities.

Activity: Records and Forms Digitization (was: Digital Forms Modernization) (\$2,500,000)

This program will create a modern, cost effective, automated, and user-friendly approach to electronic records management. DOE currently holds more than 13,000 cubic feet of permanent and temporary federal records in paper format. By 2022, the National Archives and Records Administration (NARA) will cease accepting paper records from Federal Agencies. This means all existing paper records not sent to NARA before then will need to be digitized before they are sent to NARA. Currently, DOE lacks the ability to digitize a large volume of records. This request will help establish scanning and quality control processes, whereby the records program can have confidence that newly generated electronic copies can serve as the authoritative record copy. The program will first focus on existing HQ records but will also help jumpstart the effort across the Department. This program will also generate a fully electronic environment to develop and manage DOE forms across their entire lifecycle, from creation and approval to operational use and approval routing. It will incorporate processes for OMB review and Paperwork Reduction Act, Privacy Act, and compliance with Section 508 of the Americans with Disabilities Act. This effort will reduce the creations of paper records requiring digitization and meet agency requirements to manage all records electronically.

Summary of Funding from Working Capital Fund – Interagency Transfers business line (\$8,822,000)*

Records Storage at NARA

Funding supports the annual agreement with NARA to provide records services and storage consistent with approved records schedules.

- *Integrated Acquisition Environment*
Provides for Interagency Agreement with the General Services Administration (GSA) to provide packaged services.
- *E- Government initiatives*
Initiatives include consolidation studies of lines of businesses and other intergovernmental systems.
- *OPM Credit Monitoring*
Funds credit monitoring services for all DOE employees following the Office of Personnel Management (OPM) Personally Identifiable Information (PII) data breach.

**WCF and customer fund dollars include OCIO contributions*

Budget Line: End User – IT Infrastructure (\$4,170,000 – Request) (TOTAL = \$4,170,000)

Activity: MEGABYTE Act Tool (\$250,000)

Request will supports tools to aggregate software deployed across DOE into the enterprise architecture repository for real time access by elements across DOE. The resulting data is consumed into the enterprise architecture tool to form the DOE-wide Technical Reference Model containing COTS software products deployed across DOE. Software contained in the Technical Reference Model is reviewed for conformance to the DOE enterprise architecture policies to assure COTS software no longer supported by the vendor is removed from the environment. The Technical Reference Model informs the DOE Enterprise-wide Agreement program to achieve the objectives of the MEGABYTE Act to consolidate software acquisitions to achieve savings from aggregated acquisitions using DOE, GSA, and other Government-wide acquisition vehicles. The DOE Enterprise Architecture Governance Board (EAGB) reviews candidate software for addition to the Enterprise-Wide Agreement program on a bi-monthly basis.

Activity: 21st Century IDEA Act (\$2,020,000)

The agency has procured an enterprise cloud services to provide digital forms with electronic signatures and enterprise Web Modernization tools to fix and validate the 20 most visited websites. The agency is required under the 21st Century IDEA to report annually on the 21st Century IDEA web modernization and other efforts to meet requirements set forth in the Act. This activity includes the sub-activities listed below:

Sub-Activity: Web Modernization Enterprise Tool to perform 508 compliance across the Agency (\$500,000)

To ensure the agency is compliant with the 21st Century IDEA Act and the Web Modernization guidelines, this tool will be run against the 61 domains and 5,200 sub-domains across the agency. This tool and the technical expertise are needed to support and maintain the tool.

Sub-Activity: Digitization of Paper-based Forms (\$1,220,000)

The Enterprise Cloud services to support and maintain this complex solution requires technical staff as well as the several cloud environments to support not only the internal federal customers but the public as well. This funding is necessary to operate and maintain the system and to ensure DOE has a reliable system to ensure that public engagements and obligations are met. Funding supports the ServiceNow and Adobe managed cloud infrastructure as well as provides the professional services to document and automate workflows, approvals and electronic signatures. In order to continue support of paper-based forms to digital and the increase demand from customers to use the system this is vital to the mission of the Department. This service requires multiple skill sets to support the solution that has been put in place and will need the funding to support the staff necessary to support the operations of the system.

Sub-Activity: Electronic Signature (\$300,000)

In support of M-19-17 and M-00-15, this funding will support the infrastructure needed to provide electronic signatures to the public domain. The increasing demand to use electronic signatures make it necessary to continue to support the operations and maintenance of the system. This will include the information technology service management platform licenses and staff that will provide helpdesk support, maintenance, and operations support of the platform.

Activity: Data Center Optimization Initiative (DCOI) Program (\$1,900,000)

To help with meeting the mandates set forth in OMB -19-19 and Federal Information Technology Acquisition Reform Act (FITARA), it is important to fund software licensing of the Data Center Infrastructure Management tools to help keep the facilities more energy efficient by monitoring the heating and cooling of the building and further the efforts for application rationalization inside the data centers. This activity also supports the automated reporting and development work of the Enterprise Data Analytics Repository System (eDARS). These funds will support enterprise efforts to centralize the data across the agencies' data centers and help fund critical skill sets with supporting Data Centers and information technology service management cloud platforms.

1Budget Line: End User - EITS (\$4,184,000 – Request; \$40,022,493 – WCF; \$78,769,230 Customer) (TOTAL = \$122,975,723)

Activity: EITS Payment (\$3,996,000)

Funds desktop services for the EITS business line.

Activity: Customer Advocacy Support (\$188,000)

To provide a dedicated forum to understand our customers lines of business. The formal standup of Customer Advocacy is pivotal and central to an effective Information Technology Service Management (ITSM) strategy. Funding is for personnel to perform customer engagement in support of ITSM.

Summary of Funding from Working Capital Fund – Telecommunications business line (\$40,022,493)*

Provides connectivity for DOE Headquarters and field operations through Local and Wide Area Networks and telecommunications (telephone) services. LAN connections provide access to the EITS application host systems and cybersecurity for the internet, e-mail, and other applications. Provides for the annual network technology refresh as part of lifecycle management, which is necessary to address current risks in the areas of security and availability in the core and distribution layers of existing DOE network infrastructure. By investing in a more modern network infrastructure, the Department will enhance network cybersecurity controls and will further support the collaboration capabilities being requested within the Department.

Summary of Funding from Customers – Shared Services direct billing (\$78,769,230)*

Provides for End User Services, including asset management, help desk and deskside support, and information technology service management platform application support.

**WCF and customer fund dollars include OCIO contributions*

Corporate IT Program Support

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Corporate IT Program Support \$25,306,000	\$31,235,000	+\$5,929,000
IT Portfolio Summary \$17,529,000	\$22,881,000	+\$5,352,000
Funding will support the following activities: IT Investments for Mission Delivery and Management Support; Program Management Oversight; Proof of Concepts; IT Investments for Governance, Federal Information Technology Acquisition Reform Act (FITARA), TBM Implementation, Paperwork Reduction Act (PRA), FITARA, Section 508, IPv6, Digital Transformation and OCIO Functions; Policy and Performance Management; Enterprise Project Management Office(ePMO) Tools; Folio/ Electronic Capital Planning and Investment Control (CPIC) Tools and FedRAMP..	Funding will continue FY 2021 activities and new initiatives. Funding increases within base are provided for the following areas: IT Portfolio Management, TBM Implementation, and CIO Functions Data Collection and FISMA Reporting for enhanced services and automation; Proofs of Concepts Pilot; Policy and Performance Management Privacy.	Overall increase reflect adjustments for: an Increase in Geospatial Act and SAOGI/GIO Initiatives (+\$464,000); and IT Investments for EA, IT Portfolio Management and TBM Implementation, Governance, and CIO Functions- Data Collection, FISMA Reporting and Analysis (+\$888,000). The request includes new activities: CUI Implementation (+\$1,500,000); Digital Forms Modernization (+\$2,500,000).

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
IT Infrastructure \$3,781,000	\$4,170,000	+\$389,000
Funding will support MEGABYTE Act Tool; Data Center Optimization Initiative; and 21 st Century IDEA Act.	Funding will continue to support MEGABYTE Act Tool; Data Center Optimization Initiative; and 21 st Century IDEA Act.	Increase of funding for Data Center Optimization Initiative (+\$369,000); 21 st Century IDEA Act (+\$20,000).
End User - EITS \$3,996,000	\$4,184,000	+\$188,000
This is funding for the EITS services that EITS itself consumes – it is a customer of its own services.	Continuation of FY 2022 activities and new initiatives.	Continuation of FY 2022 activities. New initiative Customer Advocacy Support (+\$188,000).

Program Direction

Overview

OCIO is requesting \$51,129,188 for Program Direction to provide funding for 142 FTEs and associated costs for the overall management OCIO corporate program management and operations, acquisitions/contract administration, human capital management and budget support, as well as Working Capital Fund requirements.

Highlights of the FY 2023 Budget Request

The Office of the Chief Information Officer (OCIO) is requesting 18 additional Federal FTEs to increase our ability to provide critical information technology and cybersecurity support to the Department. OCIO is responsible for managing and executing critical cybersecurity defense, data protection, and policy and program oversight. Additionally, in FY2021 the release of EO 14028, *Improve the Nation's Cybersecurity*, levies requirements for moving to a Zero Trust Architecture, enhancing Cloud Security, and improved incident response which all requires additional federal FTEs to accomplish program management, governance, and execution of required tasks. Specific projects are focused on secure cloud implementations, data encryption, supply chain risk management, and zero-trust architecture. Identification and security of critical information, to include records and privacy data are critical elements of the Department's strategy to improve the cybersecurity posture of the Department.

Program Direction Funding (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Headquarters					
Salaries and Benefits	25,232	25,232	30,963	+5,731	+23%
Travel	304	304	336	+32	+11%
Support Services	3,325	3,325	3,325	-	0%
Other Related Expenses	14,233	14,233	16,505	+2,272	+16%
Total, Program Direction	43,094	43,094	51,129	+8,035	+19%
Federal FTEs- Program Direction Funded	124	124	142	+18	15%
Federal FTEs- WCF Funded	3	3	3	-	0%
Support Services					
Technical Support Services	1,515	1,515	1,515	-	0%
Business, Finance, and Procurement	1,810	1,810	1,810	-	0%
Total, Support Services	3,325	3,325	3,325	-	0%
Other Related Expenses					
Training	160	160	160	-	0%
Working Capital Fund (WCF)	11,228	11,228	13,162	+1,934	15%
Desktop Services	2,333	2,333	2,671	+338	13%
Security Investigations	512	512	512	-	0%
Total, Other Related Expenses	14,233	14,233	16,505	+2,272	14%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
\$43,094,000	\$51,129,188	+\$8,035,188
\$25,232,000	\$30,963,000	+\$5,731,000
Funding supports federal staff salaries and related benefits for 124 FTEs.	Funding supports federal staff salaries and related benefits for 142 FTEs.	This increase provides for the current federal staff and 18 new FTEs in FY 2023.
Travel \$304,000	\$336,000	+\$32,000
Funding supports mission-critical travel for federal staff.	Funding supports mission-critical travel for federal staff.	Increase outreach activities to collaborate with field sites on technology enhancements and OCIO priorities.
Support Services \$3,325,000	\$3,325,000	0
(\$1,515,000) Funding sustains operations within the front office of the CIO. Funds support contractor activities and memberships/subscription services for the CIO and senior staff.	(\$1,515,000) Continuation of activities.	(\$0) No change from FY 2022 Request.
(\$1,810,000) Funding used to maintain contractor activities in the areas of Financial Management, Budget and Internal Controls; Acquisitions; and Human Capital. These activities are critical to programmatic operations and accomplishment of program goals.	(\$1,810,000) Continuation of activities.	(\$0) No change from FY 2022 Request.
Other Related Expenses \$14,233,000	\$16,505,188	+\$2,272,188
(\$160,000) Training costs to ensure all FTEs are appropriately trained to perform their duties, and development opportunities are available to CIO's federal staff.	(\$160,000) Continuation of activities.	(\$0) No change from FY 2022 Request.
(\$11,228,000) WCF funding level accounts for estimated OCIO overhead expenses.	(\$13,162,188) Continuation of activities.	(+\$1,934,188) Increased to cover anticipated WCF costs.
(\$2,333,000) Desktop Services funds are used to provide IT services and hardware to employees.	(\$2,671,000) Continuation of activities.	(+\$338,000) Increase to cover anticipated increase in EITS costs.
(\$512,000) Security Investigations	(\$512,000) Continuation of activities.	(\$0) No change from FY 2022 Request.

Office of 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, acquisition, administrative services, and conference management support. These services are critical in supporting the mission of the Department and its program offices, as well as keeping the Headquarters (HQ) operational. MA's activities include policy development and oversight, and delivery of procurement services to DOE HQ organizations, and the management of HQ facilities. MA also fulfills the statutory and Executive Order responsibilities of the Senior Real Property Officer, Senior Procurement Executive, Chief Sustainability Officer and the Department's Advisory Committee Management Officer.

For FY 2023, MA will accomplish its mission through its program office components and associated Departmental budget lines:

- Acquisition Management – Provide corporate oversight, leadership, and develop and assist in the 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. The Director, Office of Acquisition Management serves as the Senior Procurement Executive.
- Administration – Manage HQ facilities and support services, including operations management, leased and office space management, supply management, travel (domestic and international), transportation/courier services, concession services (through the General Services Administration), exchange visitor program, mail/printing service, and the Department's Freedom of Information Act program.
- Asset Management – Develop and maintain DOE policies, regulations, standards, and procedures while tracking performance pertaining to real estate, facilities and infrastructure management, and personal property to include motor vehicle fleet management. Assist senior leadership with planning and execution decisions related to the acquisition, utilization, condition, maintenance, and disposition as they relate to real and personal property. Manage DOE's real property database and excess screening process. Manage the professional development, training, and certification of personal property and realty specialists. Ensure implementation of statutory and executive requirements across the Department. Coordinate data collection, reporting, and analysis of DOE's sustainability data, including energy, water, petroleum, and resource use. Manage and implement DOE's Strategic Sustainability Performance Plan, DOE's Climate Adaptation and Resilience Plan, and provide oversight of energy, water, sustainable buildings, and resource assessments at DOE sites and National Laboratories. Manage electric vehicle activities to further the President's goal of electrifying the Federal motor vehicle fleet. The Director of the Office of Management serves as the Chief Sustainability Officer. Additionally, the Director of Asset Management serves as the Senior Real Property Officer, and the Head of the Contracting Activity for Real Estate.
- Aviation Management – Manage all DOE-owned aircraft, manned and unmanned, 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 oversight over all DOE elements that own or use aviation as a part of their mission.
- Directives Program – Manage the Department's Directive System, the primary system for establishing, promulgating, and maintaining long-term, crosscutting, departmental policies and procedures, thus, facilitate the achievement of DOE's strategic and operational goals, while ensuring safe, secure, efficient, cost-effective operations and compliance with applicable legal requirements. Support the Department's Secretarial Delegations of Authority system.
- Executive Secretariat – Facilitate quality document management of executive correspondence, departmental actions and decisions; ensure timely delivery of Congressional reporting requirements, executive commitments and information; serve as the Department's Advisory Committee Management Officer and manage the Department's Advisory Committee Management Program.
- Ombudsman – Provide independent, confidential, and informal option for all DOE federal employees to address any workplace issues and help the Department's senior leaders, managers, and supervisors minimize unwarranted distractions; increase employee engagement; and expeditiously address individual and organization matters.

- 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.
- Scheduling and Advance – Manage scheduling, logistical, and advance preparations for the Office of the Secretary.

Highlights of the FY 2023 Budget Request

The FY 2023 Budget Request of \$86,317,000 is a \$31,959,000 increase above the FY 2021 Enacted Budget and supports 206 full time equivalent employees. The additional funding provides essential support for MA's mission success and fulfillment. Highlights of specific activities, services, and initiatives are as follows:

- \$39,815,000 (+\$5,528,000) for payroll costs in support of up to 206 FTEs for the execution of MA's mission. Additional funding will support critical mission focused acquisitions/procurement positions and increase the hiring capacity to address other vital operational needs.
- \$16,000,000 (+\$16,000,000) for purchases of Zero Emission Vehicles (ZEVs) within agency-owned vehicles fleets or as part of a transition from GSA-leased gas-powered vehicles to GSA-leased ZEVs. This funding also includes related charging infrastructure and program management costs associated with executing this funding to further the President's goal of electrifying the Federal motor vehicle fleet.
- \$13,743,000 (+\$1,471,000) for Working Capital Fund (WCF) estimated expenses that support program operations, staff operations, staff benefits, as well as provide agency mission support.
- \$4,458,000 (+\$3,306,000) for Energy Information Technology Services (EITS) expenses to cover day-to-day operational requirements for laptops, software, support services, and other essential IT equipment/services. It also provides funding to cover equipment in support of the increased telework due to the pandemic.
- \$4,085,000 (+\$450,000) for mission focused contractual support services used for systems, services, staff, activities, and initiatives. The increase covers escalation costs for contracts which supports the Department's Directives Program System, MA's Cybersecurity initiative, Conference Management policy compliance, and travel policy support, as well as other MA activities, systems, initiatives, and services.
- \$2,768,000 (+\$1,844,000) for the Freedom of Information Act (FOIA) contractual support services in support of day-to-day operational support of processing costs for inquiries.
- \$2,207,000 (+\$2,207,000) for the Strategic Integrated Procurement Enterprise System (STRIPES) Development, Modernization, and Enhancements (DME) Plan to increase efficiencies using Robotic Process Automation (RPA) and Artificial Intelligence (AI) for the DOE Acquisition and Financial Community.
- \$1,233,000 (+\$1,153,000) for Asset Management in support of the Sustainability Performance Dashboard to achieve and maintain sustainability goals in accordance with statutory and executive order requirements through data collection, analysis, reporting, and outreach. This funding also helps improve the capabilities and functions of the Dashboard, which will continue to reduce the reporting burden, enhance data quality, and allow programs to leverage the information for strategic operational decisions.

**Office of Management
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted (\$)	FY 2023 Request vs. FY 2021 Enacted (%)
Salaries and Benefits	34,287	34,287	39,815	5,528	16%
Travel	867	867	867	0	0%
Support Services	3,955	3,955	9,564	5,609	142%
Other Related Expenses	15,249	15,249	20,071	4,822	32%
Electric Vehicles	0	0	16,000	16,000	0%
Total, Program Direction	54,358	54,358	86,317	31,959	59%
Federal FTEs—MA	206	206	206	0	0%
Federal FTEs—WCF	40	40	38	-2	-5%
Support Services					
Management Support	1,804	1,804	7,008	5,204	288%
Other Support Services	2,151	2,151	2,556	405	19%
Total, Support Services	3,955	3,955	9,564	5,609	142%
Other Related Expenses					
Training	151	151	151	0	0%
Energy IT Services (EITS)	1,152	1,152	4,458	3,306	287%
Working Capital Fund (WCF)	12,272	12,272	13,743	1,471	12%
Other Services	1,674	1,674	1,719	45	3%
Total, Other Related Expenses	15,249	15,249	20,071	4,822	32%

**Explanation of Changes Table
Office of Management - Funding (\$K)**

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$54,358	\$86,317	+\$31,959
Salaries and Benefits \$34,287	\$39,815	+\$5,528
Funding in support of up to 206 FTEs. Funding provides for salaries/benefits, overtime, lump sum leave, awards allocations, and performance awards.	Continued funding supports salaries/benefits, overtime, lump sum leave, awards allocations, and performance awards for up to 206 FTEs. Additional funding to cover pay raise adjustments and increase hiring capacity for critical positions.	+\$5,528 for pay raise adjustment/cost of living adjustment and hiring capacity increase.
Travel \$867	\$867	\$0
Funding in support of MA/SEAB staff travel; all travel associated with scheduling and logistics for Secretarial trips, travel associated with program oversight and evaluation, and procurement management activities. Includes the rental of vehicles from the General Services Administration motor pool and the DOE fleet.	Funding in support of MA/SEAB staff travel; all travel associated with scheduling and logistics for Secretarial trips, travel associated with program oversight and evaluation, and procurement management activities. Includes the rental of vehicles from the General Services Administration motor pool and the DOE fleet.	No change.
Support Services \$3,955	\$9,564	+\$5,609
Funding supports MA activities including ACMP, Cross Agency Priority Goals/Council Payment, SPD contractual requirements, FOIA processing costs and contractual requirements.	Funding supports continuation of MA activities including ACMP, Cross Agency Priority Goals/Council Payment, SPD contractual requirements, FOIA processing costs, Directives Program System, and other contractual requirements. Additional funding supports FOIA, Sustainability Performance Dashboard, STRIPES DME, and contractual support services cost escalations.	+\$2,207 for STRIPES DME, RPA and AI initiative. +\$1,844 for FOIA cases processing costs. +\$1,153 for the Sustainability Performance Dashboard maintenance. +\$405 for contractual support services cost escalations.
Other Related Expenses \$15,249	\$20,071	+\$4,822

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Other related expenses funding to cover EITS, WCF, training and other services necessary for organizational mission support.	Other related expenses funding supports continuation of EITS, WCF, training and other services necessary for organizational mission support. Additional funding covers operational expenses for WCF and EITS.	+\$3,306 for EITS costs to cover laptops, software, support services, and other essential equipment/services. +\$1,471 for WCF activities/services costs. +\$45 for contractual support services cost escalations.
Electric Vehicles \$0	\$16,000	+\$16,000
N/A	Funding for electric vehicles purchases and leases to further the President's goal of electrifying the Federal motor vehicle fleet.	+\$16,000 for electric vehicles purchases, leases, and charging equipment.

Office of Project Management Program Direction

Overview

The Office of Project Management (PM) provides the Department of Energy (DOE) leadership and assistance in developing and implementing DOE-wide policies, procedures, programs, and management systems pertaining to project management. The Director, Office of Project Management (PM-1) serves as the Deputy Secretary's senior advisor for project management. PM is directly accountable to and supports the Deputy Secretary as the Executive Secretariat of the Department's Energy Systems Acquisition Advisory Board (ESAAB) and the Project Management Risk Committee (PMRC). The Deputy Secretary chairs the ESAAB. PM conducts statutorily required independent cost estimates and conducts external independent reviews to validate performance baselines as required by DOE Order 413.3B for capital asset projects with a Total Project Cost (TPC) of \$100,000,000 or greater. PM manages the Department's Project Management Career Development Program (PMCDP) for DOE's Federal Project Directors.

In FY 2023, PM will accomplish its mission through its program office functions:

- **Energy Systems Acquisition Advisory Board (ESAAB).** The PM Director serves as Executive Secretariat (and member) of the ESAAB and the PMRC for the Deputy Secretary. The Board reviews all capital asset projects with a Total Project Cost (TPC) of \$100,000,000 or greater. The Board focuses on projects at risk of not meeting their performance baselines and on making critical decisions for capital asset projects with a TPC of \$750,000,000 or greater. The ESAAB is a standing board that meets at least once quarterly and is supported by the PMRC, which meets at least monthly. Additional ESAAB and PMRC meetings are scheduled as necessary to support departmental objectives and Program Office and project team schedules.
- **Project Management Policy and Systems (PMPS).** PM provides DOE-wide policy, guidance, and oversight for project management. PM provides senior leaders with monthly project status reports with independent assessments of all capital asset projects with a TPC greater than \$50,000,000 with a goal of driving improvements in project management and project delivery outcomes. PM maintains the Project Assessment and Reporting System (PARS), the Department's independent central repository for project performance data, project management metrics and key project documentation.
- **Independent Cost Reviews/Estimates.** PM conducts independent cost reviews (ICRs) or prepares statutorily required independent cost estimates (ICEs) at critical decisions including re-baselining, 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, are funded by the Program Office/Project requiring it.
- **Project Oversight.** PM conducts external independent reviews (EIRs) to validate the project performance baselines (scope, cost, and schedule) of all capital asset projects with a TPC of \$100,000,000 or greater. Additionally, PM ensures projects are ready to be brought forward to the appropriate Project Management Executive (PME) for authorization to proceed prior to each critical decision.
- **Project Assessments.** PM conducts annual independent project peer reviews (PPRs) of all active energy programs capital asset projects with a TPC of \$100,000,000 or greater under the purview of the Office of the Under Secretary of Science and Energy and the Office of Petroleum Reserves, under the purview of the Under Secretary for Infrastructure, and all Office of Environmental Management projects with a TPC of \$400,000,000 or greater and those projects that have experienced post CD-3 challenges. All costs associated with conducting PPRs, to include PM federal staff travel, is funded by the appropriate Program Office.
- **Earned Value Management System (EVMS) Certification.** PM conducts initial certification and periodic surveillance reviews to ensure contractors' 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, are funded by the Program Office/Project requiring the RFC or recertification reviews.
- **Project Management Support Office.** PM serves as the Project Management Support Office (PMSO) for all energy programs under the purview of the Office of the Under Secretary of Science and Energy and the

Office of Petroleum Reserves, under the purview of the Under Secretary for Infrastructure. In collaboration with the Program Offices, PM performs all PMSO functions in accordance with DOE Order 413.3B, as appropriate.

- **Professional Development.** PM manages the Department's Project Management Career Development Program (PMCDP) to include the professional development, training, and certification of Federal Project Directors (FPDs). The PM Director serves as co-chair and Executive Secretariat for the FPD Certification Review Board (CRB).

Highlights of the FY 2023 Budget Request

In FY 2023, the Department requests \$13,550,000. The Director, Office of Project Management (PM-1) is the Deputy Secretary's senior advisor for project management. The Office of Project Management (PM) is accountable to and serves the Deputy Secretary as the Executive Secretariat for the Department's Energy Systems Acquisition Advisory Board (ESAAB) and the Project Management Risk Committee (PMRC). PM executes critical Department-wide functions to include preparing statutorily required independent cost estimates; performing external independent reviews to validate performance baselines; conducting earned value management system certification and surveillance reviews; providing project management policy; guidance, and oversight of all capital asset projects; and manages the Project Management Career Development Program (PMCDP).

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Request	FY 2023 Request vs. FY 2021 Request (%)
Program Direction					
Salaries and Benefits	6,008	6,008	6,284	+276	5%
Travel	274	274	274	0	0%
Support Services	5,177	5,177	5,389	212	4%
Other Related Expenses	1,541	1,541	1,603	+62	4%
Total, Program Direction	13,000	13,000	13,550	+550	4%
Federal FTEs	31	31	31	0	0%
 Support Services					
External Independent Reviews (EIRs)	1,773	1,773	1,985	212	11%
Earned Value Management System (EVMS) Certification	1,247	1,247	1,247	0	0%
Project Assessment and Reporting System (PARS)	2,000	2,000	2,000	0	0%
Other Support Services	157	157	157	0	0%
Total, Support Services	5,177	5,177	5,389	212	4%
 Other Related Expenses					
Training	20	20	20	0	0%
Energy IT Services	480	480	533	+53	11%
Working Capital Fund (WCF)	1,041	1,041	1,050	+9	1%
Total, Other Related Expenses	1,541	1,541	1,603	+62	4%

Program Direction

Activities and Explanation of Changes		
FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$13,000,000	\$13,550,000	+\$550,000
Salaries and Benefits \$6,008,000	\$6,284,000	+\$276,000
Funding in support of 30 FTEs.	Continuation of FY2021 activities.	The increase assumes 4.6% pay increase in civilian salaries, FERS increase, and supplemental funds for performance award pool increase in FY 2023.
Travel \$274,000	\$274,000	\$0
Funding in support of PM staff travel. Travel is necessary to support review activities (excluding Baseline Change Proposals (BCPs), Reviews for Cause (RFC), and Earned Value Management System (EVMS) recertification reviews) of program/project activities in the field.	Continuation of FY2021 activities.	No Change.
Support Services \$5,177,000	\$5,389,000	\$212,000
Funding in support of contractual requirements, including External Independent Reviews (EIRs), Project Peer Reviews (PPRs), Earned Value Management System (EVMS) certification and surveillance reviews, Project Assessment and Reporting System (PARS).	Funding supports the continuation of FY2021 activities.	Increase in EIRs scheduled.
Other Related Expenses \$1,541,000	\$1,603,000	+\$62,000
Other related expenses to cover Energy IT Services (EITS), Working Capital Fund (WCF) and other services.	Continuation of FY2021 activities.	Increase for WCF contract annual adjustments, space, and computer support for estimated FTEs.

Chief Human Capital Officer Program Direction

Overview

The Office of the Chief Human Capital Officer (HC) supports the Department of Energy's (DOE) mission through workforce services and solutions. In support of the Department, HC strives to provide the most efficient and effective human resources (HR) services and human capital programs and meet its fundamental deliverable to customers—enhancing their ability to fill vacant positions in a timely manner with quality hires. This is accomplished 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 2023 Budget Request

The Department requests \$35,366,000 in FY 2023 for HC to support current operational levels, increase federal personnel to accelerate hiring and close the gap between enacted and current departmental staffing levels, and maintain its vital customer service mission. This request will provide sufficient resources to support ongoing initiatives related to developing more agile, cost-effective operations and a long-term vision for modernizing hiring practices, as well as improving the ability of the DOE workforce to deliver mission outcomes. This includes rebuilding capacity across DOE and reducing time-to-hire. Additionally, it will enable HC to enhance its operational capacity to carry out personnel actions and conduct strategic workforce planning related to proposed Departmental programmatic changes in the FY 2023 budget. HC is strategically positioned to provide oversight of human capital matters that pertain to DOE programmatic priorities, increase targeted outreach to underserved communities, surge hiring to close existing gaps as well as in support of the *Bipartisan Infrastructure Law*, changes to skill requirements of existing personnel, and fluctuating staffing levels—this includes an emphasis on workforce planning and development of effective talent management strategies to ensure DOE can successfully perform its mission.

HC Shared Service Center

In FY 2022 HC re-organized DOE's Consolidated Human Resources (HR) Oak Ridge Shared Service Center (ORSSC) and the HC Headquarters staff into the HC Shared Service Center (HCSSC) to create a more expansive SSC structure to provide the resources necessary to support the unique missions of HC's 32 HQ customers and their associated field offices. The HCSSC provides the full range of human capital management operational functions to support Federal employees (executive and non-executive). The HCSSC provides HR transactional services as well as recruitment, advisory, and consultative services to ensure consistent and seamless HR operational services are provided to our serviced population. Additionally, HC's Office of Talent Management; Office of Corporate Executive Management; Office of Policy, Labor and Employee Relations; and Office of Business Operations are now part of the HCSSC allowing us to provide an all-inclusive shared service approach on the full range of HC services and functions for our customers. Responsibilities include recruitment, staffing, classification, administering benefits, processing personnel actions, entering and maintaining employee data to DOE's Corporate Human Resources Information System (CHRIS) and other personnel systems, establishing and maintaining employees' electronic Official Personnel Folder (eOPF) in accordance with OPM regulations, and supporting personnel data requests from DOE and OPM.

This request provides for 148 FTEs to accelerate closing the hiring gap in approved versus onboard Department staffing levels (over 1,000 vacancies) and strengthen the Department's Intern Hiring program, and to support the Talent Teams. In addition, HC directs user funded human capital work (\$17,200,000) for 90 FTEs provided by Memoranda of Agreement with: Environmental Management (30 FTEs), Energy Efficiency and Renewable Energy (12 FTEs), Energy Information Administration (2 FTEs), Fossil Energy and Carbon Management (15 FTEs), Nuclear Energy (5 FTEs) and Science (26 FTEs).

Talent Teams and Assessments

DOE is implementing new Talent Teams to bring us into compliance with Executive Order 13932 *Modernizing and Reforming the Assessment of Federal Job Candidates*. These teams will work with subject matter experts from our serviced organizations to develop and/or implement new assessment tools for technical competencies as well as automated solutions to analyze and streamline the hiring process while more effectively assessing job applicants based on demonstrated job-related competencies. Additionally, these teams will work with our Office of Recruitment and Advisory services to increase our targeted outreach to underserved communities. HC requests \$1,400,000 to support 6 FTEs to staff these teams as well as for the development or procurement of assessment and outreach tools to support the initiative.

HR Information Technology Enhancements

The Department requests continued funding for the following IT enhancements. These investments will enable the Department to leverage data as a strategic asset for workforce management. HC will continue to explore DOE integrated IT solutions that reduce labor intensive data integration from multiple systems, improve data analytics, and automate recurring Human Capital processes. This includes evaluating software solutions to support resume review, applicant tracking, and technology to support virtual job fairs in support of surge hiring and strengthening our intern hiring program. Additionally, HC is using database development to create integrated data reporting from multiple data sources and researching other technologies to better match the recruitment needs of DOE Hiring Managers.

Implementation of USA Hire

HC requests \$100,000 to implement *USA Hire*. *USA Hire* is OPM's innovative and interactive assessment tool that integrates with DOE's hiring management system *USA Staffing* built by Industrial and Organization Psychologists and uses assessment methods that are better predictors of job performance than assessments that allow applicants to self-report on their level of expertise, thereby improving DOE's candidate pool of applicants received.

HR Information Technology Platform

HC requests \$500,000 to support continued collaboration with DOE's Chief Financial Officer (CFO) and Chief Information Officer (CIO) to study and identify Agency solutions for our HR IT platform to expand technological capabilities to improve personnel processing/recruiting efficiencies through metrics and data analytics. Efforts continue in the migration of the Corporate Human Resources Information System to the upgraded PeopleSoft v9.2 scheduled to be completed at the end of FY23. Migration was delayed for development and implementation of the position management module in v9.1 to better manage and monitor agency staffing plans and to better manage positions regarding recruiting and employee lifecycle management. This migration will allow the implementation of security patches that are vital in ensuring highly sensitive employee data is protected to the greatest extent. Work is also slated to commence in FY23 for the development of a telework management module to more effectively manage the workforce of the future. All these efforts will enable HC to produce quantitative and qualitative analyses that help drive human capital business decisions and reduce labor intensive, ineffective, and costly methods for triangulating workforce information.

HR Dashboard

HC requests \$400,000 for continued evaluation, design, and implementation of alternative solutions to Human Capital Management (HCM) systems that support integration, enhanced recruit management dashboard capabilities, and real-time data access to assist DOE senior leaders and front-line managers' decision making aligned with a workforce of the 21st century. HC will work in conjunction with CFO and OCIO, to identify options that will best meet DOE's future HCM service delivery needs. These efforts may include leveraging existing software available through OCIO or procuring new innovative solutions that will allow HC to explore Integration Platform as a Service, Software as a Service and Artificial Intelligence technologies to meet customer data and dashboard needs.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	18,716	18,716	26,365	+7,649	+41%
Travel	150	150	150	-	0%
Support Services	653	653	1,100	+447	+68%
Other Related Expenses	5,399	5,399	7,751	+2,352	+44%
Total, Program Direction	24,918	24,918	35,366	+10,448	+42%
Federal FTEs*	134	134	148	+14	+10%
HC Shared Service Center (HCSSC) FTEs**	89	89	90	+1	+1%
 Support Services					
Management Support					
Training and Education	100	100	100	-	0%
Other Support	553	553	1000	+447	+81%
Total, Support Services	653	653	1100	+447	+68%
 Other Related Expenses					
Other Services	607	607	2,140	+1,533	+253%
Energy IT Services	739	739	973	+234	+32%
Working Capital Fund	4,053	4,053	4,638	+585	+14%
Total, Other Related Expenses	5,399	5,399	7,751	+2,352	+44%

*HC's FTE level of 148 includes funding for 23 FTEs supporting the HCSSC.

**HCSSC Operations and FTEs are funded separately through Memoranda of Agreements from six programs outside of HC (Energy Efficiency and Renewable Energy, Environmental Management, Energy Information Administration, Fossil Energy and Carbon Management, Nuclear Energy, and Science)

Activities and Explanation of Changes

FY2021 Enacted	FY2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$24,918,000	\$35,366,000	+\$10,448,000
Salaries and Benefits \$18,716,000	\$26,365,000	+\$7,649,000
Provides for 134 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 and two former employees receiving workers' compensation from the now closed Alaska Power Administration (APA). FTEs support core HC mission functions of policy development, 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.	Supports increase to 148 FTE level, which supports core HC mission functions by fully funding the approved staffing plan, additional FTE to accelerate hiring and outreach efforts, and Talent Teams, as well as workers' compensation payments.	Includes 14 additional FTE, 4.6% increase in civilian salaries, FERS increase, and supplemental funds for performance awards in FY 2023.
Travel \$150,000	\$150,000	\$0
HC staff travel includes program oversight, program evaluation, recruitment, and permanent change of station moves. Primary travel need is associated with OPM-mandated accountability audits critical to maintaining agency-delegated HR authority.	Continuation of required HC staff travel activities and DC HQ visits of remote staff. HC uses WebEx and Teams for internal meetings and partners with other internal organizations and web and video conference as feasible.	
Support Services \$653,000	\$1,100,000	+\$447,000
Includes funding for: HC staff training; HC core contractors and services for the HC Shared Service Center (HCSSC); HC share of DOE Consolidated HR Service Support (retirement calculator, Employee Assistance Program - Worklife); other HC Licenses subscriptions; and other HR tools (Partnership for Public Service, CHCO Council, survey tool, CyberFeds).	Continuation of HC core contract support, and augmentation of service for HR surge work from contractor support due to variability of staffing within the department (separation, retirements, onboards).	Contract escalation increases and initial funding of new contractor support vehicle to perform surge staffing actions and increase hiring capacity to quickly close the departments hiring gaps.

Other Related Expenses \$5,399,000	\$7,751,000	+\$2,352,000
<p>Other Related Expenses (ORE) provides for Working Capital Fund (WCF) and Energy IT Services (EITS). Includes funding for HC-internal office administration needs (e.g., software and hardware, Council fees, small automation system support, rent for HR HC Shared Service Center (HCSSC) facility in Oak Ridge.</p>	<p>Continuation of WCF and EITS services, as well as HC Headquarters Security Investigations. Funds modernizing HR IT systems/tools, data analytic tools, workforce forecasting models, centralized DOE Corporate Recruitment initiatives, and customized tools to improve/automate manual HR processes (e.g., licenses for SharePoint, Business Intelligence, Lever and Dashboard contractor support).</p>	<p>Increase supports inflationary escalation of WCF and EITS cost as well as increases due to additional 14 FTE; CFO/CIO/HC collaborative improvements to HR IT Platform and licenses for customized tools.</p>

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

Overview

The Office of Small and Disadvantaged Business Utilization (OSDBU) was established by the Small Business Act (SBA) of 1953, as amended by Public Law 95-507. The OSDBU is responsible for advocating the use of small businesses, including Small Disadvantaged Businesses (SDB), certified 8(a) businesses, small businesses from Historically Underutilized Business Zones (HUBZone), Service-Disabled Veteran-Owned Small Businesses (SDVOSB), and Women-Owned Small Businesses (WOSB). This involves promoting small business prime and subcontracting opportunities in accordance with Federal laws, regulations, and policies and reporting to Congress on DOE utilization of small businesses.

The goals of the OSDBU are to institutionalize the use of small businesses and to fully integrate them into the U.S. Department of Energy's (DOE) competitive base of contractors and to help the Department meet its statutory goals for small business utilization. To accomplish this goal, the OSDBU established and executes its mission through three strategic objectives: 1) make it easier for small businesses to do business with DOE; 2) maximize small business opportunities by cultivating more productive and collaborative relationships with internal DOE Stakeholders; and 3) maximize small business awards and improving performance in the four SBA socioeconomic categories.

The OSDBU is organizationally structured to accomplish this through four enabling activities:

- 1) Availing the technical advice and expertise of the OSDBU staff and the cadre of Departmental Small Business Program Managers (matrixed to OSDBU) to both DOE programs officials and small businesses;
- 2) Promulgating educational resources such as the DOE Acquisition Forecast, trainings and informational exchanges;
- 3) Adhering to OSDBU compliance requirements such as the 15 U.S. Code § 644(k), also known as the SBA Act, establishing a cadre of Small Business Technical Advisors within the agency to support the implementation of small business procurements, Form-4220 Reporting, Category Management considerations, threshold reviews; and
- 4) Planning and execution of outreach activities such as networking and matchmaking at DOE's Annual Small Business Forum and Expo, and targeted outreach events focused on socioeconomic categories. Administering and providing information and counseling concerning DOE's Mentor-Protégé Program, as well as customer support to small businesses.

The OSDBU serves as a liaison between the small business community and the DOE procurement offices.

**Program Direction
Appropriation Level and Program Level
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted (\$)	FY 2023 Request vs. FY 2021 Enacted (%)
Washington Headquarters					
Salary & Benefits	\$2,554	\$2,554	\$3,001	\$447	18%
Travel	\$10	\$10	\$30	\$20	200%
Support Services	\$300	\$300	\$49	-\$251	-84%
Other Related Expenses	\$522	\$522	\$745	\$223	43%
Total, Program Direction	\$3,386	\$3,386	\$3,825	\$439	13%
Federal FTEs	12	12	17	0	0%
Other Related Expenses					
EITS	\$57	\$57	\$233	\$176	309%
Working Capital Fund	\$450	\$450	\$502	\$52	12%
Training	\$15	\$15	\$10	-\$5	-33%
Total, Other Related Expenses	\$522	\$522	\$745	\$223	43%

**Program Direction
Activities and Explanation of Changes**

FY 2021 Enacted	FY 2023 Request Level	Explanation of Changes FY 2023 Request Level vs. FY 2021 Enacted
Program Direction \$3,386,000	\$3,825,000	\$439,000
Salaries and Benefits \$2,554,000	\$3,001,000	\$447,000
Provides funding for 12 FTEs.	Provides full funding for 17 FTEs.	Includes 4.6% increase in civilian salaries and performance awards.
Travel \$10,000	\$30,000	\$20,000
Funding for participation in outreach events, training, and counseling, as well as one-on-one meeting with small businesses.	Funding for participation in outreach events, training, and counseling, as well as one-on-one meetings with small businesses.	Funds are typically for staff to host annual Expo and for Director and staff to conduct outreach activities to Small and Disadvantage Businesses
Support Services \$300,000	\$49,000	-\$251,000
Funding for contractor support for management support services and subscription services.	Funding for contractor support for management support services, data analysis, event marketing, document creation, maintenance, and subscription services.	Reduction in contractor support and subscription services.
Other Related Expenses \$522,000	\$745,000	\$223,000
Funding for Working Capital Fund, IT services, and staff training and development, and other services.	Funding for Working Capital Fund, IT services, telecom, staff training and development, as well as other services.	Increased funding for projected increases in Departmental IT, EITS and cybersecurity costs.

General Counsel

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.

As requested by DOE Programs that manage their own National Environmental Policy Act (NEPA) policy and compliance reviews, GC environmental attorneys also provide legal advice and counsel regarding NEPA on an ad hoc basis.

Highlights of the FY 2023 Budget Request

The Office of the General Counsel's request supports 145 FTEs (\$7.58 million over FY 2021 Enacted). The increase in funding is due to depleted prior year carryover and reflects the results of a recent OPM Organization and Workload Analysis indicating a workload strain on GC staff equivalent to the need for an additional 14 FTEs. The FY2023 Request does not include funding of 49 FTEs currently being funded by other DOE Programs via MOAs: 1) 24 FTEs paid for by NE to manage the Nuclear Waste Fund, administer the Standard Contract, and provide legal services for nuclear waste disposal activities, including interim storage; 2) 13 FTEs paid by EERE to provide legal counsel and review of all EERE rulemakings and guidance documents, statutory interpretation of EERE authorities, and legislative review of all EERE-related legislation; 3) 10 FTEs paid by OCED to lead efforts to deliver clean energy technology demonstration projects at scale in partnership with the private sector; and 4) 2 FTEs paid by EM to support complex procurements, defend bid protests, and address environmental law issues, including clean-up of federal management of hazardous waste facilities (RCRA) and response to abandoned, uncontrolled hazardous waste sites (CERCLA).

GC's FY 2023 request will seek full funding to support appropriate staffing levels to ensure the quality, availability and expertise of legal support required to confidently meet the Administration's new and expanded priorities, in addition to satisfying continuing program missions and needs to include increased cost for annual maintenance of the Intellectual Property System (IP), implemented in FY 2021 and annual subscription cost for the Electronic Financial Disclosure System (e-450), which allows for a completely secure, paperless, filing and approving of financial disclosure requirements.

New in FY 2023 Request is \$500,000 supplemental NEPA funding to provide ad hoc legal advice and counsel regarding NEPA Policy Compliance and Review on DOE Program infrastructure projects supported by the *Infrastructure Investment and Jobs Act of 2021 (IIJA)* and other Federal funding sources.

**General Counsel
Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	23,482	23,482	31,066	7,584	32%
Travel and Training	150	150	150	-	0%
Support Services	1,825	1,825	1,901	150	9%
Other Related Expenses	9,543	9,543	10,105	395	4%
NEPA			500	500	0%
Total, Program Direction	35,000	35,000	43,722	8,129	23%
Federal FTEs Paid by GC DA Funds	129	128	145	-	0%
Federal FTEs Paid by other sources	37	37	49	-	0%
Total GC FTE's	182	165	194	-	0%
Support Services					
Administrative Support	825	825	852	27	3%
Technical Support	500	500	539	39	8%
Intellectual Property System	500	500	260	-240	-48%
Financial Disclosure System	0	0	250	250	100%
Total, Support Services	1,825	1,825	1,901	76	4%
Other Related Expenses					
Energy IT Services	1,400	1,400	1,530	130	9%
Working Capital Fund	6,801	6,801	6,937	136	2%
Other Services	1,342	1,342	1,638	296	22%
Total, Other Related Expenses	9,543	9,543	10,105	562	6%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY23 Request vs FY 2021 Enacted
Program Direction \$35,000,000	\$43,722,000	+\$8,722,000
Salaries and Benefits \$23,482,000 Provides funding support for 129 FTE to include salaries, benefits, overtime, etc.	\$31,066,000 Provides funding support for 145 FTEs to include salaries, benefits, overtime, etc.	+\$7,584,000 (+\$7.58M) Increase reflects increase of 14 FTEs; 4.6% pay increase in civilian salaries, FERS increase, and retirement leave for approx. 30 federal employees.
Travel & Training \$150,000 Provides for travel to attend court proceedings, site visits, conferences, and training.	\$150,000 Provides for travel to attend court proceedings, site visits, conferences, and training.	\$0 No change in activity
Support Services \$1,825,000	\$1,901,000	+\$76,000
Provides for Administrative & Technical support and includes IP & Financial Disclosure Systems	Provides for Administrative & Technical support and includes IP & Financial Disclosure Systems	(+\$76K) Increase in support costs, increase with addition of Financial Disclosure System O&M and increase to IP Systems (Sophia) for additional needs.
Other Related Expenses \$9,543,000	\$10,105,000	+\$562,000
Energy IT Services \$1,400,000 Provides GC IT service including workstations and on-site support, FISMA reviews and reporting, etc.	\$1,530,000 Provides GC IT service including workstations and on-site support, FISMA reviews and reporting, etc.	(+\$130K) No change in service, inflation for anticipated cost increases in FY 2022 and FY2023.
Working Capital Fund \$6,801,000 Provides for rent, telecommunications, I-Manage, supplies, copiers, printing, etc.	\$6,937,000 Provides for rent, telecommunications, I-Manage, supplies, copiers, printing, etc.	(+\$133K) No change in service; anticipated cost increases.
Other Services \$1,340,000 Provides for Online Legal subscription, Law Library Materials, US Patent Office charges for DOE patents, E-Gov, office furniture, etc.	\$1,638,000 Provides for Online Legal subscription, Law Library Materials, US Patent Office charges for DOE patents, E-Gov, office furniture, etc.	(+\$298k) Anticipated increase in legal subscription costs. Project costs for VTC installation in 2 conference rooms and replacement of office glass walls no longer considered safe by modern building code standards.
NEPA \$0	\$500,000	+\$500,000.00

Departmental Administration/General Counsel/
Program Direction

(+\$500k) Increase for new line item for GC-54 to provide ad hoc legal advice and counsel regarding NEPA Policy Compliance and Review.

Office of Policy Program Direction

Overview

The Office of Policy serves as the principal advisor to the Secretary, Deputy Secretary, and Undersecretaries on domestic energy policy and related integration of energy systems. Additionally, the Office of Policy provides analysis and input to Congress, the White House, and other agencies on domestic energy policy. Areas of focus for the Office of Policy reflect the most pressing issues of the day: energy prices; economic competitiveness and the energy supply chain; climate change and clean energy policy; energy jobs; community access to safe, clean, affordable energy; and scientific innovation. The Office of Energy Jobs is part of the Office of Policy. Funding for the Arctic Energy Office (AEO) comes from the Office of Policy.

The Office serves as a focal point for policy coordination within the Department on the analysis, formulation, development, and advancement of Secretarial and Administrative priorities; and related programmatic options and initiatives that support the transition to a secure, prosperous, equitable, and zero-emissions energy economy. OP coordinates policy and strategic cross-cutting functions across DOE elements and shapes strategy and policy consistent with service to the American people and the Secretary's vision for DOE. Much of OP's work is connected to expertise or information in the various program offices across the Department, and OP works closely with other offices to harmonize activities, maximize results, and avoid duplication.

The increased request from FY 2021 to FY 2023 reestablishes energy policy work as an essential function to support urgently needed technology, economic, job creation, and emissions reduction goals. OP is staffed by an interdisciplinary team of experts, with the technical and communications skills to formulate policy pathways to achieve the Secretary's strategic vision within the full breadth of DOE's statutory mission. OP carries out strategic studies and policy analysis and maintains and coordinates a supporting set of analytical capabilities. This work spans:

- technology policy, including energy decarbonization pathways and impacts analysis;
- deployment and infrastructure policy, including systems analysis and energy prices;
- state, local, and tribal policy analysis, including integrated approaches to technical assistance,
- and energy jobs.

The Office of Energy Jobs is a significant FY 2023 priority, with goals of supporting the creation of good-paying jobs with a fair chance to join a union and bargain collectively in the clean energy workforce, while creating pathways for energy transitioning communities. This work includes a focus on workforce development standards to ensure equitable and good job creation that pays family-sustaining wages, while engaging the larger labor community on energy issues through the DOE Labor Working Group. The Office of Energy Jobs provides guidance to program offices and Labs throughout the DOE complex on fair labor practices, including regular workforce-related consultation on the design of DOE programs and reports. The Office leads DOE-wide coordination on energy jobs and collaborates on interagency and Congressional activities. The Office of Energy Jobs will administer the DOE Jobs Council and publish the United States Energy and Employment Report, which is a vital and high-visibility source of data for those in the energy sector. The Office of Policy provides significant support to interagency working groups on several topics, including the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization, as well as job creation analysis and union stakeholder engagement.

The Arctic Energy Office (AEO), supported out of the OP budget, brings together assets from across DOE to work together in collaborative and innovative ways to meet the energy, science, and national security needs of the United States and its allies. AEO serves as the front door for DOE in Alaska and the global Arctic. AEO is focused on energy transitions in the context of climate changes – natural, political, economic – that are rapid and trans-regional. To accomplish its mission, AEO collaborates with the Office of the Secretary, relevant DOE program and staff offices, National Laboratories, other federal agencies, universities, non-profits, and the private sector. FY 2023 efforts will be aligned with the needs, opportunities and priorities set forth in the multi-year/multi-organization arctic research agenda under development in FY 2022.

Highlights of the FY 2023 Budget Request
Departmental Administration/
Office of Policy/Program Direction

The FY 2023 Budget Request of \$31,073,000 is a \$24,073,000 increase above the FY 2021 Enacted Budget which supports up to 43 full time equivalent employees - an increase of 26 FTEs. The additional funding provides critical support for OP's mission fulfillment to include the Office of Energy Jobs and funding for the Arctic Energy Office.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	3,144	3,144	8,748	5,604	178%
Travel	42	42	328	286	681%
Support Services	2,183	2,183	19,267	17,084	783%
Other Related Expenses	1,631	1,631	2,730	1,099	67%
Total, Program Direction	7,000	7,000	31,073	24,073	344%
Federal FTEs	17	17	43	26	153%
Support Services					
Other Support Services	2,183	2,183	19,267	17,084	783%
Total, Support Services	2,183	2,183	19,267	17,084	783%
Other Related Expenses					
Working Capital Fund	1,358	1,358	1,880	522	38%
Training	75	75	100	25	33%
Energy IT Services	206	206	680	474	230%
Other Expenses	25	25	70	45	180%
Total, Other Related Expenses	1,631	1,631	2,730	1,066	65%

**Office of Policy
Activities and Explanation of Changes**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$7,000,000	\$31,073,000	+\$24,073,000
Salaries and Benefits \$3,144,302	\$8,748,000	+\$5,603,698
Provides funding for 17 FTEs to include salaries and benefits.	Funding for salaries and benefits for the 43 FTEs to support increased workload, including additional energy jobs staff. Includes funds for Arctic Energy Office.	<ul style="list-style-type: none"> Funding provides for salaries/benefits, overtime, lump sum leave, awards allocations and performance awards. Increase covers 4.6% civilian pay raise; funding for additional salaries and benefits for FTEs.
Travel \$42,000	\$328,000	+\$286,000
Provides funding to support travel by staff, including travel to accompany the Secretary and DOE senior leadership.	Continuation of FY 2021 activities and travel to support Arctic Energy office in Fairbanks, Alaska and Energy jobs.	<ul style="list-style-type: none"> Funding supports return to pre-COVID-19 travel by staff, including travel to accompany the Secretary and DOE senior leadership.
Support Services \$2,183,000	\$19,267,000	+\$17,084,000
Provides support services needed for FY 2021 technical analysis and administrative requirements including the U.S. Energy Employment Report (USEER).	Continuation and expansion of FY 2021 activities. Additionally, supports ability to obtain research tools, annual subscriptions, other contractor support used for analysis activities. Analysis activities include data processing, systems modeling, forecasting, strategic planning, evaluation, and other approaches.	<ul style="list-style-type: none"> Funding will support ability to obtain research tools, such as subscriptions, other contractor support used for analysis activities including workshops, other reports, and the US Energy Employment Report. Significant clean energy policy analysis work is required to meet ambitious technology, economics, jobs, and emissions goals.
Other Related Expenses \$1,630,698	\$2,730,000	+\$1,099,302
Provides funding to support business costs associated with the Department's Working Capital Fund; IT equipment and support.	Continuation of FY 2021 activities and increased services and equipment related to working capital, IT, to support increase of 26 FTEs.	<ul style="list-style-type: none"> +\$522K WCF increase +\$474K IT services/equipment +\$70K Training and other expenses

**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.

PA directly supports the DOE mission by developing and implementing strategies for communicating the Department's mission, 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 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 effect cost savings at the Department by consolidating website platforms, reducing duplication, and improving 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 the mission, as PA seeks to serve the public in more efficient and effective ways online. It is through the Digital Strategy Office that PA is making government more collaborative and participatory.

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs. FY 2021 Enacted (\$)	FY 2023 Request vs. FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	2,068	2,068	3,922	+1,854	90%
Travel	190	190	190	0	0
Support Services	911	911	1,011	100	11%
Other Related Expenses	831	831	813	-18	-2%
Total, Program Direction	4,000	4,000	5,936	+1,936	49%
Federal FTEs	21	21	27	0	0
 Other Related Expenses					
Energy IT Services	113	113	145	+32	28%
Working Capital Fund	718	718	668	-50	-7%
Total, Other Related Expenses	831	831	813	-18	-2%

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs. FY 2021 Enacted
Program Direction \$4,000,000	\$5,936,000	+\$1,936,000
Salaries and Benefits \$2,068,000	\$3,922,000	+\$1,854,000
Provides funding for 21 full time employees (FTE). This includes DOE's team of media spokespersons, a New Media team managing digital communications and website efforts, the speechwriting team that supports the Secretary and other senior officials and program offices, and the administrative staff required to support DOE's mission.	Continuation FY 2021 activities and full funding for 27 FTEs.	Increase to fully fund staff of 27 and 4.6% percent pay raise for Federal employees, FERS benefits increase in FY 2023.
Travel \$190,000	\$190,000	\$0
Travel expenses support the office's ability to provide appropriate staffing to the Secretary and Deputy Secretary; Staff travel for video production and presentations at conferences to enhance the DOE mission; enhanced video projects across complex; and other media projects.	Continuation of FY 2021 activities.	No change.
Support Services \$911,000	\$1,011,000	+\$100,000
Support services include continued contractor support to upgrade and maintain the Department's digital communications and website efforts. Funding also supports initiation of contractor services.	Support services include continued contractor support to maintain and upgrade the Department's digital communications and website efforts.	The increase accounts for contractor support to maintain the Department's upgrade and website efforts
Other Related Expenses \$831,000	\$813,000	-\$18,000
Funding of Working Capital Fund and Energy IT services for 21 FTEs.	Funding of Working Capital Fund and Energy IT services for 27 FTEs	Decrease in WCF billing.

DEPARTMENT OF ENERGY
Funding by Site Detail
Departmental Administration FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Argonne National Laboratory

Strategic Partnership Projects	100	100	100
Strategic Partnership Projects and Revenues	100	100	100
Office of Technology Transitions (DA)	55	55	0
Total Argonne National Laboratory	155	155	100

Brookhaven National Laboratory

Strategic Partnership Projects	275	275	1,000
Strategic Partnership Projects and Revenues	275	275	1,000
Office of Technology Transitions (DA)	80	80	0
Total Brookhaven National Laboratory	355	355	1,000

Fermi National Accelerator Laboratory

Office of Technology Transitions (DA)	55	55	0
Total Fermi National Accelerator Laboratory	55	55	0

Idaho National Laboratory

Office of Technology Transitions (DA)	155	155	0
Total Idaho National Laboratory	155	155	0

Idaho Operations Office

Strategic Partnership Projects	1,000	1,000	2,000
Strategic Partnership Projects and Revenues	1,000	1,000	2,000
Office of Technology Transitions (DA)	1,150	1,150	0
Total Idaho Operations Office	2,150	2,150	2,000

Lawrence Berkeley National Laboratory

Strategic Partnership Projects	3,308	3,308	2,250
Strategic Partnership Projects and Revenues	3,308	3,308	2,250
Office of Technology Transitions (DA)	105	105	0
Total Lawrence Berkeley National Laboratory	3,413	3,413	2,250

Lawrence Livermore National Laboratory

Office of Technology Transitions (DA)	55	55	0
Total Lawrence Livermore National Laboratory	55	55	0

Los Alamos National Laboratory

Office of Technology Transitions (DA)	55	55	0
Total Los Alamos National Laboratory	55	55	0

National Energy Technology Lab

Strategic Partnership Projects	150	150	150
Strategic Partnership Projects and Revenues	150	150	150
Total National Energy Technology Lab	150	150	150

National Renewable Energy Laboratory

Strategic Partnership Projects	500	500	500
Strategic Partnership Projects and Revenues	500	500	500
Office of Technology Transitions (DA)	1,378	1,378	0
Total National Renewable Energy Laboratory	1,878	1,878	500

DEPARTMENT OF ENERGY
Funding by Site Detail
Departmental Administration FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Nevada National Security Site

Office of Technology Transitions (DA)	25	25	0
Total Nevada National Security Site	25	25	0

NNSA Albuquerque Complex

Strategic Partnership Projects	8,918	8,918	4,305
Strategic Partnership Projects and Revenues	8,918	8,918	4,305
Total NNSA Albuquerque Complex	8,918	8,918	4,305

Oak Ridge Institute for Science & Education

Office of Technology Transitions (DA)	220	220	0
Total Oak Ridge Institute for Science & Education	220	220	0

Oak Ridge National Laboratory

Strategic Partnership Projects	12,227	12,227	9,750
Strategic Partnership Projects and Revenues	12,227	12,227	9,750
Office of Technology Transitions (DA)	55	55	0
Total Oak Ridge National Laboratory	12,282	12,282	9,750

Pacific Northwest National Laboratory

Strategic Partnership Projects	0	0	8,645
Strategic Partnership Projects and Revenues	0	0	8,645
Office of Technology Transitions (DA)	175	175	0
Total Pacific Northwest National Laboratory	175	175	8,645

Richland Operations Office

Strategic Partnership Projects	100	100	100
Strategic Partnership Projects and Revenues	100	100	100
Total Richland Operations Office	100	100	100

Sandia National Laboratories

Office of Technology Transitions (DA)	175	175	0
Total Sandia National Laboratories	175	175	0

Savannah River Operations Office

Strategic Partnership Projects	6,700	6,700	11,200
Strategic Partnership Projects and Revenues	6,700	6,700	11,200
Total Savannah River Operations Office	6,700	6,700	11,200

Thomas Jefferson National Accelerator Facility

Office of Technology Transitions (DA)	30	30	0
Total Thomas Jefferson National Accelerator Facility	30	30	0

Washington Headquarters

Office of the Secretary	5,582	5,582	6,642
Congressional & Intergovernmental Affairs	5,000	5,000	7,142
Office of the Chief Financial Officer	53,590	53,590	62,283
Economic Impact & Diversity	10,169	10,169	34,140
Office of International Affairs	26,825	26,825	62,141
Chief Information Officer	140,200	140,200	233,731
Other Departmental Administration	141,662	141,662	219,789

DEPARTMENT OF ENERGY
Funding by Site Detail
Departmental Administration FY 2023
(Dollars in Thousands)

	FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
Strategic Partnership Projects	6,722	6,722	0
Strategic Partnership Projects and Revenues	6,722	6,722	0
Office of Technology Transitions (DA)	8,871	8,871	0
Total Washington Headquarters	398,621	398,621	625,868
Undesignated LPI			
Artificial Intelligence and Technology Office	2,500	2,500	2,608
Miscellaneous Revenues	-93,378	-93,378	-100,578
Strategic Partnership Projects and Revenues	-93,378	-93,378	-100,578
Defense-Related Administrative Support	-183,789	-183,789	-170,695
Office of Technology Transitions (DA)	5,000	5,000	0
Total Undesignated LPI	-269,667	-269,667	-268,665
Total Funding by Site for - Departmental Administration	166,000	166,000	397,203

Inspector General

Inspector General

**Office of the Inspector General
Proposed Appropriation Language**

For expenses necessary for the Office of the Inspector General in carrying out the provisions of the Inspector General Act of 1978, [57,739,000] \$106,808,000 to remain available until September 30, [2023] 2024.

Public Law Authorizations

- Public Law 95-452, “Inspector General Act of 1978”
- 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 111-258, “Reducing Over-Classification Act”
- Public Law 112-194, “Government Charge Card Abuse Prevention Act of 2012”
- Public Law 112-199, “Whistleblower Protection Enhancement Act of 2012”
- Public Law 113-6, “Consolidated and Further Continuing Appropriations Act of 2013/2014 Omnibus Appropriations Act”
- Public Law 113-101, “Digital Accountability and Transparency Act”
- Public Law 114-117, “Grants Oversight and New Efficiency Act”
- Public Law 115-53, “Cybersecurity Act of 2015”
- Public Law 114-261, “To Enhance Whistleblower Protection for Contractor and Grantee Employees”
- Public Law No. 116-117, “The Payment Integrity Information Act of 2019 (PIIA)”

**Office of the Inspector General
(\$K)**

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
57,739	57,739	106,808

Overview

The Office of the Inspector General (OIG) is dedicated to its mission to strengthen the integrity, economy, and efficiency of the Department's programs and operations. The OIG can 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.

Highlights of the FY 2023 Budget Request

The OIG focuses its efforts to enhance the efficiency and effectiveness of the Department's programs and operations by:

- **Incurred Cost Audits of Management and Operating Contracts.** The OIG will conduct independent incurred cost audits of the Department's Management and Operating Contracts, valued at over \$17,000,000,000. In addition, audits of M&O contractors' Disclosure Statements will become an integral part of the newly implemented independent audit strategy for M&O contractors' incurred costs.
- **Data Analytics.** The OIG's Data Analytics program has developed novel insights into DOE spending and anomalies. With a 30% increase in the number of audits, inspections and investigations requiring the support of data analytics, the OIG will leverage its novel insights into DOE spending and anomalies and seek to expand the use of analytic tools to identify trends or provide indications of fraud.
- **Inspections, Intelligence Oversight, and Special Projects.** OIG's Inspections team will continue to focus on intelligence oversight, special inquiries raised by Congress or senior departmental officials, and allegations received from OIG's Hotline. Since December 2019, the OIG Hotline experienced a 25% increase in complaints. Likewise, over the same period, whistleblower investigations increased more than 70% since 2019. The OIG expects this growth to continue and, as a result, will direct additional resources to perform appropriate oversight.
- **Investigations.** In recent years, the Department experienced an 18% increase in contract and grant fraud cases, an 18% increase in cases involving integrity of government officials, and a 60% increase in national security and intellectual property cases. This additional work by our Office of Investigations resulted in a 36 percent increase in the number of criminal investigations and a substantial increase in the dollar value of contractor fraud cases. The increased level of enhanced information sharing and collaboration within the department, other federal agencies, data analytics, and incurred cost audits has increased OI's workload and demand for federal investigators. In addition, the OIG seeks to expand its focus on high priority, high value areas including subcontract awards that account for several billion dollars each year, anti-trust violations, public corruption, and fraud in the areas of grants, loans, and other DOE programs. Furthermore, the OIG will continue to utilize Special Assistant United States Attorneys to increase criminal prosecutions.
- **Audits.** OIG performs audits on Department programs and operations, focused on providing reliable and credible financial and performance information. The scope of this work is determined through a risk-based approach focused on areas of greatest risk to the Department. The OIG seeks to increase oversight of key DOE program areas such as Power Marketing Administrations, Environmental Safety and Health, clean energy, national security, and other high-risk areas identified by the Department's Administration and GAO.
- **Subcontract Oversight.** The OIG continues to assess the Department's contract award and administration process to its subcontractors. Approximately ninety percent of the Department's annual budget is spent on contracting, with thirty to fifty percent of that amount being dispersed to subcontractors. To date, OIG work has resulted in sizeable settlements with subcontractors; therefore, the OIG plans to direct additional resources to the oversight of subcontract administration.

- **Cybersecurity Oversight Efforts.** Over the past year, the OIG has detected a 70% increase in the number of cybersecurity weaknesses identified, an alarming increase in vulnerabilities within the DOE IT environment. Additionally, hacks and breaches have become more sophisticated and ubiquitous. For example, the Solarwinds hack led to the infiltration of at least 18,000 government and private networks, including DOE. Consequently, the OIG seeks to expand the range and frequency of its penetration testing and other security testing measures to minimize risk to DOE systems.
- **NNSA Modernization Efforts.** NNSA has undertaken a modernization effort that involves major projects (e.g., weapons complex transformation). OIG will conduct reviews that will proactively seek to identify opportunities to improve the efficiency and effectiveness of these operations.
- **Environmental Management.** The Department's environmental liability of \$512,257,000,000 remained on the Government Accountability Office's Biennial High Risk List in 2021. The OIG will continue to review the efficacy of the Department's environmental programs.
- **Clean Energy and IT Modernization.** The OIG will expand its oversight into these, and other emerging priority areas for the Department, to help to prevent fraud, waste, and abuse in these new and expanding programs.
- **New Offices/Classified Space.** OIG will continue its efforts to open offices in strategic locations and acquire access to a sensitive compartmented information facility, pursuant to the Department's ability to provide additional space and support OIG's mission.

**Office of the Inspector General
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	46,958	46,958	81,270	+34,312	73%
Travel	2,444	2,444	2,619	+175	7%
Support Services	757	757	9,439	+8,682	1,147%
Other Related Expenses	7,580	7,580	13,480	+5,900	78%
Total, Program Direction	57,739	57,739	106,808	+49,069	85%
Federal FTEs	303	303	428	+125	41%
Support Services					
Management Support			8,634	+8,634	
Federal Information Security Modernization Act (FISMA)	757	757	805	+48	6%
Total, Support Services	757	757	9,439	8,682	1,147%
Other Related Expenses					
Council of the Inspectors General on Integrity and Efficiency (CIGIE)	190	190	351	+161	85%
Information Technology	1,537	1,537	4,943	+3,406	222%
Infrastructure			2,000	+2,000	
Training	1,443	1,443	1,656	+213	15%
Working Capital Fund	3,173	3,173	3,240	+67	2%
Other Related Expenses	1,237	1,237	1,290	+53	4%
Total, Other Related Expenses	7,580	7,580	13,480	+5,900	78%

OIG FY 2024 – FY 2027 Focus

- Continuation of FY 2023 Activities
- Expanded Data Analytics Capabilities
- Expanded Cybersecurity oversight
- Expanded contract and grant fraud cases
- Expanded Hotline and Whistleblower Activities
- Expanded Oversight of Independent Incurred Cost Audits
- Expanded Oversight of Intelligence and Counterintelligence
- Increased IT Independence

Office of Inspector General

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$57,739,000	\$106,808,000	+\$49,069,000
Salaries and Benefits \$46,958,000	\$81,270,000	+\$34,312,000
Funding supports 303 Federal staff with specialized skill sets (e.g., Certified Public Accountants, Cyber, Data Analytics, Technology Crime Investigators, and Certified Fraud Examiners) who identify significant Departmental program and operational challenges.	Continue the transition to an independent audit program and the identification of significant Departmental challenges with Full-Time Equivalent (FTE) level of 428.	The funding increase reflects an increase in FTE usage by 93 FTEs. Additional FTEs will enable OIG to provide additional support for the independent audit program. Assumes 4.6 percent pay increase in civilian salaries, FERS increase, and supplemental funds for performance award pool increase in FY 2023.
Travel \$2,444,000	\$2,619,000	+\$175,000
Funding supports travel to provide oversight at DOE's 25 geographically dispersed facilities.	Continue to perform audits, inspections, and investigations across the DOE complex.	Funding directly reflects support for increased personnel and workload, the expansion of audits, analytics, cyber, and forensic efforts in direct support of OIG's mission.
Support Services \$757,000	\$9,439,000	+\$8,682,000
Funding directly reflects interagency support services and contracts necessary to support the implementation of the independent audit program. Provides support for the Federal Information Security Modernization Act of 2014 (FISMA). Annual independent evaluations to determine whether the Department of Energy's unclassified cybersecurity program adequately protected its data and information systems.	Increased management support to the independent audit program. Continued support for independent annual evaluations in accordance with FISMA.	Funding increase directly reflects interagency support services and contracts necessary to support the independent audit program as we transition to performing more of this work within the OIG. The funding also includes FISMA support.
Other Related Expenses \$7,580,000	\$13,480,000	+\$5,900,000
This funding includes critical training 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 Inspectors General on Integrity and Efficiency (CIGIE) and to fund OIG's share of the DOE Working Capital Fund and Energy Information Technology Services.	Continue to support training, information technology needs, secure infrastructure, and other requirements in the performance of OIG duties.	The funding increase reflects forensic efforts, training support, personnel security investigations, and building a secure infrastructure. The OIG will also need to increase its investments in cloud technology, forensic hardware, and software to sustain the data analytics program, cyber, and technical crimes capabilities.

Office of the Inspector General
(\$K)

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
57,739	57,739	106,808

Bipartisan Infrastructure Legislation
(\$K)

FY 2022 Enacted	FY 2023 Enacted
18,686	13,100

Total Funding
(\$K)

FY 2021	FY 2022	FY 2023
57,739	76,425	119,908

DEPARTMENT OF ENERGY
 Funding by Site Detail
 Inspector General FY 2023
 (Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Washington Headquarters			
Program Direction - Office of Inspector General	57,739	57,739	106,808
Total Washington Headquarters	57,739	57,739	106,808
Total Funding by Site - Inspector General	57,739	57,739	106,808

Technology Transitions

Technology Transitions

**Office of Technology Transitions
Proposed Appropriation Language**

For Department of Energy expenses in carrying out the activities of the Office of Technology Transitions, \$21,558,000, to remain available until September 30, 2028: Provided, that of such amount, \$13,183,00 shall be available until September 30, 2024, for program direction.

Explanation of Change

No change. In FY 2023, funding for the Office of Technology Transitions is being requested in a separate appropriation from Departmental Administration to increase transparency and reflect the multi-year nature of program requirements.

Office of Technology Transitions Overview

The mission of the Office of Technology Transitions (OTT) is to expand the commercial and public impact of the research investments of the DOE. OTT enhances the public return on investment from DOE's technology portfolio, including the National Laboratories, through a suite of outcome-oriented activities that will enable climate change mitigation, job creation, innovation hub development, and commercialization of energy technology. Internally, OTT works to fill gaps in the research, development, demonstration, and deployment (RDD&D) continuum, providing specialized tools, training, analysis, and programs to improve the successful transition of technology from proof of concept to prototype to demonstration. OTT also supports enabling policies for, tracks the impact of, and shares success stories from the Department's commercialization and partnering activities. Externally, OTT supports development of a robust ecosystem for energy entrepreneurs and technology start-ups and seeds public-private partnerships with a diverse set of actors, including state, local and tribal entities; industry, financial, and other market players; as well as academia, non-profits, and philanthropic entities. Fundamentally, OTT supports mechanisms to make the Department's research, development and demonstration (RD&D) more deployment-ready. OTT's FY 2023 budget targets and prioritizes impact in the following areas:

- Place-based approaches to commercializing innovation, which enables catalytic ecosystems that align federal funding with incubators, private companies, National Laboratories, universities, state and local officials, investors, and non-profits.
- Entrepreneurial training and workforce development programs for Lab researchers and students, which enable the current and future workforce to convert innovation into real-world outcomes.
- Access to and searchability of DOE's intellectual property, laboratory experts, and facilities, which enables direct public-private engagement leading to partnerships.
- Support for DOE crosscutting priorities through market and commercialization pathways analysis, which enable market-informed program design and industry engagement.
- Policy coordination to expand use of funding mechanisms in DOE program design and that reduce barriers in conducting business with the DOE National Laboratories and other federal, quasi-governmental, and non-federal entities.
- Convening of and outreach to decision-makers (e.g., C-suite in private companies) to identify opportunities for partnerships to commercialize DOE technologies.

Highlights of the FY 2023 Budget Request

The Department requests \$21,558,000 for OTT in FY 2023. This level of funding will allow OTT to implement statutory authorities under the Energy Act of 2020, make targeted investments to enhance Departmental commercialization outcomes, and fully fund an ongoing regional clusters program focused on incubators and accelerators. This includes increases for strategic mission areas including market and commercialization pathways analysis and staffing increases to support an expanded program and outreach portfolio.

Future Years Energy Program (FYEP)

(\$K)

	FY 2023 Request	FY 2024	FY 2025	FY 2026	FY 2027
Office of Technology Transitions	21,558	22,000	23,000	24,000	25,000

Outyear Priorities and Assumptions

In the FY 2012 Consolidated Appropriations Act (P.L. 112-74), Congress directed the Department to include a future-years energy program (FYEP) in subsequent requests that reflects the proposed appropriations for five years. This FYEP shows outyear funding for each account for FY 2024 - FY 2027. The outyear funding levels use the growth rates in outyear account

totals published in the FY 2023 President's Budget for both the 050 and non-050 accounts. Actual future budget request levels will be determined as part of the annual budget process.

OTT priorities in the outyears include the following:

- Targeted investments to improve the commercial impact of DOE RDD&D investments and enhance Departmental commercialization outcomes.
- Execution of commercialization programs and other technology transfer activities.
- Focused market and commercialization pathways analysis and policy coordination to inform program design and industry engagement.
- Partnership development to improve awareness of partnership opportunities and to leverage the capabilities of DOE and its National Laboratories.

Funding (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Washington Headquarters					
Salaries and Benefits	3,863	3,863	5,424	+1,561	+40%
Travel	300	300	500	+200	+67%
Support Services	4,251	4,251	6,304	+2,053	+48%
Other Related Expenses	850	850	955	+105	+12%
Total, Program Direction	9,264	9,264	13,183	+3,919	+42%
Total FTEs	22	22	30*	+8	+36%
Support Services					
Management Support Services	3,951	3,951	4,804	+853	+22%
Market and Commercialization Pathways Analysis	300	300	1,500	+1,200	+400%
Total, Support Services	4,251	4,251	6,304	+2,053	+48%
Other Related Expenses					
Working Capital Fund (WCF)	570	570	570	0	0%
Other	280	280	385	+105	+38%
Total, Other Related Expenses	850	850	955	+105	+12%
Programs					
Commercialization Activities	3,375	3,375	3,375	0	0%
Energy Program for Innovation Clusters (EPIC)	5,000	5,000	5,000	0	0%
Total, Programs	8,375	8,375	8,375	0	0%
Total, Office of Technology Transitions	17,639	17,639	21,558	+3,919	+22%

Authorizations:

Public Law 109–58, “Energy Policy Act of 2005,” Title V

15 U.S. Code § 3708(b and c) - Administrative arrangements – Corporation & Administrative authorization

15 U.S. Code § 3710(a) - Utilization of Federal Technology

42 U.S. Code § 2121(a) - Authority of Commission

42 U.S. Code § 16391(e) - Establishes the Energy Technology Commercialization Fund

Public Law 116-68 Consolidated Appropriations Act 2021 – reference “Energy Act 2020” Title IX

*FTE Request was presented as 39 in the FY 2023 Budget Appendix but reduced to 30 due to late adjustments in the OTT FY 2023 Request.

Program Direction fully funds federal salaries and benefits, official travel, training, DOE Working Capital Fund, Energy Information Technology (IT) Services, associated support services contracts, and all program implementation expenses to execute the OTT mission, comply with the Energy Act of 2020 and coordinate commercialization activities with the Department, including the National Laboratories. This funding supports a communications team, market and commercialization pathways analysis function, third-party evaluation efforts, policy efforts, annual data collection and reporting, targeted stakeholder outreach and partnering efforts, and oversight and management of all programmatic activities, including the Technology Commercialization Fund (TCF), Energy Program for Innovation Clusters (EPIC), Lab Partnering Service (LPS), Energy I-Corps (EIC), the Energy Technology University Prize (ETUP), the OTT Summer Entrepreneurship Intern Program, and other commercialization programs and activities.

Communicating Successes - Stakeholder engagement is assisted by a clear understanding of the capabilities, possibilities, and impact of the National Laboratories and the broader DOE RDD&D investment portfolio. OTT regularly amplifies success stories from across the DOE complex and develops communications content to showcase the DOE innovation story. A subset of success stories is reported to Congress annually to meet statutory requirements. OTT's communications bring to life the impacts that the DOE and the National Laboratories have had on companies, industries, the Nation, and the world, underscoring the potential for further external partnerships. FY 2023 funding supports continued communications support at a sustained level.

Data Collection and Reporting - OTT gathers, verifies, and validates unclassified technology transfer partnership and metrics data for all 17 DOE National Laboratories and four production facilities on an annual basis. This effort supports annual statutory reporting on National Laboratory utilization and provides unique visibility into the commercial impact of DOE's investments in the National Laboratories and Facilities and the breadth of beneficiaries and partners across the Nation. FY 2023 funding supports data collection and reporting at a sustained level.

Summer Internship Program - OTT will continue its Summer Entrepreneurship Program for approximately 20 undergraduate students. This paid internship program will benefit a diverse cohort of participants by enhancing their education and training in technology commercialization-related fields and increasing their future marketability in these disciplines. In addition, participants will gain deep insight into the federal government's role in the creation and implementation of policies that will affect energy technology development and commercialization. Participants will also contribute to OTT mission-related research activities under the guidance of National Laboratories technology transfer and commercialization specialists and OTT staff. The Budget will sustain this program in FY 2023.

Market & Commercialization Pathways Analysis - OTT will continue to expand its market and commercialization pathways analytical capabilities to illuminate technology market trends and drivers and enable transitions of technology across the RDD&D continuum. OTT analysis helps illuminate market structures and commercial-adoption risk and helps identify commercialization opportunities for energy technologies. OTT facilitates the development and use of market analysis content, methodologies, and data services across DOE offices in both the Under Secretary for Science and Innovation (S4) and Under Secretary for Infrastructure (S3), as well as convening the National Laboratory community to promote market awareness and information sharing around resources and methodologies to enhance commercialization opportunities for DOE technologies. OTT focuses its analytical efforts on crosscutting and strategic topics and identifies and pursues technology commercialization opportunities based on these insights. OTT's market and commercialization pathways analysis complements the Department's analytical efforts to maximize the impact of DOE programs and funding.

One example of this effort is the report on Competitiveness and Commercialization of Energy Technologies that OTT produced in support of the Department's response to Executive Order 14017 on America's Supply Chains. This report provides a clear framework to identify commercialization opportunities for US-developed technologies, support US leadership in clean energy sectors, and pursue national economic, climate, and security goals. Another example is commercialization pathways and risk analytics in support of Office of Clean Energy Demonstrations (OCED) portfolio planning activities, which illustrate a collaborative relationship emerging between OCED and OTT that is rooted in the Infrastructure Investment and Jobs Act. This supplements ongoing work to accelerate technology commercialization

activities in high-priority crosscutting efforts, such as the Energy Storage Grand Challenge. These analytical products are representative of the value OTT is adding with targeted funding through its market and commercialization analysis function.

In FY 2023, OTT will continue to build out its market and supply chain analytical capability to amplify market intelligence in several crosscutting areas to accelerate the commercialization of DOE-developed technologies. Energy storage, critical materials, and the hydrogen economy are examples of high-priority topic areas that OTT will provide analytical support to.

Partnership Development - Since FY 2016, OTT has supported a high-impact outreach function to expand DOE's network of potential partners. The initial focus of these efforts was to better engage market participants, such as corporations, startups, venture capitalists, and private equity firms. Starting in FY 2019, OTT expanded this function to support increased and more substantive market-informed outreach, including to non-traditional entities, such as foundations, family offices, incubators, and accelerators, as well as non-commercial state, local, and other federal entities. The objective always is to increase awareness of the opportunities for partnership with, and to leverage the capabilities of the DOE and its National Laboratories. By working with a diverse group of capital providers and market actors with various investment time horizons, risk appetites, organizational structures, and constituencies, OTT is well-positioned to identify effective ways to help maximize the impact of the Department's RDD&D investments.

One example of OTT's outreach efforts is the InnovationXLab Summit series. These are non-technical events that target industry executives and decision-makers, investors, and National Laboratory stakeholders for a two-way exchange of information and ideas, with the goals of:

- Catalyzing public-private and public-public partnerships;
- Engaging the private sector to better understand industry's technical needs, risk appetite, and investment criteria; and
- Informing DOE RDD&D planning to increase commercialization possibilities.

To date, OTT has sponsored seven InnovationXLab Summits covering Energy Storage, Grid Modernization, Advanced Manufacturing, Artificial Intelligence, Biomanufacturing, Carbon Utilization, and Quantum Information Science and Technology, with an Arctic-focused event planned for May 2022. These events – both in-person and virtual – have included thousands of attendees and over a thousand unique Lab-Industry connections made.

FY 2023 funding will maintain planned staffing levels for strategic partnership development.

Policy Coordination and Prize Authority - OTT will continue its leadership role in coordinating commercialization policies and mechanisms across DOE and across the Federal Government. Within DOE, OTT oversees the implementation of national technology transfer and commercialization authorities and the policy priorities of the Administration and convenes the Technology Transfer Policy Board comprising DOE program office representatives and the Technology Transfer Working Group comprising National Laboratory tech transfer and commercialization professionals and DOE site office representatives. Externally, OTT coordinates with other federal agencies through the Interagency Working Group on Technology Transfer and the Federal Laboratory Consortium for Technology Transfer. Additionally, OTT serves as co-chair of and participates in the Lab-to-Market subcommittee of the Office of Science and Technology Policy's National Science and Technology Council. These activities provide an opportunity for OTT to gain insights on best practices and program designs that can be shared across the Federal Government and considered for implementation at DOE.

In FY 2023 OTT continues efforts to implement Energy Act 2020 guidance on use of prize authority as a prize center of excellence that will enable wider and more effective Departmental use of prizes by S3 and S4 programs. OTT will also work to deliver other required and ongoing Congressional evaluation and reporting requirements and recently has been leading agency efforts to explore potential use of an expanded set of partnering mechanisms and authorities, to include re-authorized Other Transaction Authority (OTA).

FY 2023 funding will support continued engagement by OTT staff with stakeholders on streamlining central policies and procedures, thus simplifying, and enabling private sector access to the capabilities and resources of the DOE National Laboratory enterprise. OTT will continue to assess, document, and disseminate best practices, including those related to

use of prize authorities, and to update the DOE Technology Transfer Execution Plan in accordance with statutory requirements.

Program Management – Funding supports HQ oversight and management of all programmatic activities, including the Technology Commercialization Fund (TCF), EnergyTech University Prize (ETUP), Energy Program for Innovation Clusters (EPIC), Lab Partnering Service (LPS), Energy I-Corps (EIC), Laboratory Technical Assistance Programs, Summer Entrepreneurship Intern Program, and other commercialization activities that support OTT’s mission. This includes the costs of both federal and contractor staff engaged directly in or in support of program management and implementation activities. FY 2023 funding will support increased program management in line with the expanding OTT portfolio of high-impact program activity.

**Office of Technology Transitions
Program Direction
Activities and Explanation of Changes**

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2021 Enacted vs FY 2023 Request
Program Direction \$9,264,000	\$13,183,000	+\$3,919,000
Salaries and Benefits \$3,863,000	\$5,424,031	+\$1,561,031
Funding supports about 22 FTEs responsible for managing OTT's commercialization portfolio and providing essential operations support. This includes management of all OTT programs, office operational support, and staff focus on creating public-private partnership opportunities and conducting market and commercialization analyses.	Funding will support an increase (+8) to 30 FTEs to support growth in the OTT commercialization portfolio. New staff will support expanded program management and implementation requirements and critical operations support.	Supports FTE increase and 2.7% cost-of-living increase in civilian salaries, FERS increase and supplemental funds for performance awards in FY 2023.
Travel \$300,000	\$500,000	+\$200,000
Funding supports travel requirements associated with DOE's commercialization portfolio, such as OTT engagement with the National Laboratories at the bi-annual Technology Transfer Working Group meetings, information gathering from Principal Investigators, outreach at industry events and conferences, and OTT participation in National Laboratory events. In the absence of in-person events for much of FY 2021, OTT has supported virtual event expenses requiring technology platforms and services.	OTT's expanding awardee portfolio will benefit from rigorous and active project management involving elevated travel. More regular in-person industry outreach and event participation should resume, including significant stakeholder engagement efforts by the Chief Commercialization Officer.	Supports expanded travel requirements for more active project management of an expanding grant portfolio, as well as expanded National Laboratory engagement around catalytic activities.
Support Services \$4,251,000	\$6,303,969	+\$2,052,969
Funding supports contractor support associated with management of OTT's programs portfolio, all communications support, access to tools and information for more informed industry engagement, market and supply chain analysis, developing guidance and policies, implementing the Administration's technology transfer and commercialization priorities and best practices, and conducting other required data collection, verification, validation and reporting.	Funding will support program implementation activities – including those performed by the National Laboratories - associated with management and stewardship of OTT commercialization programs, all communications support, access to tools and information for more informed industry engagement, market and supply chain analysis, developing guidance and policies, implementing the Administration's technology transfer and commercialization priorities and best practices, and conducting other required data collection, verification, validation and reporting.	Increase in funding reflects expansion of existing activities as well as a different business model that would shift program implementation costs from Program-to-Program Direction, including those performed by the National Laboratories, as well as funding all direct mission activities performed by contractors with Program Direction.
Other Related Expenses \$850,000	\$955,000	+\$105,000

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2021 Enacted vs FY 2023 Request
Funding will support the business costs associated with the DOE's Working Capital Fund (office space, phones, utilities, etc.); Energy IT Services (IT equipment and support); specialized software licensing; EGov- costs; security investigations; and staff development and training to maintain and enhance work related skills and capabilities.	Continuation of activities in FY 2023.	Increase driven by increasing staff size.

Office of Technology Transitions Programs

Description:

In addition to the work of federal and HQ contractor employees funded through Program Direction, OTT requests \$8.4 million in Programs funding to support Commercialization Activities and continue the successful regional incubator and accelerator program. The Budget requests a period of availability of five years for OTT's program funding.

Commercialization Activities:

Energy I-Corps - Energy I-Corps (EIC) is an eight-week training program pairing National Laboratory scientists and engineers with industry mentors to define the value proposition for the National Laboratory-based technology that they are developing. It directly addresses the OTT authorization language to "encourage students, energy researchers, and national laboratory employees to develop entrepreneurial skillsets and engage in entrepreneurial opportunities." Central to the program is a requirement to conduct extensive customer discovery interviews to deepen understanding of the market and other opportunities for a particular DOE-sponsored technology. This program fosters an entrepreneurial workforce and creates a cohort of DOE National Laboratory market-oriented researchers that have been immersed in an intense program of commercialization training centered on customer outreach and partnership with the private sector. Since the program's inception in 2015, 165 teams from 12 National Laboratories have conducted 11,500 interviews and worked with many industry sectors to discover the commercial impact of technologies they have developed at the National Laboratories. Because of the teams' participation in the program, these technologies have reached a point of commercial viability that has attracted over \$110 million in follow-on funding from both federal and private sources and 13 new companies have been launched. Additionally, over 70 licenses of DOE-funded technologies have been executed as a result of the Energy I-Corps program.

OTT funding primarily supports curriculum development and delivery of the training of the Energy I-Corps program, while participating DOE programs opt in by funding the cost of the participating researchers' time to complete the program. OTT will also directly fund promising project teams that may not align well with any one office's priorities, such as crosscutting topic teams. OTT also supports follow-on training opportunities for some of the most promising EIC program graduates.

Lab Partnering Service (LPS) - OTT's LPS meets our Energy Act 2020 mandate to: "Establish a Lab Partnering Service Pilot Program to provide services that encourage and support partnerships between the National Laboratories and public and private sector entities, and to improve communication of research, development, demonstration, and commercial application projects and opportunities at the National Laboratories to potential partners through the development of a website and the provision of services, in collaboration with relevant external entities, and to identify and develop metrics regarding the effectiveness of such partnerships."

The Lab Partnering Service (LPS) provides information to small businesses; corporate entities; State, local and Tribal officials; investors and other external stakeholders interested in advancing energy innovation and connecting with leading DOE National Laboratory assets. Specifically, LPS facilitates access to National Laboratory expertise, technologies, facilities, and success stories. LPS streamlines access to unique capabilities that were previously difficult for investors, innovators, and others to find because the capabilities are distributed across the National Laboratory enterprise and presented primarily for the scientific community. In FY 2023, OTT will focus on tracking impact and driving traffic to LPS, as well as continuing to maintain and update LPS content, especially in fields of high commercial relevance. OTT will expand virtual outreach efforts designed to maximize public use of the platform and further integrate LPS with existing National Laboratory tools and capabilities, expanding its reach. LPS will continue to upgrade and modernize the state-of-the-art patent visualization available via the Visual Patent Service (VPS.)

Technology Commercialization Fund (TCF) - In FY 2023, OTT will continue to implement the TCF, authorized in section 1001 of the Energy Policy Act of 2005 with updated flexibility provided in section 9003 of the Energy Act of 2020. OTT has taken a more strategic view on implementation of the TCF by shaping an innovative program design structure that creates efficiencies and increases impact by forming crosscutting collaborations among RDD&D organizations and DOE National

Laboratories. DOE's new, collaboratively developed approach offered program offices three options for deciding how to obligate their FY 2022 TCF funding:

1. **Technology-Specific Commercialization CRADAs:** Some DOE program offices opted to continue soliciting collaborative technology-specific partnerships between DOE labs and private sector companies in a similar manner to previous years' iterations of the TCF. OTT has worked with program offices that selected this option to ensure a focus on commercialization is maintained and other TCF requirements are incorporated.
2. **Technology-Specific Commercialization Programs:** DOE program offices were given the opportunity to develop their own proposed use of TCF funding that meets the statutory requirements of the TCF. These proposed activities can leverage or expand existing technology-specific commercialization programs or create new ones.
3. **Core Laboratory Infrastructure for Commercialization:** Eight DOE program offices worked with OTT to develop a multiple program office joint lab call that combines available TCF funding to address core barriers and known gaps impeding DOE laboratory commercialization. These proposed activities will help address and fix systemic challenges, barriers, gaps, and root causes so that DOE is more effective at driving commercialization of promising energy technologies in the future.

Moving forward, OTT and all DOE program offices expect to learn from the FY 2022 approach and will incorporate lessons learned into future fiscal year TCF approaches and lab calls. The goal for all TCF lab calls and resulting projects or programs, as set forth in TCF's authorizing statute, will continue to be "promoting promising energy technologies for commercial purposes."

EnergyTech University Prize – The EnergyTech University Prize (ETUP) is a university student competition to successfully identify a promising energy technology, assess its market potential, and create a business plan for commercialization. ETUP aims to cultivate the next generation of energy innovators while accelerating the transfer of energy technologies to the market. The prize seeks to attract the talented students of today and help them develop into the engineers, policymakers, entrepreneurs, market analysts, and project developers of tomorrow. Multidisciplinary student teams develop and present a business plan that leverages national laboratory-developed or other high-potential energy technologies. The prize is a high-leverage program sponsored by OTT, and multiple DOE RDD&D offices provide additional bonus funding.

Other Commercialization Activities – OTT continuously assesses the spectrum of commercialization activities across the Department and seeks to seed gap-filling programs and activities with small, targeted investments. Areas of opportunity in FY 2023 may include revisiting mechanisms for small businesses to better engage National Laboratories (such as technical assistance and vouchers) and directly funding catalytic Lab commercialization programs.

Regional Incubator and Accelerator Program

Energy Program for Innovation Clusters (EPIC) – EPIC is a competitive funding program for incubators supporting energy innovation clusters. OTT requests that \$5M continue to be directed to this important area. The funds have been used to implement a multi-pronged strategy involving grants and prizes supporting a portfolio of impactful and geographically diverse incubators focusing on developing strong innovation clusters, connections, and support for energy-related technology and entrepreneurship.

**Technology Transitions
Programs**

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2021 Enacted vs FY 2023 Request
Program Support \$8,375,000	\$8,375,000	\$0
Commercialization Activities \$3,375,000	\$3,375,000	\$0
Funding supports execution of the Technology Commercialization Fund, Energy I-Corps Program, Technical Assistance Programs, the Lab Partnering Service, and targeted seed investments for new high-impact, gap-filling commercialization programs.	Continuation of activities in FY 2023.	No change.
Energy Program for Innovation Clusters \$5,000,000	\$5,000,000	\$0
Funding supports the Energy Program for Innovation Clusters initiative, including prizes, grants, and other competitive offerings.	Continuation of activities in FY 2023.	No change.

DEPARTMENT OF ENERGY
Funding by Site Detail
Office of Technology Transitions FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Idaho Operations Office

Office of Technology Transitions (DA)	0	0	3,434
Total Idaho Operations Office	0	0	3,434

Washington Headquarters

Office of Technology Transitions (DA)	0	0	9,749
Total Washington Headquarters	0	0	9,749

Undesignated LPI

Technology Transitions Program Office	0	0	8,375
Total Undesignated LPI	0	0	8,375

Total Funding by Site - Office of Technology Transitions	0	0	21,558
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Working Capital Fund

Working Capital Fund

**Working Capital Fund
Program Mission
(\$K)**

FY 2021 Obligations	FY 2022 Estimate	FY 2023 Estimate
264,181	282,272	282,272

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. The Fund Manager reviews financial and business performance with Business Line Managers each quarter. These reviews culminate in an Annual Report that includes analysis of financial measures, including each business line's performance against its standards and its accomplishments.

WCF charges for full cost recovery for each business line 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 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 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.

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 provide the basis for programs to manage their utilization of the WCF and control their budgets. FY 2023 guidance states that Program Office customers may utilize Program funding (as available and appropriate) for expenses that support program operations or agency mission/support and are independent of the number of staff: A-123/Internal Controls; Copy Services; Corporate Business Systems (all segments except Flexible Spending Accounts and Subsidy For Energy Employee Transit (SEET)); Financial Statement Audits; Interagency Transfers; Mail & Transportation; Pension Studies; Printing & Graphics; Project Management Career Development Program (PMCDP); and Procurement Management. WCF expenses that support staff operations or provide staff benefits and fluctuate based on the number of staff, are funded from Program Direction: Building Occupancy; Flexible Spending Accounts and Subsidy for Energy Employee Transit (SEET); Corporate Training Services; Health Services; Overseas Presence; Supply; and Telecommunications.

Table 1
FY 2023 Working Capital Fund Budget Business Lines^a
(\$K)

	FY 2021 Obligations	FY 2022 Estimate	FY 2023 Estimate
A-123/Internal Controls	971	1,680	1,680
Building Occupancy	139,750	116,928	116,928
Copy Services	2,645	4,223	4,223
Corporate Business Systems	37,785	48,770	48,770
Corporate Training Services	3,178	2,984	2,984
Financial Statement Audits	8,764	12,160	12,160
Health Services	995	1,947	1,947
Indirect WCF	643	0	0
Interagency Transfers	8,333	8,822	8,822
Mail and Transportation Services	4,068	4,308	4,308
Overseas Presence	13,164	16,522	16,522
Pension Studies	194	553	553
Printing and Graphics	3,489	4,573	4,573
Procurement Management	8,740	16,253	16,253
Project Management Career Development Program (PMCDP)	1,618	1,678	1,678
Supplies	23	2,649	2,649
Telecommunications	29,821	38,223	38,223
Total, Working Capital Fund	264,181	282,272	282,272

^a Numbers may not add due to rounding.

Changes from FY 2022

There are no changes in WCF Budget estimates for FY 2023 from FY 2022 levels.

Table 2 summarizes projected customer billings by business line and by customer Program Office. Billing for customer organizations may change as a result of the final FY 2023 appropriations enacted for each Program Office, usage-based activities driven by consumption and/or any changes approved by the WCF Board.

Table 2
FY 2023 Working Capital Fund Budget Business Lines by Customer Program Office
(\$K)

ORG (1)	A-123/INT CNTRL	BLDG OCCUP	COPY SVCS	CORPORATE BUSINESS SYSTEMS	CORP TRNG SVCS	FIN STMT AUDITS	HEALTH SVCS	INTER-AGENCY TRANS	MAIL & TRANSP	OVERSEAS PRESENCE	PENSION STUDIES	PMCDP	PRINT & GRAPH	PROC MGMT	SUPPLY	TELECOM	TOTAL ALL ACTIVITIES	ORG
TYPE \$ *	P\$	PD\$	P\$	P\$/PD\$ (2)	PD\$	P\$	PD\$	P\$	P\$	PD\$	P\$	P\$	P\$	P\$	PD\$	PD\$	P\$+PD\$	
AI	\$ 0	\$ 180	\$ 35	\$ 25	\$ 7	\$ 1	\$ 2	\$ 1	\$ 32	\$ -	\$ -	\$ 26	\$ 4	\$ -	\$ 11	\$ 53	\$ 378	AI
AR	\$ 18	\$ 2,473	\$ 31	\$ 681	\$ 9	\$ 128	\$ 19	\$ 66	\$ 33	\$ -	\$ -	\$ -	\$ 31	\$ 137	\$ 0	\$ 498	\$ 4,123	AR
AU	\$ 10	\$ 7,426	\$ 419	\$ 550	\$ 40	\$ 73	\$ 91	\$ 57	\$ 368	\$ -	\$ -	\$ -	\$ 342	\$ 56	\$ 159	\$ 2,533	\$ 12,122	AU
BPA	\$ -	\$ 130	\$ -	\$ 81	\$ 518	\$ -	\$ 102	\$ 135	\$ 18	\$ -	\$ -	\$ -	\$ 31	\$ -	\$ 3	\$ 37	\$ 1,055	BPA
CF	\$ 2	\$ 5,225	\$ 133	\$ 412	\$ 44	\$ 18	\$ 70	\$ 19	\$ 149	\$ -	\$ -	\$ -	\$ 122	\$ 22	\$ 95	\$ 1,839	\$ 8,151	CF
CI	\$ 0	\$ 689	\$ 18	\$ 40	\$ 5	\$ 2	\$ 9	\$ 2	\$ 53	\$ -	\$ -	\$ -	\$ 20	\$ 1	\$ 23	\$ 174	\$ 1,035	CI
CR	\$ 7	\$ 882	\$ 15	\$ 115	\$ 3	\$ 49	\$ 6	\$ 24	\$ 23	\$ -	\$ -	\$ -	\$ 22	\$ -	\$ 29	\$ 52	\$ 1,227	CR
EA	\$ 4	\$ 1,754	\$ 62	\$ 150	\$ 51	\$ 28	\$ 27	\$ 25	\$ 53	\$ -	\$ -	\$ -	\$ 42	\$ 1	\$ 45	\$ 565	\$ 2,804	EA
ED	\$ 0	\$ 672	\$ 45	\$ 73	\$ 15	\$ 4	\$ 11	\$ 3	\$ 48	\$ -	\$ -	\$ -	\$ 132	\$ 14	\$ 19	\$ 216	\$ 1,252	ED
EE	\$ 82	\$ 11,664	\$ 413	\$ 2,983	\$ 147	\$ 596	\$ 147	\$ 324	\$ 153	\$ 661	\$ 20	\$ 20	\$ 587	\$ 976	\$ 219	\$ 3,756	\$ 22,747	EE
EI	\$ 6	\$ 7,929	\$ 139	\$ 810	\$ 106	\$ 44	\$ 125	\$ 37	\$ 147	\$ -	\$ -	\$ 4	\$ 199	\$ 186	\$ 86	\$ 1,264	\$ 11,083	EIA
EM	\$ 338	\$ 8,298	\$ 198	\$ 8,518	\$ 252	\$ 2,455	\$ 123	\$ 1,746	\$ 187	\$ 330	\$ 147	\$ 730	\$ 209	\$ 4,952	\$ 236	\$ 2,426	\$ 31,147	EM
FE	\$ 45	\$ 3,380	\$ 148	\$ 2,422	\$ 151	\$ 330	\$ 70	\$ 217	\$ 127	\$ 330	\$ -	\$ 75	\$ 164	\$ 2,867	\$ 73	\$ 860	\$ 11,261	FE
GC	\$ 2	\$ 5,045	\$ 91	\$ 344	\$ 51	\$ 12	\$ 65	\$ 11	\$ 87	\$ -	\$ -	\$ -	\$ 140	\$ 10	\$ 101	\$ 844	\$ 6,801	GC
HC	\$ 1	\$ 2,233	\$ 151	\$ 332	\$ 52	\$ 9	\$ 41	\$ 11	\$ 118	\$ -	\$ -	\$ -	\$ 127	\$ 26	\$ 41	\$ 911	\$ 4,053	HC
HG	\$ 0	\$ 927	\$ 15	\$ 42	\$ 10	\$ 2	\$ 7	\$ 1	\$ 53	\$ -	\$ -	\$ -	\$ 21	\$ -	\$ 5	\$ 86	\$ 1,168	HG
IA	\$ 1	\$ 1,720	\$ 60	\$ 175	\$ 13	\$ 9	\$ 23	\$ 6	\$ 11	\$ 661	\$ -	\$ -	\$ 32	\$ 43	\$ 8	\$ 437	\$ 3,200	IA
IE	\$ 1	\$ 106	\$ 9	\$ 26	\$ 1	\$ 5	\$ 1	\$ 3	\$ 13	\$ -	\$ -	\$ -	\$ 7	\$ 7	\$ 4	\$ 40	\$ 222	IE
IG	\$ 3	\$ 1,971	\$ 37	\$ 345	\$ 55	\$ 18	\$ 36	\$ 18	\$ 97	\$ -	\$ -	\$ -	\$ 37	\$ 32	\$ 20	\$ 504	\$ 3,173	IG
IM	\$ 6	\$ 6,043	\$ 181	\$ 278	\$ 31	\$ 45	\$ 43	\$ 42	\$ 399	\$ -	\$ -	\$ 2	\$ 129	\$ 932	\$ 166	\$ 2,931	\$ 11,228	IM
LM	\$ 10	\$ 441	\$ 15	\$ 288	\$ 16	\$ 73	\$ 8	\$ 52	\$ 41	\$ -	\$ 21	\$ 24	\$ 44	\$ 125	\$ 16	\$ 544	\$ 1,719	LM
LP	\$ 1	\$ 2,107	\$ 68	\$ 205	\$ 23	\$ 8	\$ 32	\$ 7	\$ 44	\$ -	\$ -	\$ -	\$ 31	\$ 4	\$ 29	\$ 551	\$ 3,109	LP
MA	\$ 3	\$ 6,060	\$ 332	\$ 570	\$ 76	\$ 19	\$ 83	\$ 30	\$ 568	\$ -	\$ -	\$ -	\$ 401	\$ 586	\$ 162	\$ 2,333	\$ 11,224	MA
NA	\$ 673	\$ 20,946	\$ 989	\$ 15,520	\$ 507	\$ 4,885	\$ 323	\$ 3,857	\$ 632	\$ 11,401	\$ 292	\$ 407	\$ 768	\$ 3,225	\$ 547	\$ 8,547	\$ 73,519	NA
NE	\$ 55	\$ 2,239	\$ 52	\$ 1,476	\$ 76	\$ 397	\$ 57	\$ 364	\$ 85	\$ 2,478	\$ 11	\$ 104	\$ 91	\$ 18	\$ 60	\$ 753	\$ 8,313	NE
NR	\$ 82	\$ -	\$ -	\$ 1,477	\$ 41	\$ 598	\$ 50	\$ 290	\$ 1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 24	\$ 2,563	NR
OE	\$ 10	\$ 1,091	\$ 62	\$ 362	\$ 16	\$ 71	\$ 23	\$ 36	\$ 87	\$ 330	\$ -	\$ 4	\$ 114	\$ 19	\$ 69	\$ 490	\$ 2,784	OE
OP	\$ 0	\$ 743	\$ 30	\$ 80	\$ 22	\$ 2	\$ 15	\$ 3	\$ 64	\$ -	\$ -	\$ -	\$ 75	\$ -	\$ 23	\$ 301	\$ 1,358	OP
PA	\$ 0	\$ 387	\$ 40	\$ 41	\$ 3	\$ 2	\$ 6	\$ 2	\$ 33	\$ -	\$ -	\$ -	\$ 39	\$ 2	\$ 12	\$ 109	\$ 677	PA
PM	\$ 1	\$ 571	\$ 39	\$ 85	\$ 16	\$ 5	\$ 11	\$ 3	\$ 26	\$ -	\$ -	\$ -	\$ 16	\$ -	\$ 4	\$ 148	\$ 927	PM
S	\$ 0	\$ 1,589	\$ 64	\$ 30	\$ 5	\$ 2	\$ 10	\$ 1	\$ 158	\$ -	\$ -	\$ -	\$ 162	\$ -	\$ 30	\$ 467	\$ 2,519	S
SB	\$ 0	\$ 270	\$ 40	\$ 52	\$ 4	\$ 1	\$ 4	\$ 1	\$ 84	\$ -	\$ -	\$ -	\$ 18	\$ -	\$ 10	\$ 101	\$ 585	SB
SC	\$ 300	\$ 6,088	\$ 162	\$ 7,440	\$ 213	\$ 2,174	\$ 172	\$ 1,283	\$ 184	\$ 330	\$ 61	\$ 275	\$ 230	\$ 1,960	\$ 187	\$ 2,377	\$ 23,436	SC
SSA	\$ 13	\$ 5,218	\$ 105	\$ 593	\$ 56	\$ 93	\$ 67	\$ 56	\$ 97	\$ -	\$ -	\$ 2	\$ 96	\$ 9	\$ 143	\$ 931	\$ 7,480	SSA
TT	\$ 0	\$ 309	\$ 24	\$ 26	\$ 6	\$ 3	\$ 4	\$ 2	\$ 18	\$ -	\$ -	\$ -	\$ 12	\$ -	\$ 16	\$ 151	\$ 570	TT
WAPA	\$ 4	\$ 124	\$ 0	\$ 2,124	\$ 344	\$ 1	\$ 63	\$ 88	\$ 16	\$ -	\$ -	\$ 4	\$ 77	\$ 42	\$ 3	\$ 368	\$ 3,258	WAPA
TOTALS	\$ 1,680	\$ 116,928	\$ 4,223	\$ 48,770	\$ 2,984	\$ 12,160	\$ 1,947	\$ 8,822	\$ 4,308	\$ 16,522	\$ 553	\$ 1,678	\$ 4,573	\$ 16,253	\$ 2,649	\$ 38,223	\$ 282,272	

* Type \$ -- P\$ = Program funding; PD\$ = Program Direction funding. Cells displayed as zeroes ("0") are rounded to zero. Numbers may not add due to rounding.

* Maximum amount is reflected for P\$; Program Office customers can still opt to use PD\$ funding at their discretion, within the authorization of their appropriation.

* A number of DOE Program Offices have no P\$ funding, therefore their WCF share is financed with PD\$.

1) Office of Clean Energy Demonstrations (OCED) was not included at the time of initial formulation. For this and other new Program Offices approved late in the FY23 formulation process and those created and appropriated per the Infrastructure Investment and Jobs Act (IIJA) – draft estimates will be provided and organizations will be included separately in the FY22-23 execution years. These organizations will be added to WCF formulation in FY24, or beyond depending on the availability of estimation data.

2) Corporate Business Systems -- FSA & SEET segments = PD\$; all other segments = P\$.

Table 3 summarizes the projected Federal Full Time Equivalents (FTEs) funded via the WCF by business line and the parent Program Office to which the FTEs are assigned in the DOE personnel system. Associated FTE costs are included as part of the indirect component of the amounts reflected in Tables 1 and 2 in line with the overall WCF goal of recovering full costs. Billing for customer organizations may change as a result of FTE vacancy status and/or any changes approved by the WCF Board.

Table 3
FY 2023 Projected FTEs Funded via the Working Capital Fund by Business Line and Parent Program Office

Business Line	Managing Org	FTEs
A-123/Internal Controls	CF	0.80
Building Occupancy	MA	24.70
Copy Services	MA	1.50
Corporate Business System (CBS)	CF/HC/MA/PA	32.15
Corporate Training Services (CTS)	HC	4.90
CyberOne	IM	0.00
Financial Statement Audits	IG	0.40
Health Services	HC	3.80
Interagency Transfers	IM	0.45
Mail & Transportation	MA	1.50
Overseas Presence	NNSA	22.00
Pension Studies	CF	0.50
Printing & Graphics	MA	6.30
Procurement Management	MA	1.30
Proj Mgmt Career Dev Prog (PMCDP)	MA	1.20
Supplies	MA	0.10
Telecommunications	IM	3.30
Fund Manager/Indirect	WCF	2.00
Total FTE Estimate		106.90

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

A-123/Internal Controls

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.

A-123/Internal Controls 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 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. Departmental programs that use proprietary financial systems are excluded from billing for this business line.

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 2023 estimates reflect historical costs for utilities as well as information provided by GSA as to the anticipated rent for future years (as of FY 2021), and projections of space usage in future years (as of FY 2021) based on input from customer organizations, historical information, space availability, and Departmental objectives.

Copy Services**Description**

This Copy Services Business Line 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 electronic files; and
- Digital news clips to programs based on subscriptions.

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 2023 estimates reflect amounts based on usage from the year prior to formulation (FY 2020).

Corporate Business Systems

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. The line of business provides efficiencies in its administration that result in a single, senior business manager for DOE's corporate business systems. The business consists of STARS, STRIPES, Funds Distribution System (FDS) 2.0, iPortal, Payment Processing, CHRIS and related sub-segments, Digital Media and Payroll.

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, and 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 Governmentwide Treasury Account Symbol (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.

Funds Distribution System (FDS) 2.0 Segment is a corporate solution that automates, standardizes, and streamlines the funds distribution and formulation processes and procedures across the Department. Costs include all operations and maintenance support, including the Chief Information Officer's Application Hosting and annual Oracle Software licensing.

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

Payment Processing Segment: The Oak Ridge Financial Service Center processes all of the Department's payments. It completes over 168,000 payments annually. Costs include operations and maintenance of Financial Accounting Support Tool (FAST), Vendor Inquiry Payment Electronic Reporting System (VIPERS), and the Department of Energy Payment and Collection (DOE-PAC) systems.

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 USA Staffing), 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. Costs include all operations and maintenance support, including the Chief Information Officer's Application Hosting and annual Oracle Software licensing.

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 of the Department's Home Page (Energy.gov), consisting mostly of application hosting, iterative development, and platform upgrades to meet ongoing scale and usage demands.

Working Capital Fund

Payroll Services Segment encompasses three areas: Payroll, Flexible Spending Account (FSA) and Voluntary Early Retirement Authority (VERA) / Voluntary Separation Incentive Payment (VSIP) administrative fees, and Subsidy for Energy Transit (SEET). Civilian payrolls are prepared based on authenticated documentation. Through the Defense Finance and Accounting 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. Payroll services accounts for and reports on employees' health benefits coverage, thrift savings plans, transit subsidies (SEET), and unemployment compensation, among other non-salary employee payments. It also processes donated leave into the Defense Civilian Pay System. Additionally, it 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. 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 2023 this is FY 2020).
- ORFSC charges programs based on a pro-rata share of processed transactions during the fiscal year prior to formulation (for FY 2023 this is FY 2020).
- 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 2023 this is FY 2021).
- SEET and FSA are charged to programs based on actual usage during the fiscal year. Estimates are derived from the twelve month period prior to formulation.

Corporate Training Services

Description

The Corporate Training Services (CTS) Business Line combines Training Delivery and Services (TDS), Learning Nucleus, OPM 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.

Learning Nucleus Segment is a web-based commercial off-the-shelf training system that provides access to online learning and training. The Learning Nucleus program provides access to online learning activities proven to improve learning outcomes and reduce costs independently or in combination with other training methods. The overall vision of the Learning Nucleus program is to provide all DOE federal employees with access to web-based training. The Learning Nucleus 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 present new topics and refresher training. Program offerings include modular course design and customized training for on-site and centralized delivery. The training management services are offered to customers on a negotiated basis only.

Office of Personnel Management (OPM) 360 Degree Assessment Program Segment provides the Department with services through an Interagency agreement with OPM. 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:

- Learning Nucleus - Participating DOE organizations pay for Learning Nucleus 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 courses.
- OPM 360 - Participation in the OPM 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 2023 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2019), except Learning Nucleus, which is based on an allocation of the number of employees on-board by organization at the beginning of the formulation year (FY 2021).

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, information technology support personnel and vulnerability testing, as required by the Federal Information Security Management Act (FISMA)]. Oversight of this process and contract activities is provided by the Office of the Inspector General.

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. Departmental programs that use proprietary financial systems (e.g., the FERC and the PMA's) will be excluded from billing for this business.

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 (DOE-wide), 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) Segment 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 Segment 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 Service segments are based on an allocation of Headquarters Federal employment on-board by organization at the beginning of the formulation year (for FY 2023, this is FY 2021). Charges for the Drug Testing segment are based on an allocation of DOE-wide Federal employment on-board by organization at the beginning of the formulation year (for FY 2023, this is FY 2021).

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 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 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).

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.

OPM Credit Monitoring - Program office cost shares are based on an allocation of HQ and Field credential numbers by organization from the beginning of the formulation year (for FY 2023, this is FY 2021).

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 threat of dangerous or hazardous items being mailed to the Department and its employees, the business line has implemented various processes for sanitizing and testing mail for dangerous or hazardous materials.

The Transportation Service includes shuttle bus operations, Headquarters executive transportation, motor vehicle fleet administration, and courier service. The shuttle bus operates between DOE Headquarters 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.

Overseas Presence

Description

The Department has a long-standing presence in several diplomatic missions around the world, enabling the Department to promote American trade and support critical treaties with our allies.

DOE funds 22 federal positions and 28 locally employed staff in 21 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

The annual bill for these charges will cover the fixed cost of the program and be allocated to programs by the Overseas Presence Advisory Board (OPAB) based on negotiations with applicable program offices.

Pension Studies

Description

Pension Studies provide program offices with an independent measure of contractor benefits and compare each contractor to both internal and external benchmarks. 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, benefit plan provisions, workforce restructuring, and pension legislation. These studies support the Department's budget projections, financial statements analysis, Office of General Counsel, and pension and post-retirement benefit management plans. Additionally, the business line regularly provides analysis and assistance to DOE program offices and contractors facing difficult pensions and benefits issues that require objective Departmental expertise.

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 regular 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.

Publicizing the results of the study has exerted pressure on the contractors to address the costs associated with their benefit plans. Given that there are 45 pension plans and 41 postretirement benefit plans, analysis across the entire complex requires a significant amount of resources.

The Pension Studies line of business and its systems also supports DOE's compliance with mandated financial reporting. This includes a Congressional mandate to provide semiannual reports to Congress in April and September with updated information on Department of Energy contractor defined benefit pension plans and mandated reporting of pensions and benefits information in the Annual Financial Report.

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. Studies are conducted on a biannual cycle (currently the even fiscal years), with reduced billings required for off-cycle years (currently odd fiscal years).

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 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 2023 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2020).

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 represents funding to various audit entities; however, the majority of the funding is provided to the Defense Contract Audit Agency (DCAA). DCAA provides audit services to the Department's program offices in support of their acquisition activities, at the request of their contracting officers. These services benefit DOE by supporting contracting officers in making determinations for reasonableness and realism, and also by validating contractor costs, indirect rates, disclosure statements, and accounting systems.

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. During FY 2021, the return on investment calculation shows that for every one dollar invested in the contract closeout activity, \$19 of uncosted funding was de-obligated from expired instruments.

Purchase Card Data Mining Segment monitors purchase card usage within the Department. DOE purchase cards are issued under a task order through the SmartPay3 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 (IntelliLink) to DOE at no cost for the basic version. This segment provides surveillance over the use of purchase cards and oversees the data mining to track and resolve suspicious purchase card transactions through risk-based analytics. DOE has incorporated customizations to the IntelliLink data mining system in an effort to enhance security.

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 quarter.
- FY 2023 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2020).

Project Management Career Development Program

Description

The Project Management Career Development Program (PMCDP) establishes requirements and responsibilities for all federal project directors (FPDs) with line management responsibility for capital asset projects. The PMCDP defines the necessary project management knowledge, skills, and abilities; project management training requirements; a career development tracking system; and a project management certification program to successfully manage DOE/NNSA projects. Certification requirements and responsibilities are applied in accordance with the Certification and Education Guidelines (CEG) developed and maintained by the Office of Project Management Oversight and Assessments and approved by the PMCDP Certification Review Board. All candidates for PMCDP certification must have individual development plans (IDPs) that address planned training and course work, details, rotational assignments, mentoring agreements, and other developmental activities defined in DOE O 361.1C, Acquisition Career Management Program, Chapter V.

Pricing Policy

In FY 2023, the business line will continue to assess programs based on the number and value of their projects in the Department's portfolio, and the number of incumbent FPDs or potential FPDs 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). The variable costs of delivering courses will be charged to programs based on their pro-rata share of targeted participants. FY 2023 estimates reflect amounts based on

programmatic statistics reported in PARS and PMCDP Program participant profile data at the time of formulation (FY 2021). 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 FPDs.

In addition, we expect some programs outside of the assessment pool to request 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 one self-service store, which carry a wide variety of consumable office products. At customers' request, it acquires specialty items, not stocked in the store. Products carried are based on review of equipment in the agency inventory and customer input and suggestions. This business operates the supply store 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 store (located in Forrestal) 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 2023 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2020); extraordinary or unusual changes in usage patterns are not anticipated in the Fund's estimates.

Telecommunications

Description

The Telecommunications Business Line consists of comprehensive enterprise activities to include: Network and Voice Infrastructure Services, DOEnet Services, Video Teleconferencing and Cellular Services.

Network and Voice Infrastructure Services Segment provides connectivity for DOE Headquarters (HQ) and Field operations through Local, Metropolitan and Wide Area Networks. This connectivity provides interoperability for organizational Local Area Network (LAN) and Metropolitan Area Network (MAN) segments in two main Headquarters (DC Metro area) and associated satellite buildings; and connectivity to the Headquarters-located corporate applications. Wide Area Network (WAN) infrastructure provides access to/from and cybersecurity for Internet access, e-mail and other applications for information processing and sharing through non-HQ infrastructure.

Voice infrastructure connects two main Headquarters and satellite buildings for internal and external phone service. The infrastructure includes communication networks, installed telephones and processing switching equipment. Telephone services includes local, long distance and international dialing; and specialized services such as operator-assisted conference calls, voice mail, call forwarding and automatic ring-back.

DOEnet Services Segment provides connectivity to the entire national complex. DOEnet is a centrally managed DOE-Wide Area Network that provides a common standard service to carry business related data, access to the Trusted Internet Connection (TIC) compliant service, and access to Headquarters Corporate applications, systems and services DOE-wide.

Cellular Services Segment encompasses procurement of cell phones, smart phones, pagers and other cellular equipment. The cellular device costs are monitored regularly, and carrier plans are centrally adjusted to attain maximum savings.

Direct Customer Charges Segment supports above-standard services including: local, long distance and international person-to-person and operator-assisted calling; specialized services such as multiple-party conferencing and electronic voice mail; Federal Relay Services which enable federal employees who are deaf, hard-of-hearing, deaf/blind, or have speech disabilities equal communication access; Wireless Access Point (WAP) hardware; cabling projects requiring use of external vendor support; toll-free services; circuit costs that support specific customer locations; and procurement of other telecommunications related equipment.

Pricing Policy

Charges for Telecommunications are based on usage of these services by program offices, including the following components:

- Network and Voice Infrastructure Services Segment – Infrastructure charges represent infrastructure costs which are composed of: (1) the cost of leased telecommunications circuits; (2) the cost of maintaining common infrastructure components and upgrades where needed; and (3) the cost of providing technical staff to install, repair and monitor/operate the various common infrastructure components. These charges are allocated among program organizations based on the number of active LAN connections and phone numbers, as a monthly charge. Since the Fund's inception, program customers have been validating the number of these connections. 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.
- DOEnet Services Segment – DOEnet costs are predominately comprised of: (1) the cost of leased telecommunications circuits; (2) site hardware components and maintenance; and (3) the cost of technical support staff. DOEnet costs are allocated to participating sites based on the costs associated with providing the service – circuit costs, hardware and maintenance costs, and the costs of technical support staff.
- Cellular Services Segment – Cellular charges represent costs which are composed of: (1) administrative support involved with ordering, activation, rate analysis, rate selection, deactivation, accumulating, translating and validating commercial vendor billing data systematically for the record keeping, accounting and financial reporting and customer reporting; (2) cellular device costs; and (3) cellular plan costs. Administrative charges are allocated among program organizations based on the number of active cellular devices, as a monthly charge. All cellular device and plan costs are allocated to the program office owner.
- Direct Customer Charges Segment – Programs are billed in proportion to consumption of goods and services. FY 2023 estimates reflect amounts based on usage from the fiscal year prior to formulation (FY 2020). Extraordinary or unusual changes in usage patterns are not anticipated in the Fund's estimates.

Crosscutting Activities

Crosscutting Activities

Department of Energy Crosscuts Overview

In FY 2023, the Department of Energy will increase its emphasis on crosscutting efforts that enable the Department and Administration to accelerate progress on climate and energy goals through fully integrated science and applied energy research, development, demonstration, and deployment (RDD&D).

DOE's climate and energy crosscuts enhance collaboration, coordination and integration across its science and applied energy programs with oversight provided by the Office of the Under Secretary for Science and Innovation in close partnership with the Office of the Under Secretary for Infrastructure to ensure that available resources are focused on achieving the nation's most critical energy and climate challenges. This coordination also helps align the considerable capabilities of DOE's stakeholders including national laboratories, universities, industry, and other partners. Within DOE, crosscutting initiatives may be coordinated through Working Groups, Science and Energy Tech Teams (SETTs), Grand Challenges or other mechanisms.

Where possible, science and applied energy program offices and functional offices have also highlighted crosscut information in their program narrative. Alignment to key Bipartisan Infrastructure Law provisions is noted in each science and energy crosscut narrative. Key contributing offices that are engaged in crosscut activities include Office of Technology Transitions, Loan Programs Office, Office of General Counsel, Office of the Chief Financial Officer, Office of Artificial Intelligence and Technology, Office of Economic Impact and Diversity, and the Office of Policy. These offices may contribute staff time or funding as noted in specific crosscut narratives to enhance impact of the Departments efforts.

The FY 2023 priority crosscut initiatives include a combination of existing and new topics including:

- Advanced Manufacturing
- Biotechnology
- Carbon Dioxide Removal
- Critical Minerals and Materials
- Energy Storage
- Water-Energy Nexus
- Grid Modernization
- Hydrogen
- Industrial Decarbonization
- Subsurface Energy Innovations

A major focus in key crosscutting efforts are the launch and execution of 'Energy Earthshots' that target the major RD&D innovation breakthroughs that we know we must achieve to solve the climate crisis and reach a net-zero carbon economy by 2050. The Energy Earthshots Initiative is an all-hands-on-deck call for innovation, collaboration, and acceleration of our clean energy economy by tackling the toughest remaining barriers to demonstrate and deploy emerging clean energy technologies at scale. With each Energy Earthshot, the Department is setting tough, yet achievable cost or performance targets to transform these technologies over the next 10 years—lowering costs, raising performance, creating new jobs, and clearing the way to our clean energy goals. In 2021 DOE launched three Energy Earthshots: Hydrogen Shot, Long Duration Storage Shot, and Carbon Negative Shot. In FY 2022 DOE is scoping additional candidate Energy Earthshot concepts and in FY 2023 DOE is requesting funding through the

Office of Science to support research in Energy Earthshot technology areas. Each Energy Earthshot is guided by an integrated DOE crosscut team that will create a multi-year roadmap and be implemented with extensive stakeholder engagement from research and national laboratory, industry, environmental, environmental justice, and interagency partners.

Additional DOE crosscuts include:

- Safeguards and Security
- Research and Development
- Small Business Innovation Research/Small Business Technology Transfer
- Pensions
- Infrastructure
- Exascale Computing
- Cybersecurity
- Energy Sector Cybersecurity

Advanced Manufacturing Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	65,775	0	TBD	TBD
Advanced Research Projects Agency – Energy*	65,775	0	TBD	TBD
Energy Efficiency and Renewable Energy	534,102	542,364	895,700	+361,598
Advanced Manufacturing	396,000	396,000	582,500	+186,500
Bioenergy Technologies	15,500	15,500	16,000	+500
Building Technologies	0	0	5,000	+5,000
Hydrogen and Fuel Cell Technologies	28,000	22,000	25,000	-3,000
Solar Energy Technologies	42,500	50,000	179,200	+136,700
Strategic Programs	540	0	0	-540
Vehicle Technologies	31,000	31,000	50,000	+19,000
Water Power Technologies	3,850	10,500	12,000	+8,150
Wind Energy Technologies	16,712	17,364	26,000	+9,288
Fossil Energy and Carbon Management	8,050	8,050	2,500	-5,550
Advanced Materials	8,050	8,050	2,500	-5,550
National Nuclear Security Administration	111,908	111,908	113,338	+1,430
Nuclear Energy	34,869	33,000	11,250	-23,619
Crosscutting Technology Development	5,000	8,000	11,250	+6,250
Transformational Challenge Reactor	29,869	25,000	0	-29,869
Science	0	0	27,000	+27,000
Basic Energy Sciences	0	0	20,000	+20,000
Biological and Environmental Research	0	0	3,000	+3,000
Fusion Energy Sciences	0	0	3,000	+3,000
Isotope R&D and Production	0	0	1,000	+1,000
Grand Total	754,704	696,322	1,049,788	+360,859

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

Advanced Manufacturing is a family of activities that: integrate advanced automation, computation, software, sensing, and networking into manufacturing processes; make use of cutting edge materials and emerging capabilities to improve product manufacturability; decrease the carbon intensity and improve the sustainability of manufacturing processes; increase facility operation efficiency and electrification into an increasingly decarbonized electric grid; and enable the next generation of clean energy technologies through development of innovative processes. Advanced Manufacturing research, development, demonstration, and deployment (RDD&D) activities for new tools and technologies that are more sustainable and efficient for a growing and competitive economy and accelerate the adoption of technologies and practices will drive U.S. economic competitiveness and energy productivity.

This crosscut encompasses multiple offices across DOE that sponsor RDD&D to foster the innovations required to sustainably manufacture the clean energy technologies needed for the industrial, transportation, and buildings sectors, as well as the energy production and delivery systems needed to power these sectors in the future. Advanced Manufacturing is the engine that will drive the transition to a decarbonized future, new jobs, and U.S. manufacturing competitiveness.

Crosscut activities will enable new and improved materials, processes, and systems across supply chains and product lifecycles. Advanced Manufacturing is critical for a transformation of the national and global energy systems to meet our climate goals, and create a competitive, resilient, agile manufacturing sector.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment of: battery material processing, as well as battery manufacturing and recycling; clean hydrogen production; wind energy technology manufacturing; solar energy manufacturing; and advanced energy manufacturing and recycling. These investments are essential in addressing the development of new technologies and advancing supply chain needs to support growth in clean energy. Provisions for industrial decarbonization are covered in that crosscut narrative.

Coordination Efforts:

The participating DOE offices plan to increase intra-departmental collaboration in their Advanced Manufacturing activities, pursuing coordinated roadmapping exercises, leveraging best practices and advances that are relevant across technologies, and identifying joint funding opportunities where appropriate. Participating DOE offices include Advanced Research Projects Agency – Energy (ARPA-E), Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM) Nuclear Energy (NE), the National Nuclear Security Administration (NNSA), and Science (SC).

Crosscutting efforts in Advanced Manufacturing are coordinated through working groups focused on Industrial Decarbonization and Clean Energy Technology Manufacturing. These will maintain cross-office alignment on these topics.

In addition to the funding offices identified here, various crosscutting offices (including the Office of Economic Impact & Diversity, Office of Policy, Office Artificial Intelligence and Technology, and the Office of Technology Transitions) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department’s investments.

Crosscut Objectives

- *Advance the materials and production processes for energy products, technologies, and systems.*
- *Improve resiliency and agility of material supply chains needed for energy products, technologies, and systems.*
- *Accelerate the transition from technology innovation to demonstration and commercialization.*
- *Make knowledge and transformational tools accessible across manufacturing organizations and develop a diverse future manufacturing workforce.*

Crosscut Action Areas:

1. ***Action Area #1 - Industrial Innovations - Efficiency, Decarbonization and Manufacturing Innovations:*** Focus on reducing greenhouse gas (GHG) emissions from industries through new

manufacturing technologies. Key activities include the development and demonstration of decarbonization solutions for energy-intensive industries and crosscutting decarbonization technologies while prioritizing the key industries of chemicals, iron and steel, cement, and food products.

2. **Action Area #2 - Foundational Technologies - Materials and Manufacturing** : Focus on solving foundational materials and manufacturing challenges for both decarbonization and clean energy by developing novel materials with improved properties, as well as new production processes. Key activities include advanced materials and foundational manufacturing technologies. Prioritize critical materials including high conductivity metals, innovative manufacturing processes such as additive manufacturing, and agile manufacturing.
3. **Action Area #3 - Clean Energy Technology Manufacturing**: Focus on solving key manufacturing challenges for clean energy technology that are critical for achieving economy-wide decarbonization. Prioritize research and development to address manufacturing innovation needs to drive down cost, improve performance, and accelerate commercialization of innovative clean energy technologies such as energy storage systems, hydrogen systems, solar energy products, wind turbine blades, semiconductors for multiple applications, and critical materials R&D addressing supply, substitution, and reuse.

Program Organization:

1. **Advanced Research Projects Agency–Energy (ARPA-E)**: As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy.
 - a. In FY 2021 ARPA-E funded projects within its Open 2021 Funding Opportunity Announcement (FOA) and Supporting Entrepreneurial Energy Discoveries (SEED) Exploratory Topic programs with Advanced Manufacturing components.
 - b. ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in Advanced Manufacturing will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE)**: Many EERE technology programs support advanced manufacturing work across DOE and work in close coordination with other DOE offices.
 - a. **Advanced Manufacturing Office (AMO)**: AMO plays a leading role in the decarbonization of the industrial sector and addressing the climate crisis by driving innovations that lead to a more resilient and competitive domestic manufacturing sector and that deliver the clean energy technologies needed to decarbonize other sectors. In FY 2023 AMO will support:
 - i. **Crosscut Action Area #1 - Industrial Innovations**: RD&D enabling decarbonization of energy-intensive industries, including chemicals, iron and steel, cement, and food products, as well as crosscutting technologies, such as carbon capture and utilization, energy efficient thermal processes, and industrial electrification. Demonstration projects at pilot scale will also be pursued where they advance our emissions and energy efficiency objectives. Support for opportunities identified in the Industrial Decarbonization Roadmap and aligned demonstration projects, including joint FOAs with other DOE offices, where

- appropriate, as well as support for one new Clean Energy Manufacturing Innovation Institute, and the sixth year of National Alliance for Water Innovation.
- ii. *Crosscut Action Area #2 – Foundational Technologies:* RD&D on materials that support clean energy manufacturing, industrial decarbonization, and economy-wide decarbonization including high conductance materials and materials for harsh service conditions. AMO will provide additional funding for the Critical Materials Institute, R&D for additive manufacturing via the Manufacturing Demonstration Facility, and support for the High-Performance Computing for Manufacturing program. AMO will support efforts to keep the United States as the global leader in technologies like Cadmium Telluride photovoltaics (PV) and develop the next generation of PV materials for potential domestic manufacture, such as perovskites. AMO Critical materials work will span applied R&D to demonstration, with an emphasis at the early supply chain stages, such as lithium extraction from brines.
 - iii. *Crosscut Action Area #3 - Clean Energy Technology Manufacturing:* AMO will partner with other EERE offices to invest in low-cost, high-volume manufacturing processes for clean energy sources, including a robust, domestic solar manufacturing sector through the Solar Manufacturing Accelerator in partnership with EERE's Solar Energy Office; megawatt (MW)-scale electrolyzers and complete fuel cell systems and recycling systems at end of life; novel processing technologies for conventional electrodes in electric vehicle (EV) batteries; and component, operational, and production manufacturing efficiencies for wind turbines. AMO will support identified opportunities currently under development on advanced manufacturing applications for hydropower; and RD&D to increase the conversion efficiencies and reduce manufacturing costs and material usage in PVs. AMO will have a particular focus on promising technologies that can be made in the United States with the potential to be exported, such as concentrating solar thermal power systems for electricity generation and industrial processes along with thermal energy storage assets.
 - b. *Bioenergy Technologies Office (BETO):* DOE's Bioenergy Technologies Office (BETO) supports the research and development of valuable chemicals and materials that can replace petrochemicals with renewable alternatives. This work includes R&D on bioderived polymers and plastics that provide performance advantages to traditional materials, including polymers and plastics that are design for enhanced recyclability. BETO also supports development of novel biological processes to recycle traditional plastics and polymer materials that can reduce energy-intensity of recycling operations.
 - c. *Building Technologies Office (BTO):* BTO will fund projects to accelerate advanced manufacturing especially in the areas of new low to no global warming potential refrigerants and highly efficient cost-effective heat pumps to support rapid adoption of decarbonization technologies. BTO will begin work with AMO on manufacturing scale up support for advanced heating, ventilation, and air conditioning (HVAC) and dehumidification technologies. Many BTO funded R&D projects have shown value in emerging technologies for dehumidification that significantly reduce energy use. These emerging technologies are mostly new membrane or chemical based and require very different manufacturing processes and equipment compared to regular vapor compression-based air conditioning and refrigerant equipment. BTO will work with AMO to explore innovative manufacturing technologies that can scale production of advanced dehumidification equipment.

- d. *Hydrogen and Fuel Cell Technologies Office (HFTO)*: HFTO invests in advanced manufacturing processes to enable accelerating the deployment of hydrogen and fuel cell technologies to address decarbonization of the transportation and industrial sectors. Activities span manufacturing processes for electrolyzer and fuel cell systems and components, hydrogen refueling components, quality control monitoring diagnostics, and clean production of metals and chemicals. Work aligned to Crosscut Action Areas for FY 2023 is delineated here:
- i. *Crosscut Action Area #1 - Industrial Innovations*: demonstrate use of clean hydrogen for decarbonizing industrial applications (e.g., steel manufacturing, ammonia, etc.)
 - ii. *Crosscut Action Area #2 – Foundational Technologies*: continue to collaborate and address industry’s need to identify advanced materials for safe use of hydrogen and hydrogen blends across sectors in collaboration with FECM.
 - iii. *Crosscut Action Area #3 - Clean Energy Technology Manufacturing*: collaborate on defining BIL activities, including manufacturing and recycling.
- e. *Solar Energy Technologies Office (SETO)*: SETO supports the research, development, demonstration, and commercialization of advanced manufacturing relevant technologies to help develop new products for domestic manufacture, support new technologies to drive down domestic manufacturing costs, develop robust domestic supply chains, and mitigate issues related to material availability. SETO’s efforts focus on Crosscut Action Area #3 and the Request supports new programming centered on supporting the development of a sustainable, robust, and resilient American solar supply chain. Domestic supply chains are critical to ensuring the U.S. has access to the volume of solar energy cells, modules, and system components to meet decarbonization goals. The primary effort from SETO will be to launch the new Solar Manufacturing Accelerator, with the Advanced Manufacturing Office, that will help establish domestic manufacturing capabilities of advanced PV technologies that rely less on foreign sourced materials, in particular those materials where one country controls the market and where unfair labor practices may exist. The Accelerator’s focus will be on reducing solar manufacturing costs while solidifying domestic material, equipment, and product supply chains. Additionally, the Request encompasses new programming under the American-Made Challenges to spur U.S. business innovation in solar, including new rounds of the American-Made Solar Prize to incentivize and transition new solar technologies into prototypes ready for real world validation. Other efforts supported in the Request to enhance U.S. solar manufacturing include continued support for the American-Made Network to provide commercialization resources, a crosscutting initiative designed to support a qualified, diverse, and inclusive clean energy manufacturing workforce and connect trainees with the industry, and continued support for the Incubator program to accelerate the prototyping, development and demonstration of new solar energy technologies for commercialization and domestic manufacturing.
- f. *Vehicle Technologies Office (VTO)*: VTO supports Crosscut Action Areas 2 and 3. In FY 2023, VTO priority focus areas include (1) new joining technologies for multi-material structures required in order to incorporate these lightweight polymer matrix composites and other new lightweight materials (aluminum and magnesium) into vehicle applications for increasing fuel economy and reducing the environmental impact of vehicles, (2) support for the Lightweight Metals Core Program to develop scalable processing methods to locally enhance the properties of aluminum and magnesium, (3) support battery materials scale-up at National Laboratories, and (4) support Battery Processing Science and Engineering dedicated to solid state materials processing.

- i. VTO will continue and scale up efforts related to solid state processing and new joining technologies for multi-material structures in vehicles. New joining materials will be required to incorporate these lightweight polymer matrix composites and other new lightweight materials (aluminum and magnesium) into vehicle applications for increasing fuel economy and reducing the environmental impact of vehicles. The Lightweight Metals Core Program will develop scalable processing methods to locally enhance the properties of aluminum and magnesium.
 - ii. VTO will continue electric vehicle battery innovations to develop novel processing technologies for conventional electrodes as well as lithium metal anodes and solid-state batteries. Projects involve either active materials scale-up or scientific investigations of novel processing approaches for lithium intercalation cathode materials, lithium metal batteries, or solid-state electrolytes.
- g. *Water Power Technologies Office (WPTO)*: WPTO has been funding foundational and application-based research for advanced manufacturing opportunities for hydropower. An opportunities analysis is being performed to that will support development of a roadmap that will inform the hydropower program and industry towards future research and engagement. The goal of FY 2023 activities is to encourage and enable the hydropower industry to recognize the opportunities to apply advanced manufacturing technologies and techniques to hydropower challenges for existing and new infrastructure. An opportunities analysis for advanced manufacturing applications for hydropower is currently being prepared by Oak Ridge National Laboratory (ORNL). Outputs will be utilized to inform a roadmap in FY 2022, and then will be used to build a program in partnership with the Manufacturing Demonstration Facility at ORNL to provide support and validation of technologies for hydropower. (*Crosscut Action Areas #2 - Foundational Technologies and #3- Clean Energy Technology Manufacturing*). In marine energy, building on a materials strategy to be released in FY 2022, WPTO will support advancement of composites and other materials that can withstand the forces and ocean environment necessary to advance marine energy technologies at all scales. (*Crosscut Action Area #2 - Foundational Technologies*)
- h. *Wind Energy Technologies Office (WETO)*: WETO uses Advanced Manufacturing to address the issues and challenges associated with turbine scaling for both land-based and offshore wind technologies. These activities will enable wind turbine technologies that overcome transportation constraints, allow for larger and lightweight turbine components through novel designs and materials, and increase material and component production throughput. In FY 2023, WETO will continue work leveraging prior R&D in additive manufacturing, in addition to broadening into other advanced manufacturing methods such as high performance computing (HPC), artificial intelligence (AI), and advanced machine learning (AML). The use of these methodologies will allow WETO to address several issues associated with the scaling of wind turbines through component design and material optimization, and reduction of critical rare-earth materials. This work explores the use of these technologies and their application to wind turbine blades, generators, foundations and towers (*Crosscut Action Areas #2– Foundational Technologies and #3 – Clean Energy Technology Manufacturing*). Demonstration activities of these technologies will also be examined in the short to longer term (*applies to all Crosscut Action Areas*).
3. **Fossil Energy and Carbon Management (FECM)**: FECM plays a leading role in the decarbonization of the industrial sector and power sector by developing crosscutting carbon capture, carbon reduction, CO₂ conversion, carbon storage, and clean hydrogen production and

utilization technologies. FECM's RDD&D program focuses on technologies that help to ensure clean and affordable energy for all and facilitates the transition towards a carbon-pollution-free economy. This RDD&D is targeted at improving overall system efficiency, reducing capital and operating costs, and enabling affordable carbon management. Carbon management technologies have an important role in the decarbonization of the manufacturing sector for industries such as steel, cement, and chemicals. Additionally, advanced manufacturing capabilities such as roll-to-roll manufacturing and 3D printing, can help enable many of the advanced carbon management technologies that are under development today and on the verge of commercial deployment. By applying these techniques to reduce material costs, improve designs and manufacturability of these technologies, advanced manufacturing will enable the potential deployment and buildout point-source carbon capture and storage and carbon removal. As the Department moves to establish a clean hydrogen economy, hydrogen-resistant materials will need to be developed to allow for its production, use, transport, and storage.

a. Crosscut Action Area #1 - Industrial Innovations:

- R&D and pilot-scale tests of capture technologies supporting decarbonization of energy-intensive industries including chemicals, steel, cement, and clean hydrogen.
- Commercial deployment efforts for retrofitting existing facilities with CCS for hydrogen and ethanol production, and more recently feasibility and front-end engineering design (FEED) studies for cement, steel, and chemicals.

b. Crosscut Action Area #2 - Foundational Technologies:

- Leveraging manufacturing capabilities to facilitate development of CCUS technologies. For example:
 - i. R&D on producing "smart packing" used for solvent-based carbon capture systems.
 - ii. Investigation of additive manufacturing via the Manufacturing Demonstration Facility to mass produce carbon capture process equipment.
- RD&D supporting advanced manufacturing of:
 - i. embedded sensors for harsh environments.
 - ii. refractory materials for gasification systems.
 - iii. ceramic matrix composites for use in hydrogen turbines.

c. In addition, FECM will support crosscutting development, technical assistance, and technical partnerships including:

- Support for MW-scale demonstrations of integrated energy storage technologies with power plants to accelerate the deployment and adoption of these technologies to help attain net-zero emissions in the power sector by 2035.
- The Simulation-Based Engineering (SBE) program, which strives for the development and application of new and innovative physics- and chemistry-based models and computational tools at multiple scales (atomistic, device, process, grid and market) to help move the integrated energy systems of the future toward a net-zero carbon economy.
- Support for development of advanced manufacturing processes such as 3D printing, roll-to-roll, etc. to advance domestic manufacturing capability and create good paying domestic jobs.

- FECM's University Training and Research Program, which enabled numerous undergraduate, master's, and doctoral students to conduct early-stage research in hydrogen and decarbonization technologies, including minority institutions of higher learning (Historically Black Colleges and Universities and Other Minority Institutions).
 - d. Aligned to the Crosscut Action Areas and the Critical Minerals and Materials crosscut, FECM will work on:
 - Improved extraction of critical minerals and materials from unconventional and secondary sources.
 - Design of novel, environmentally responsible mineral processing technologies to be used with a variety of feedstocks.
- 4. National Nuclear Security Administration (NNSA):** The mission of the NNSA's Advanced Manufacturing Development (AMD) Program is to enable a responsive and resilient nuclear security enterprise by rapidly developing and deploying advanced manufacturing solutions to both existing, known problems and developing technologies and capabilities to rapidly recover from unforeseen problems. AMD supports development of models, additive manufacturing, prototyping of machining and development of tooling for electronic printing and material development.
- a. *Crosscut Action Area #2 - Foundational Technologies. In FY 2023, AMD will support:*
- Approaches to advance qualification and certification methods to use additively manufactured parts in the active stockpile.
 - Development of material recyclability processes to reuse scrap material and reduce supply chain risk.
 - Conduct of testing to confirm components manufactured with new production methods improve performance margins.
- b. Future anticipated work aligned with the Crosscut includes:
- Accelerate and transition the use of additive manufacturing as an agile production process for stockpile components.
 - Invest in digital manufacturing to enhance process control diagnostics and supply chain risk mitigation.
 - Support key manufacturing technologies that are replacing obsolete materials and processes on a timeline to support future systems.
 - Leverage scientific knowledge for new qualification and certification methods to enable delivery of additively manufactured components intended for future weapons systems.
- 5. Nuclear Energy (NE):** The goal is to maintain U.S. leadership in the development of materials and manufacturing technologies for nuclear energy applications. NE will enable nuclear reactor technology developers by developing materials and manufacturing technologies to produce components that improve safety and reliability and are more cost effective to manufacture.
- a. *Crosscut Action Area #1 - Industrial Innovations:* NE plans to partner and leverage joint capabilities to demonstrate technologies through the production of parts, components and subsystems that have the potential for widespread impact in manufacturing for the nuclear sector. The investment of resources at critical decision points should help overcome technological and regulatory hurdles that could be seen as too risky for the private sector to take on alone. This approach should engage reactor vendors and original equipment

manufacturers, as well as suppliers for products and capabilities with the intent for adoption of the technologies.

- b. *Crosscut Action Area #2 – Foundational Technologies*: NE is engaging stakeholders to develop an accelerated qualification framework for certifying advanced materials and manufacturing technologies. The framework will focus initially on 316 stainless steel materials, which are understood in traditional manufacturing processes but are new to advanced manufacturing processes. These materials are a high priority for near-term deployment of advanced reactors and support of the current fleet. In the long-term, NE plans to demonstrate advanced alloy development and manufacturing capabilities that enhance deployment and operations of the existing and advanced reactor fleet.

6. Science (SC): In FY 2023, SC will support efforts for fundamental science leading to transformational manufacturing aligned with all of the *Crosscut Action Areas*. The opportunities for underpinning science for manufacturing crosses many SC activities, including biomanufacturing, next-generation microelectronics fabrication, innovations for accelerator technology, science to transform “traditional” chemical and materials manufacturing, materials for extreme environments, and isotope production and enrichment, to name a few. Central to the discovery and application of transformative science are computational tools and a system-based co-design approach to integration of experiments, predictive theory, and artificial intelligence and machine learning that cross the interfaces among components in manufacturing systems.

- a. *Basic Energy Sciences (BES)*: The recent SC BES workshop on Basic Research Needs for Transformative Manufacturing complements prior SC workshops and provides priority research directions that form the basis for this initiative. Critically, new investments in manufacturing science will be enabling for other science and technology initiative areas within DOE, including the Energy Earthshots, with a focus that includes the science for scale-up from initial discoveries to bridge the gap to applied research and commercial application.
- b. *Biological and Environmental Research (BER)*: SC BER continues biomanufacturing research that will build on broader biotechnology activities and genome-enabled engineering and design of biomaterials.
- c. *Fusion Energy Sciences (FES)*: The 2018 SC Fusion Energy Sciences Advisory Committee (FESAC) report¹ on Transformative Enabling Capabilities for Efficient Advance Toward Fusion Energy highlighted the promise of novel synthesis, manufacturing, and materials design to enable fusion energy systems for the future. FES is pursuing these new manufacturing technologies to enable design and advancement of novel material systems capable of surviving the extreme conditions expected in fusion reactors as well as other applications of materials for extreme environments.
- d. *Isotope R&D and Production (DOE IP)*: Advanced manufacturing investments within SC DOE IP form the underpinnings of the next generation of isotope production and processing techniques. Next generation targets and target fabrication techniques developed utilizing multiscale models and tools, coupled with co-design research and methodologies, are critical to enable robust domestic supply chains for critical isotopes used in climate and energy research and applied technologies. Development of modern isotope enrichment technologies will enable advanced manufacturing approaches to enriched materials that can lower operating costs and the spent fuel footprint.
- e. SC will interact with technology offices to ensure close coordination of FY 2023 funding opportunities to ensure maximum impact of funded research on technology challenges.

Research opportunities will include a focus on Established Program to Stimulate Competitive Research (EPSCoR) regions as well as broad outreach to minority serving institutions.

Biotechnology Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY2021 (\$ Change)
Advanced Research Projects Agency - Energy	25,499	0	TBD	TBD
ARPA-E Projects*	25,499	0	TBD	TBD
Energy Efficiency and Renewable Energy	59,375	59,375	57,250	-2,125
Bioenergy Technologies	59,375	59,375	57,250	-2,125
Science	640,728	663,647	738,183	+97,455
Advanced Scientific Computing Research	10,000	10,000	10,884	+884
Basic Energy Sciences	228,154	266,330	259,114	+30,960
Biological and Environmental Research	402,574	387,317	468,185	+65,611
NNSA	0	0	20,000	20,000
Defense Nuclear Nonproliferation	0	0	20,000	20,000
Grand Total	725,602	723,022	815,433	+115,330

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

The challenge to position the United States on an irreversible path to a net-zero economy in 2050 will require advances in every sector. Just as biotechnology is a significant tool in combatting the COVID-19 pandemic, it can also enable global decarbonization efforts across major sectors such as transportation, industry, and agriculture. Biotechnology refers to a wide array of advanced techniques and tools that harness the power of biology, including bioengineering and bioprocessing technologies, to optimize microbes and plants for production of biofuels and bioproducts and enhance the ability of agriculture and forests to help sequester carbon in soils. The goal of this crosscut is to increase the impact of biotechnology on decarbonization through efforts that will ultimately translate benchtop discoveries into commercial-scale bioeconomy applications.

Scientific and commercial achievements in biotechnology underpin the bioeconomy which accounts for five percent of U.S. Gross Domestic Product. DOE has supported major advancements in biotechnology and genome sciences including the sequencing of the human genome and development of genetic editing technologies like CRISPR. To take full advantage of progress made over the last decade in genome sequencing cost and speed, and to accelerate the Nation's capabilities to apply biotechnology to address deep decarbonization challenges, integrated efforts that bring together biological research, data science, high-performance computing, artificial intelligence and machine learning, automation, and process engineering are needed to realize deep decarbonization benefits for transportation, industry, and agriculture. In coordination with these efforts, it is also critical to reduce national security risks associated with biotechnology and biomanufacturing.

Coordination Efforts:

DOE's Biotechnology Working Group is comprised of members from EERE-BETO, SC-BES, SC-BER, SC-ASCR, and ARPA-E. In FY 2021, the working group organized the "Designing for Deep

Decarbonization: Accelerating the U.S. Bioeconomy” workshop. The working group will further engage stakeholders and experts on the challenges and opportunities identified at this workshop.

In addition to the funding offices identified here, various crosscutting offices (including the Office of Economic Impact & Diversity, Office of Policy, the Artificial Intelligence and Technology Office, and the Office of Technology Transitions) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department’s investments. The National Nuclear Security Administration also contributes expertise and capabilities that will anticipate and detect threats and strengthen biodefense.

Crosscut Objectives:

- ***Innovation built on strong foundations:*** Exploit and improve on genomic diversity within nature to identify new biological, bioinspired, and biohybrid functions.
- ***Enhance access to tools and facilities:*** Facilitate user access and interoperability between SC user facilities relevant to biotechnology, Bioenergy Research Centers, and the Agile BioFoundry.
- ***Increase range of production of biofuels and bioproducts:*** Conduct research and development (R&D) to increase the variety of sustainable biofuels and bioproducts made from plants and microbes.
- ***Develop advanced modeling and data analytics for biotechnology:*** Create integrative, collaborative, and open access computational platforms for biotechnology, with capabilities in Artificial Intelligence and Machine Learning techniques
- ***Reduce risk by advancing biosafety and biosecurity:*** Assess biotechnology and biomanufacturing risks and develop approaches to reduce risks and integrate security into biotechnology development.

Crosscut Action Areas:

1. **Strengthen Cross-DOE Coordination and Collaboration:** Ensure an integrated approach, including clearly defined “swim lanes” and “relay points,” to avoid duplication and increase collaboration, share best practices for management of user facilities and other community resources, workshops and Principal Investigator meetings, community/stakeholder engagement, and data/information sharing.
2. **Support Fundamental and Applied R&D and Technology Transfer:** Establish the foundational scientific infrastructure, knowledge base, innovation, and technology transfer to enable dissemination and scale-up for biotechnology.
3. **Develop coordinated “use cases” and collaborations to identify technical and process (workflow) challenges:** Establish informal working groups and formal collaborations to regularly assess the state of biotechnology and DOE’s readiness to facilitate the entire biotechnology workflow.
4. **Coordinate on Workforce/STEM and Diversity, Equity, and Inclusion:** Collaborate on best practices and accelerate progress towards common goals.

Program Organization:

There are several offices across DOE that work biotechnology and collaborate with one another to achieve the crosscut objectives.

1. **Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021 ARPA-E selected and/or obligated \$25,499K in Biotechnology funding to projects aligned with the Crosscut through ARPA-E's Supporting Entrepreneurial Energy Discoveries (SEED) Exploratory Topic and Open 2021 programs as well as through Macroalgae Research Inspiring Novel Energy Resources (MARINER). ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in Biotechnology will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE):** EERE's *Bioenergy Technologies Office (BETO)* focuses on developing bioengineering techniques to optimize production of targets (fuels, chemicals, and materials) in microbes. These research, development, and demonstration (RD&D) activities in FY 2023 include:
 - a. Agile BioFoundry, a consortium of seven National Laboratories that brings together world-class biotechnology capabilities to target a 50 percent reduction in the time and cost to bring new bio-derived molecules to market by accelerating the Design-Build-Test-Learn cycle.
 - b. Biological engineering including enzymatic hydrolysis, fermentation, downstream separations, and catalysis as a part of state of technology pathways which demonstrate transformation of bio-based feedstocks into jet fuels and chemicals.
 - c. Biological methods for plastic deconstruction and upcycling including optimization of novel enzymes and organisms to achieve commercial relevance.
3. **Science (SC):** There are multiple programs with the Office of Science that are major contributors to the advancement of the biotechnology crosscut objectives and scientific discovery. In FY 2023, SC programs will focus on new and continued research as described below.
 - a. *Advanced Scientific Computing Research (ASCR)* employs high performance computing and the exascale ecosystem to accelerate progress in biotechnology across mission areas and national priorities. Through partnerships and collaborations within the Office of Science, DOE, and related mission agencies (National Institutes of Health (NIH), U.S. Department of Agriculture) ASCR is advancing the foundational research, computational readiness, and high-performance computing (HPC) access for biotechnology applications that underpin predictive capabilities for climate, national preparedness and security, and other DOE missions.
 - i. Computational Partnerships supports collaborations with Biological and Environmental Research and NIH to incorporate ASCR research, methods and capabilities into mission critical applications to drive innovation and harness the potential of HPC to provide insights and predictive models that support an array of biotechnology goals.
 - ii. Existing partnerships with the National Cancer Institute and NIH incorporate DOE expertise in multiscale modeling, artificial intelligence, data management and workflows, collaborative community driven model development, and HPC with grand challenges in cancer and health to validate existing methods across diverse datasets and applications and to generate new, hybrid methods that accelerate progress in

- improving health outcomes and DOE mission critical applications. This includes new efforts to explore the technical readiness and feasibility of digital twin technology to improve cancer treatment outcomes and the development of clinically informed predictive models of radiation impacts on human health across time and length scales.
- iii. ASCR is expanding partnerships to include new collaborations with applications focused on emergency response to build an enhanced response capability with state-of-the-art predictive models that leverage the DOE exascale ecosystem and can be rapidly employed when needed.
- b. *Basic Energy Sciences (BES)* supports fundamental chemical and materials research to underpin the development of biotechnology. Research supported by BES may also use biotechnological approaches to understand molecular and atomic mechanisms in biochemical and chemical processes and structures which, in turn, may advance new biotechnologies. BES provides tools for characterizing biotechnology-relevant materials and processes through x-ray, neutron, electron beam scattering, and nano-science capabilities.
 - i. BES biosciences programs support basic research to provide mechanistic understanding of the biochemistry, chemistry, and biophysics of energy capture, conversion, and storage in plants and microbes. Research provides insights into the mechanisms of light harvesting and creation and transport of energy carriers in natural photosynthesis, develops molecular-level understanding of redox and active site protein chemistry controlling energy and molecular conversions, and discovers biochemical and biophysical principles that determine the synthetic pathways to produce biomolecules and structures with specific architectures. These detailed mechanistic studies can enable strategies for biotechnology-based approaches to energy capture and conversion.
 - ii. BES research on biomolecular materials focuses on the creation of robust, scalable, energy-relevant materials and systems with emergent behavior that work with the extraordinary effectiveness of molecules and processes of the biological world, foundational for biotechnology applications.
 - iii. Research in catalysis science and solar photochemistry focuses on mechanistic understanding of energy and molecular conversion processes that establish a foundation for development of bio-inspired, biohybrid and biomimetic systems. Future research areas include programmable biomaterials and biocatalysts, neuromorphic computing, and design of chemical processes and integrated systems. Next-generation tools will foster new developments in biotechnology.
 - iv. Advances at BES scientific user facilities will ensure a broad science and capability base for research at the interface of physical, biological, and computational sciences to understand integrated systems, including those driving or developed through biotechnology.
 - c. *Biological and Environmental Research (BER)* employs biotechnological approaches such as genome sequencing, proteomics, metabolomics, structural biology, high-resolution imaging and characterization, and integration of information into computational models that can be iteratively tested and validated to advance a predictive understanding of biological systems for DOE mission goals.
 - i. Genomic Science supports fundamental research on discovery and manipulation of genome structure, regulatory elements and epigenetic controls to understand

genotype to phenotype translations in microbes and plants. These efforts include biosystems design research to explore genomic pathway design and new secure gene-editing and multi-gene stacking techniques for designing new functions into plants and microbes providing a crucial foundation for advancing biotechnology.

- ii. Additionally, these efforts seek to gain an understanding of how genomic mechanisms translate to understanding the functioning of plants and soil microbial communities in the environment. This information leads to understanding how plants and microbes impact the cycling and fate of carbon, nutrients, and contaminants in the environment and contribute to more sustainable ecosystems.
- iii. Advances in genomic science increasingly require integrative, collaborative, and open access computational platforms to converge on optimized solutions for clean energy production and renewable products. New capabilities in artificial intelligence/machine learning techniques will aid discovery of novel processes and key insights into the functioning of biological systems by examining enormous datasets with powerful analytics to discover new biological principles hidden in complex multivariate data.
- iv. BER supports four Bioenergy Research Centers (BRCs) engaged in multidisciplinary genome-enabled biotechnology research to sustainably produce a range of bioenergy and bioproducts from renewable plant biomass. The BRCs seek to identify the genomic underpinnings of complex plant traits in crops with promising bioenergy/bioproduct characteristics, streamline biomass deconstruction processes to funnel plant components into defined process streams, design new pathways in microorganisms to convert plant biomass to a range of fuels, chemicals and products, and develop the needed agronomic understanding of how to manage bioenergy crops for sustainable production on marginal lands laying the scientific foundation for a broader bio-based economy.
- v. New quantum-enabled instrumentation for imaging biological processes will be explored in Biomolecular Characterization and Imaging Science for visualizing cellular metabolism non-destructively. Multimodal imaging concepts will also be pursued to create integrative systems to validate hypotheses of cellular function or design of new process.
- vi. The Joint Genome Institute (JGI) provides users with high quality genome production and new analysis techniques for complex plant and microbiome samples. Integrative activities with the DOE Systems Biology Knowledgebase will provide new cross-platform capabilities for JGI users and users of the new National Microbiome Data Collaborative providing information on how microbial communities function in a variety of environments.

4. **National Nuclear Security Administration (NNSA):** The NNSA Bioassurance program will contribute to DOE biotechnology efforts through innovations in biosecurity to reduce risk throughout the biotechnology research and development and biomanufacturing lifecycles. The Bioassurance program will anticipate and detect threats and strengthen biodefense. Activities covered under this program will focus on anticipating destabilizing threats through modeling, identifying threat signatures and developing detection technologies, and rapidly developing and validating safeguards and threat mitigation approaches. NNSA will integrate its high-security work with the Department's "open" science work, providing the full spectrum of capabilities essential for a bioassurance program informed by national security expertise drawn from parallel and analogous work on nuclear threats, risks, export controls and licensing, nonproliferation, detection, and verification.

Carbon Dioxide Removal Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	84,478	0	TBD	TBD
Advanced Research Projects Agency - Energy*	84,478	0	TBD	TBD
Energy Efficiency and Renewable Energy	88,750	13,000	26,000	-62,750
Advanced Manufacturing	0	0	10,000	+10,000
Bioenergy Technologies	88,750	10,000	13,000	-75,750
Water Power Technologies	0	3,000	3,000	+3,000
Fossil Energy and Carbon Management	40,000	40,000	65,000	+25,000
Carbon Dioxide Removal	40,000	40,000	65,000	+25,000
Science	35,500	36,700	170,950	+135,450
Advanced Scientific Computing Research	0	0	25,000	+25,000
Basic Energy Sciences	12,500	13,700	77,950	+65,450
Biological and Environmental Research	23,000	23,000	68,000	+45,000
Grand Total	248,728	89,700	261,950	+97,700

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

Nearly all climate models that simulate scenarios for reaching net-zero indicate the need for a near-term focus on carbon dioxide removal (CDR) development and deployment (D&D) in addition to carbon reduction efforts including mitigative point source carbon capture and sequestration. Intergovernmental Panel on Climate Change modeling shows that only emissions scenarios including CDR achieve neutrality in 2050.

CDR refers to multiple approaches that capture carbon dioxide (CO₂) directly from the atmosphere and durably store it in geological, biobased and ocean reservoirs or in value-added products to create negative emissions. Negative emission technologies at scale are necessary for achieving national and global net-zero greenhouse gas emission (GHG) goals in the coming decades, removing CO₂ from the accumulated pool in the of carbon from the atmosphere, and avoiding the most critical climate consequences.

In recognition of the necessity of CDR, DOE launched the Carbon Negative shot as its third Energy Earthshot at COP26 in November of 2021. Carbon Negative Shot is a decadal goal to reduce the cost of atmospheric carbon removal to less than \$100/net metric ton of CO₂ equivalent (CO₂e). This effort is being deployed to achieve a net-zero carbon economy and eventually remove legacy carbon pollution to help address the climate crisis, with a dedicated focus on doing so in a just and sustainable manner.

Carbon Negative Shot defines four criteria that define goals for each CDR pathway: 1) less than \$100/net metric ton CO₂e for both capture and storage of CO₂; 2) robust accounting of full lifecycle emissions (i.e., ensures emissions created from construction to operation of the removal technology are accounted for); 3) high-quality, durable storage with costs demonstrated for monitoring, reporting, and verification for over a period of at least 100 years; and 4) enables necessary gigaton scale removal.

The diverse suite of technologies and approaches in CDR requires integrated investment across the full research, development, demonstration, and deployment (RDD&D) spectrum such that breakthroughs are rapidly transferred and scaled, and that deployment of first-of-its kind technologies quickly informs the next generation of innovation. CDR approaches include, but are not limited to, biomass carbon removal with storage (BiCRS), bioenergy with carbon capture and sequestration (BECCS), direct air capture (DAC) with durable storage (DACS), biological methods to stored products, enhanced mineralization, soil carbon sequestration, improved forest management, and direct ocean capture (DOC) with durable storage (DOCS). Within these approaches, the technology or mechanisms for CO₂ removal are variable, leading to challenges in how to quantify reductions via lifecycle analyses (LCA), and how to accurately define the economics and costs.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, funding from the BIL will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment of carbon dioxide direct air capture, storage, conversion, and transportation. These investments are essential in building out key components of a nascent industry.

Ongoing research, development, and demonstration (RD&D) are needed for other pathways, to enhance scientific understanding of the foundational materials and processes, advance the state of the art, develop accounting methods, monitoring and verification and other activities as described throughout this crosscut narrative.

Coordination Efforts:

In addition to developing and implementing a cross-agency CDR strategy, priorities include joint efforts on information sharing and engagement with external stakeholders, technology experts, and other government agencies. There is close coordination between the DOE's efforts in the CDR crosscut, the interagency CDR Task Force led by DOE, and the international CDR Mission that the U.S. is co-leading as part of Mission Innovation effort on CDR. The CDR crosscut group manages the Carbon Negative Shot.

In addition to the funding offices identified here, various crosscutting offices (including the Office of Economic Impact & Diversity, Office of Policy, the Office of Artificial Intelligence and Technology Office, the Office of International Affairs, and the Office of Technology Transitions) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments.

Crosscut Objectives:

- ***Discover, innovate, and enable the deployment of low-cost and scalable CDR pathways to accelerate removal of carbon dioxide directly from the atmosphere and environment:*** Foster crosscutting fundamental science and applied research and development (R&D) to enable breakthroughs along the carbon removal value chain. Identify and address critical barriers to reducing the costs and energy requirements for CDR systems and materials through targeted research investments. Promote and demonstrate the strategic deployment of diverse CDR systems and strategies.
- ***Engage stakeholders and communicate strategy:*** Host workshops and public meetings to share information. Engage with communities that could participate in or be affected by CDR including sovereign tribal nations, labor groups, and environmental, environmental justice (Justice40), and climate justice organizations.
- ***Address resource and sustainability requirements:*** Assess availability of primary energy, water, and other inputs to ensure holistic, sustainable, low, and negative-life-cycle emissions pathways,

and ensure the stewardship of our communities, natural resources, and the environment. For D&D projects, coupling carbon accounting through LCA and techno-economic analyses are critical for assessing the net amount and timescale of carbon removal alongside associated costs.

Crosscut Action Areas:

The Department of Energy (DOE) Program offices Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM), Science (SC), and Advanced Research Projects Agency-Energy (ARPA-E) will support:

1. **Cost effective capture, conversion, transport, and durable storage:** Issue targeted funding announcements to address scientific and technical challenges preventing widespread deployment of cost-effective CDR technologies, as identified in the Carbon Negative Shot.
2. **Robust Monitoring, Reporting, and Verification (MRV):** Issue targeted R&D funding announcements to advance necessary technologies for measuring, monitoring, and verifying durable carbon storage.
3. **Systems Analysis:** Conduct resource assessments on availability of primary energy, water, and other inputs to ensure holistic, sustainable, low and negative-life-cycle emissions pathways.
4. **Demonstrate and support key infrastructure for CDR:** Leveraging BIL funding related to CDR, demonstrate and validate carbon transport and storage at scale.

Program Organization:

1. **Advanced Research Projects Agency–Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021, ARPA-E selected and/or obligated \$84,478K in CDR funding to projects from ARPA-E's Harnessing Emissions into Structures Taking Inputs from the Atmosphere (HESTIA), Supporting Entrepreneurial Energy Discoveries (SEED) Exploratory Topic, and Open 2021 programs. ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in CDR will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE):** Within the EERE there are several programs that support the efforts of the CDR crosscut.
 - a. *Advanced Manufacturing Office (AMO):* AMO is developing technology to improve the feasibility of DAC through manufacturing improvements to DAC sorbents and intensified process development that couples DAC with durable storage and using industrial byproducts, such as steel slags and mine tailings, for mineral carbonation to produce products for beneficial use and/or local carbon sequestration.
 - b. *Bioenergy Technologies Office (BETO):* BETO supports RDD&D on technologies, systems, and practices to increase carbon removal from biomass, including sustainable agriculture, forest management, and the use of biomass CO₂ from point sources and DAC technologies to improve the productivity of algal biomass. This work includes developing tools and remote sensors for soil carbon monitoring, researching the long-term carbon-drawdown potential of biochar, pursuing landscape design analysis, and investigating the feasibility and carbon

sequestration potential of sustainable BECCS practices, including biomass conversion to advanced fuels and chemicals.

- c. *Water Power Technologies Office (WPTO)*: WPTO will build on its National Laboratories seed funding program and internal scoping activities to further investigate the role of marine energy in CDR in FY 2022. Investments may include understanding the energy requirements of offshore seaweed farming for CDR with AMO and ARPA-E; building on Pacific Northwest National Laboratory (PNNL)/National Oceanic and Atmospheric Administration's (NOAA) Pacific Marine Environmental Laboratory research interests, including ocean observing to assess ocean-based CDR projects, sustainable mariculture for CO₂ offsets, and methods for ocean alkalinity enhancement and CDR in coastal ecosystems; and a host of foundational R&D projects at National Laboratories and universities to understand energy requirements, siting, and energy storage needs of marine-energy powered CDR.

- 3. **Fossil Energy and Carbon Management (FECM)**: FECM focuses on CDR approaches that include chemicals, minerals, and biological pathways. FECM has been working on carbon capture and storage (CCS) projects for almost 20 years and has invested heavily in the development of technologies to capture CO₂ from power plants and industrial sources. More recently, DOE has been applying these technology developments to various approaches, including BECCS and DAC coupled to dedicated storage. The FECM CDR subprogram was a new budget line in the FY 2022 Budget Request and in FY 2023 will support funding on chemical, mineral, and biological concepts. However, it builds upon past CCS efforts which have been funded through FECM's CCS activities, such as past work on DAC, mineralization, co-firing of biomass, and capture technology development. RDD&D activities include:

- a. DAC with durable storage: FECM funds significant DAC RDD&D alongside all carbon storage research at DOE. This includes transformational DAC materials and components, pilot-scale testing, front-end engineering and design (FEED) studies, and large-scale extended tests. FECM is requesting funds for the DAC Test Center at a National Energy Technology Laboratory (NETL) campus.
- b. Biomass waste R&D: R&D on sustainably sourced biomass waste coupled with CCUS which offers an opportunity for near-term deployment of CDR technologies. This includes gasification of waste feedstocks, such as plastics and sustainably sourced biomass waste with CCS.
- c. Mineralization: FECM is continuing to invest in RDD&D for in situ, ex situ, and surficial mineralization opportunities.
- d. Significant RDD&D investments and work for geological CO₂ storage and CO₂ transport. Coupled to CO₂ capture processes, such as bioenergy and DAC, reliable storage on timescales that will positively impact climate are of central focus. For example, reliable storage on the scale of 1000s years is desired, which may include geologic storage deep underground, or the conversion of CO₂ to synthetic aggregates through mineral carbonation (replaces sand and gravel for construction) or plastics.
- e. Program support for Carbon Negative Shot, Mission Innovation Initiative on CDR and/or CDR Task Force.

- 4. **Science (SC)**: SC provides foundational knowledge and state-of-the-art capabilities in support of crosscut objectives and has supported theoretical and experimental science related to understanding chemical and biological processes, separations, materials, and geochemistry related to carbon capture for many years. Key activities in FY 2023 for CDR include:
 - a. Supporting scientific discoveries and major scientific tools to transform our understanding of CO₂ chemistry, gas separation systems, and materials important to CDR technologies.

Research focuses on advancing fundamental knowledge to enable energy-efficient CO₂ capture from dilute sources (e.g., DAC and DOC) and conversion of CO₂ into durable products (e.g., mineralization). In FY 2022, the Office of Basic Energy Sciences (BES) released or plans to release three special funding opportunity announcements (FOA) that included research topics relevant to CDR technologies: Energy Frontier Research Centers, Chemical and Materials Sciences to Advance Clean Energy and Transform Manufacturing and RENEW. Clean energy topics, including CDR, were also called out in the FY 2022 SC Open FOA. In FY 2023, Basic Energy Sciences (BES) will continue to support CDR research that spans from single principal investigators to large teams in BES core programs, to Energy Frontier Research Centers, to Energy Earthshot Research Centers (EERC), described below.

- b. In addition, SC operates major x-ray, neutron, nanoscience, genome sequencing, and high-performance computing user facilities that provide advanced synthesis, fabrication, characterization, and computational capabilities that support CDR efforts across the spectrum of basic and applied research.
- c. BES also supports research that provides foundational knowledge about critical minerals and materials, such as rare earth elements and platinum group elements, to ensure they remain available or to reduce the dependence on them for CDR technologies as well as other energy technologies (related to the Critical Minerals and Materials Crosscut).
- d. Biological and Environmental Research (BER) supports fundamental systems biology research on 1) plants and plant microbiomes to capture atmospheric CO₂ and sequester stabilized forms of carbon in biomass and soil, and 2) algal systems to convert gaseous CO₂ waste streams into a broad range of bioproducts in support of other CDR technologies.
- e. Both BES and BER will participate in the initiation of the EERCs, a new modality of research to be launched in FY 2023, bringing together multi-investigator, multi-disciplinary teams to perform energy-relevant research with a scope and complexity beyond what is possible in standard or small-group awards. Aligned with both SC and the technology offices, EERCs will address key research challenges at the interface between currently supported basic research and applied R&D activities, to bridge the R&D gap. Efforts will focus directly on the interface, ensuring that directed fundamental research and capabilities at SC user facilities tackle the most challenging barriers identified in the applied R&D activities. The Carbon Negative Shot will be addressed in this crosscut.

Critical Minerals & Materials Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	13,653	44,000	TBD	TBD
Advanced Research Projects Agency - Energy*	13,653	44,000	TBD	TBD
Energy Efficiency and Renewable Energy	104,000	106,523	208,600	+104,600
Advanced Manufacturing	45,000	45,000	60,000	+15,000
Geothermal Technologies	4,000	50	5,000	+1,000
Hydrogen & Fuel Cell Technologies	25,000	30,000	30,000	+5,000
Solar Energy Technologies	0	0	16,000	+16,000
Vehicle Technologies	30,000	30,000	73,600	+43,600
Wind Energy Technologies	0	1,473	24,000	+24,000
Fossil Energy and Carbon Management	23,000	23,000	40,000	+17,000
Mineral Sustainability – Critical Minerals	23,000	23,000	40,000	+17,000
Nuclear Energy	59,500	19,000	127,000	+67,500
Nuclear Energy Enabling Technologies	1,000	500	500	-500
Fuel Cycle Research and Development	58,500	18,500	126,500	+68,000
Office of Technology Transitions	100	100	100	0
Science	17,000	17,000	25,000	+8,000
Basic Energy Sciences	17,000	17,000	25,000	+8,000
Grand Total	217,253	209,623	400,700	+197,100

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

Critical minerals and materials (CMM) are central for U.S. energy and both economic and national security as they underpin many clean energy technologies, vital manufacturing processes, and a number of key defense applications. Developing reliable, domestic and trusted ally sources, substitutes and processing capacity for these minerals and materials reduces supply risks faced by the United States. Further, there is international competition for these minerals, coupled with disruption potential from geopolitical events and resource nationalization. Reliable, resilient, and secure critical material and mineral supply chains are therefore vital to meeting our economic, national security, and climate goals. These supply chain components include, but are not limited to, rare earth elements (REE) for permanent magnets in electric vehicle (EV) motors and wind turbines; cobalt, lithium, manganese, nickel, and graphite for EV and grid batteries; and platinum group metals in fuel cell catalysts and catalytic convertors. In addition, there are additional key minerals such as copper and uranium, which are vital for clean and low carbon energy, and for resilience considering dynamic and changing global supply chain dynamics.

The development of a sustainable, safe, and robust domestic supply chain for CMM can also create high-paying jobs, support both existing and new manufacturing economies, and aid in a just transition for coal and fossil-based communities. At the same time, development of more diverse and robust mineral

and material supply chains must incorporate engagement and consultation with diverse stakeholder and tribal communities, coupled with deep consideration of and mitigation of the environmental and life cycle impacts of accelerated mineral supply chain growth.

The CMM Crosscut is also working to address key technology portfolio gaps in areas where the Department of Energy (DOE) has less historical focus such as: hard rock (including sedimentary and clay) critical mineral extraction and mining technologies, advanced subsurface technologies, unconventional resource extraction technologies, and robotics and autonomous operation applications in mineral extraction.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment of battery and critical mineral recycling, battery material processing, as well as address critical material innovation, efficiency and alternatives, supply chain research and rare earth elements. These investments are essential in addressing the supply chain and technology needs to support growth in clean energy.

Coordination Efforts:

The CMM Crosscut is coordinated through a crosscutting team and is comprised of representatives from across DOE. DOE investments within the Advanced Research Projects Agency - Energy (ARPA-E), Office of Energy Efficiency and Renewable Energy (EERE), Office of Fossil Energy and Carbon Management (FECM), Office of Nuclear Energy (NE), and Office of Science (SC), support the crosscut objectives. ARPA-E, EERE, FECM, and NE support applied research, development, and demonstration (RD&D) across these topics, while SC provides the necessary fundamental research and world-class user facilities necessary to achieve the goals.

Additionally, key facilitating offices support implementation of key portions of these programs. The Office of Technology Transitions (OTT), in coordination with DOE program offices, analyzes, identifies and supports technology commercialization pathways and partnership opportunities. The International Affairs Office (IA) identifies and facilitates opportunities with key foreign and ally partners and serves as a key bridge to other U.S. Government efforts in the global supply chain. The Office of Policy (OP) provides in-depth analysis and identifies policy tools which can accelerate technology use and adoption in support of the clean energy transition. The Office of Legacy Management (LM) manages DOE's Uranium Leasing Program. In addition to the offices identified here, various crosscutting offices (including the Office of Economic Impact & Diversity, Office of Clean Energy Demonstrations, and the Office of Artificial Intelligence and Technology) may contribute staff time and coordinate with the research, development, demonstration and deployment (RDD&D) funding offices to enhance the impact of the Department's investments.

FY 2023 activities include developing and executing RDD&D coordination, budget development, and strategic planning for the crosscut through workshops, reports, and strategy updates. Strategic planning efforts will build upon previous coordination activities directed by Congress, as well as coordination mandated through Executive Order (EO) 13953, *Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries*, and EO 14017, *America's Supply Chain*. This work includes ongoing DOE efforts within the Office of Policy to develop and maintain domestic supply chains by increasing raw material availability, expanding domestic manufacturing capabilities, supporting formation of and investment in

diverse, secure, and socially responsible foreign supply chains, and enhancing supply chain knowledge and decision making. The CMM crosscut will also coordinate with other priority technology efforts, the most notable and impactful being the Subsurface crosscut, to ensure that key topics and opportunities are not overlooked.

Critical mineral development and access within the U.S. requires close coordination between DOE and other agencies which have key leadership, supporting, or facilitating roles. This includes regulatory (Environmental Protection Agency, Department of Interior (DOI)), international (Department of Commerce (DOC), Department of State, Export-Import Bank, Development Finance Corporation (DFC)), technical (DOI-United States Geological Survey), and commercial facing (DOC, Department of Labor) partners. Interagency collaboration is key to advance and secure sustainable mineral extraction, and to address the issues and challenges posed by future possible resources such as from marine environments.

Crosscut Objectives:

- ***Diversify a domestic and trusted source supply of CMM in a safe, sustainable, and environmentally just way:*** Demonstrate and deploy proven processes for producing, processing and utilizing domestic materials that are cost competitive, minimize environmental impact, increase material stewardship, and ensure workforce safety. Concurrently, advance innovation and new technologies which provide a pathway to lower cost and lower impact mineral access solutions.
- ***Develop safe, responsible, and environmentally just domestic processing and refining capabilities for CMM:*** Develop, demonstrate, and deploy safe, economically competitive, sustainable, and novel technologies for processing and refining CMM.
- ***Develop substitutes for CMM which use earth-abundant materials, are easily and economically processed, and which can have a lessened environmental footprint compared to alternatives:*** Adoption of alternative materials, components, and technologies that minimize or eliminate the use of scarce or difficult-to-access CMM.
- ***Expand and improve the efficient use, recycling and second-life application of CMM:*** Drive solutions to address efficient CMM collection and develop technologies to enable reuse, remanufacture, and efficient recycling for reintroduction into the supply chain.
- ***Develop a high-precision, material-specific understanding of the global supply chain into the future:*** As part of an all-of-government approach, conduct ongoing analyses on criticality, supply/demand, material flow, supply chain risk and uncertainty and state of industry practice. Ensure that this analysis supports actionable options and alternatives to ensure supply chain stability.

Crosscut Action Areas:

1. ***Strengthen Cross-DOE Coordination and Collaboration:*** Ensure an integrated approach to CMM RDD&D activities to include analysis of domestic and trusted ally supplies and processing through workshops, joint funding opportunities, community/stakeholder engagement, and data/information sharing. This requires organizing around the problem vs. a functional or commodity-specific focus.
2. ***Support Fundamental and Applied Research and Development (R&D) and Technology Transfer:*** Establish the foundational scientific infrastructure, knowledge base, innovation, and technology transfer activities to enable DOE to meet the crosscut objectives.

3. **Launch, Support, and Sustain Demonstration Projects:** A durable U.S. CMM supply chain requires a carefully crafted bridge between scientific discovery, technology development and industry uptake. Demonstration projects which allow risk reduction and at-scale testing of key technologies is key to a durable and secured supply chain. DOE will leverage BIL activities to support the CMM crosscut.
4. **Coordinate Broadly on Workforce Development, Science, Technology, Engineering, and Math (STEM) and Diversity, Equity, and Inclusion:** Collaborate both within the government and with all stakeholders on best practices and accelerate progress towards common goals.

Program Organization:

There are several technology offices which either directly invest in CMM, or which play a vital role in in the critical mineral supply chain.

1. **Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021 ARPA-E selected and/or obligated \$13,653K in CMM funding to projects from ARPA-E's Supporting Entrepreneurial Energy Discoveries (SEED) Exploratory Topic and Open 2021 programs. In FY 2022 ARPA-E is targeting approximately \$44,000K in CMM funding to projects from ARPA-E's Mining Innovations for Negative Emissions Resource Recovery (MINER) program. ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in CMM will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE):**
 - a. **Advanced Manufacturing Office (AMO):** Efforts will focus on comprehensive RD&D to reduce supply risk and improve supply resilience for materials and technologies necessary for the clean energy transition (including rare earths, lithium, cobalt, and gallium). These materials are needed for applications such as magnets in EVs and wind turbines, batteries, efficient lighting and semiconductors. Strategies include diversifying supply, developing substitutes, improving reuse/recycling, and more efficient use. Efforts will also focus on pilot and demo projects and testbeds that verify economics of scaled continuous operations in real world conditions. Areas of interest for these projects include highly selective separation, metal reduction, magnet manufacturing, materials recovery from secondary and unconventional sources, material reuse, more efficient use, and balanced coproduction. Lithium-ion extraction projects will improve industrial production of lithium precursors (lithium carbonate and lithium hydroxide) from raw materials sources including (but not limited to) hard rock minerals, brines, geothermal brines, and mine tailings to diversify the domestic sources of lithium.
 - b. **Geothermal Technologies (GTO):** Efforts will address technology and process gaps that still exist following the results of the Geothermal Lithium Extraction Prize to generate technical solutions to our Nation's critical minerals supply through geothermal brine and produced water extraction and processing. This may include efforts to scale up technical solutions developed as part of the Geothermal Lithium Extraction Prize to successful demonstration in the Salton Sea area of California. In the Salton Sea alone, there is an estimated annual

lithium resource potential of 600,000 tons, which currently exceeds the annual U.S. demand for lithium.

- c. *Hydrogen and Fuel Cell Technologies Office (HFTO)*: HFTO supports R&D to reduce Platinum Group Metals (PGM) catalysts for fuel cells and hydrogen production technologies, as well as additional supporting activities to reduce vulnerabilities and build supply chain resilience.
- d. *Solar Energy Technologies Office (SETO)*: SETO supports the analysis of potential PV deployment limitations related to materials scarcity and the RD&D of materials alternatives, techniques to use materials more efficiently and recycling methods to further utilize existing materials. Critical material considerations will help inform RD&D vectors within the new Solar Manufacturing Accelerator, a collaborative effort with EERE's Advanced Manufacturing Office.
- e. *Vehicle Technologies Office (VTO)*: Accelerate fundamental research for developing substitutes for graphite by enabling silicon anodes and for developing near term lithium chemistries that require very low or no cobalt. Focus research on lithium battery technologies that eliminate the need for cobalt, significantly reduce or eliminate the need for nickel and graphite such as lithium metal and solid-state battery technologies. Battery recycling R&D will advance the scale-up of bench scale processes and validate processes to meet the goal of utilizing mostly recycled material that matches the performance of virgin material.
- f. *Wind Energy Technologies Office (WETO)*: Funding for analysis and technology innovation efforts to both understand the vulnerabilities of the wind energy supply chain to critical materials and to mitigate those vulnerabilities by reducing dependence on, and improving recovery of, critical materials within wind energy components.

3. Fossil Energy and Carbon Management (FECM):

- a. FY 2023 Key Objectives (Planned): The FY 2023 Budget Request supports further advance production of high purity, commercial grade REEs and other critical minerals, which will form next stage development to broadly enable extraction of REEs and other critical minerals from unconventional feedstocks (such as coal refuse, acid mine drainage, and produced water) towards commercial industry adoption.
- b. Funding will also be utilized for Front-End Engineering Design (FEED) studies for an extraction, separation and recovery facility/system that can produce 1-3 metric tons per day of an at least 75% rare earth oxide and/or salt mixed concentrate by weight and assess potential for individual separation and reduction to metal.
- c. Funding would be applied to further regional basin projects (the Carbon Ore, Rare Earth and Critical Minerals (CORE-CM) Initiative). It will continue to support regional characterization and field activities for unconventional/secondary sources, basin commercialization strategic planning/implementation, environmental remediation value streams, basinal technology development and stakeholder outreach and engagement.
- d. Funding would be applied to further Carbon Ore to Products projects to develop synthetic graphite, graphene, and other carbon materials that are critical resources for batteries, electronics, composites, and similar end-uses. This will include technoeconomic analysis and life-cycle analysis, process systems, and market analyses of high value carbon products that will enable critical mineral production from coal-based feedstocks.
- e. The development of a sustainable, safe, and robust domestic supply chain for critical minerals and materials can also create jobs and aid in a just transition for coal and fossil-based communities. These communities have expertise that could be transferrable to technology development throughout the supply chain:

- i. Upstream unconventional technology and technique development from resource characterization and prediction, through novel extraction from sources such as acid mine drainage, mine refuse, coal ash, and geothermal and produced water brines.
 - ii. Midstream technology development for environmentally sustainable, efficient, and cost-effective extraction, processing, and refining of resources from unconventional and secondary sources.
 - iii. Downstream technology development for the transformation of carbon ore to synthetic graphite and graphene for battery anodes as well as graphene for quantum dots for use in solar cells.

- 4. **Nuclear Energy (NE):** To combat the climate crisis, create American jobs, position the U.S. to compete successfully worldwide, and support national security goals, the Office of Nuclear Energy is taking steps to support a domestic nuclear fuel supply chain including uranium mining, conversion, enrichment, fuel fabrication, and the option of recycling. NE is also developing materials and manufacturing technologies to support advanced reactors and the current fleet of domestic reactors.
 - a. In prior years, NE began to identify the critical minerals for the alloys and other applications used by the U.S. nuclear industry for the current fleet and projected for advanced reactors. NE also began supporting domestic uranium mining capabilities through R&D activities to reduce lifecycle costs of uranium production; demonstrating the production of high-assay low enriched uranium (HALEU) using U.S. origin enrichment technology to encourage commercialization by the private sector; and developing advanced recycling technologies as options to improve uranium resource utilization.
 - b. Fuel Cycle Research and Development: A HALEU Availability program will support civilian domestic demonstration and commercial use. This program will work to make available small quantities of HALEU from limited DOE uranium inventories and HALEU production in the short term and will work with the private sector in its design and build out of commercial U.S. HALEU production capability in the long term. Additionally, activities for the development and demonstration of different recycling technologies to make available small quantities of HALEU materials will continue, by using the molten salt and hybrid ZIRCEX processes.
 - c. Nuclear Energy Enabling Technologies: Perform research on the positive effects of advanced manufacturing techniques to improve use of critical minerals for nuclear energy applications.

- 5. **Office of Technology Transitions (OTT):** In FY 2022, DOE published the OTT-led report on the “Competitiveness and Commercialization of Energy Technologies, a Supply Chain Deep Dive Assessment,” as part of the DOE’s Response to EO 14017, “America’s Supply Chains.” In FY 2023, OTT will continue to collaborate with other DOE offices on the implementation of the framework and methodology described in that report. These activities include:
 - a. Conducting market and economic analysis to identify commercialization opportunities across critical material and related supply chains.
 - b. Expanding analysis and industry engagement activities to identify and pursue commercialization projects and pathways.

- 6. **Science (SC):** For many years, SC has supported foundational theoretical and experimental science related to understanding unique chemistry and materials properties associated with

REE, substitution for platinum group element (PGE) catalysts, and novel battery materials and chemistries. New research directions in FY 2023 emphasize the full breadth of the crosscut.

- a. SC-supported research has focused on understanding of the role of REEs, PGEs, and other critical elements in the determination of the properties of materials and molecules at length scales ranging from electronic to atomic and microstructural scales, and on advancing geoscience and separation science to enhance the extraction and chemical processing of critical elements.
- b. Research will expand understanding of the REE and PGE chemistry, including selective separations from solutions, and dynamics and reactivity at mineral-water interfaces during extraction and recovery.
- c. Emphasis will be on integration of the related fields of synthesis, characterization, predictive theory/modeling, and data science to advance understanding of the role of REE, PGE and other critical elements in the determination of the properties of functional materials such as magnets and catalysts, and on the use of such knowledge to reduce, eliminate, or find substitutes for critical materials in energy-relevant technologies.
- d. SC operates major x-ray, neutron, nanoscience, and high-performance computing user facilities that provide advanced synthesis, fabrication, characterization, and computational capabilities to this community for basic, applied, and industrial research.

Energy Storage Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	48,281	45,000	TBD	TBD
Advanced Research Projects Agency - Energy ¹	48,281	45,000	TBD	TBD
Energy Efficiency and Renewable Energy	344,792	311,400	496,000	+151,208
Advanced Manufacturing	25,000	30,000	30,000	+5,000
Building Technologies	25,250	7,500	25,000	-250
Geothermal Technologies	6,515	250	12,000	+5,485
Hydrogen and Fuel Cell Technologies	117,000	120,250	123,000	+6,000
Renewable Energy Integration	0	0	64,000	+64,000
Solar Energy Technologies	17,000	10,000	26,800	+9,800
Strategic Programs	1,235	7,000	0	-1,235
Vehicle Technologies	135,000	135,000	181,700	+46,700
Water Power Technologies	15,000	0	27,500	+12,500
Wind Energy Technologies	2,792	1,400	6,000	+3,208
Federal Energy Management Program	0	0	1,000	+1,000
Fossil Energy and Carbon Management	5,000	5,000	6,000	+1,000
Repurposing Fossil Energy Assets	5,000	5,000	6,000	+1,000
Nuclear Energy	103,000	92,000	12,000	-91,000
Crosscutting Technology Development	10,000	10,000	9,000	-1,000
Advanced Reactor Demonstration Program	80,000	80,000	0	-80,000
Light Water Reactor Sustainability	13,000	2,000	3,000	-10,000
Office of Clean Energy Demonstrations	0	0	12,500	N/A
Clean Energy Demonstrations	0	0	12,500	N/A
Office of Electricity	80,000	80,000	81,000	+1,000
Energy Storage Research	57,000	57,000	81,000	+24,000
20-OE-100 Grid Storage Launchpad ²	23,000	23,000	0	-23,000
Office of Technology Transitions	100	100	100	0
Science³	66,758	83,268	160,508	+93,750
Basic Energy Sciences	66,758	83,268	160,508	+93,750
Grand Total	647,931	616,768	769,108	+179,458

¹ ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

² \$47 million was provided in the FY 2022 Omnibus appropriation to fully fund the remainder of Grid Storage Launchpad construction.

³ Science funding includes the Batteries and Energy Storage Energy Innovation Hub, the Fuels from Sunlight Energy Innovation Hubs, the Energy Frontier Research Centers (EFRCs), the Energy Earthshot Research Centers (EERCs), and core research. SC also supports broad research related to hydrogen as an energy storage medium.

Summary:

The DOE Energy Storage crosscut encompasses activities including research, development, and demonstration (RD&D) efforts to accelerate market adoption of transformational energy storage technologies. Energy storage technologies are critical to decarbonizing the energy sector, whether for the power sector, transportation, buildings, or industrial end use. Fully decarbonizing the grid alone is likely to require thousands of gigawatts-hours of new energy storage, incorporating a portfolio of technologies that range in function from immediate response to the ability to discharge continuously for weeks or longer. Existing technologies must be demonstrated and validated for new uses, and new technologies must be developed, proven safe and effective, and commercialized within the next 5-10 years if the United States will achieve its ambitious decarbonization goals.

The Energy Storage Grand Challenge (ESGC) is the coordination mechanism for the Energy Storage crosscut activities. The ESGC goal is to accelerate the development, commercialization, and utilization of next generation energy storage technologies at the scale necessary for the United States to reach its decarbonization goals. This work includes the Long Duration Storage Energy Earthshot, which is a bold target to achieve 90% cost reductions for technologies that can provide 10 hours or longer duration of energy storage within the coming decade. As an Energy Earthshot, Long Duration Storage Shot highlights a top Administration research, development, demonstration, and deployment (RDD&D) focus area where innovation breakthroughs will address the climate crisis and create high-paying clean energy jobs in the United States.

As energy storage can be provided through and enabled by a broad range of technologies – electrochemical, electromechanical, thermal, flexible generation, controllable loads, and power electronics – several DOE offices have the authority and scope to work on different energy storage systems and applications. Given the opportunity space to advance energy storage through a portfolio of technologies, DOE offices are coordinating to target their funding more effectively to the highest priority areas while integrating the RD&D capabilities and expertise across program portfolios.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment of battery and critical mineral recycling, battery material processing, and long duration energy storage. These investments are essential in addressing the supply chain and technology needs to support the storage needs for intermittent renewables and grid reliability.

Coordination Efforts:

The Energy Storage Grand Challenge is co-chaired by the Offices of Electricity (OE) and Energy Efficiency and Renewable Energy (EERE) and includes the Offices of Fossil and Carbon Management (FECM), Nuclear Energy (NE), Science (SC), Technology Transitions (OTT), Clean Energy Demonstrations (OCED), the Federal Energy Management Program and Advanced Research Projects Agency-Energy (ARPA-E) as well as the Loan Programs Office (LPO) as a key participant. The ESGC coordinates activities aligned with the ESGC Roadmap, which was published in December 2020. Plans include holding a Long Duration Storage Shot Summits and workshops, as well as technical assistance and funding opportunities.

In addition to the offices identified here, various crosscutting offices (including the Offices of Economic Impact & Diversity, Policy, and Artificial Intelligence and Technology) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments.

Crosscut Objectives:

There are two crosscutting primary research and development (R&D) objectives:

- **Long Duration Storage Shot Target:** \$0.05/kWh levelized cost of storage for long duration stationary applications, a 90% reduction from 2020 baseline costs by 2030. Achieving this levelized cost target would support the Administration's 2035 and 2050 decarbonization goals and facilitate commercial viability for storage across a wide range of uses, including in:
 - Remote communities, which are frequently disconnected or may not have access to the grid, and
 - Grid-scale applications, where storage can meet load during periods of peak demand and ensure reliability of critical infrastructure, including communications and information technology.
- **Electric Vehicles (EV) Battery Cells Goal:** Reduce EV battery cell cost by 50 percent to \$60/kWh manufactured cost for a battery cell by 2030 for a 300-mile range electric vehicle to achieve cost parity with internal combustion engine vehicles. Advances in battery production for transportation applications are anticipated to continue benefitting production, performance, and safety of similar technologies used in batteries for stationary applications.

These objectives can be met by many technologies, and the more different technologies that meet them, the greater the likelihood that the full range of attributes needed to ensure reliability, flexibility, equity, and resilience in the energy sector will be met.

Crosscut Action Areas: Through ESGC, DOE supports energy storage technologies across the full value chain, from basic and applied research through analysis, demonstration, and full integration into the power and end-use sectors. The program is organized around the following five primary tracks:

1. **Technology Development:** accelerates a range of storage technologies to meet the cost and performance goals of specific end use cases. These activities include fundamental breakthroughs in new materials, prototyping at the device scale, system-level validation, and early-stage demonstrations.
2. **Manufacturing and Supply Chain:** develops technologies, approaches, and strategies for U.S. manufacturing that support and strengthen U.S. leadership in innovation and continued at-scale manufacturing.
3. **Technology Transition:** ensures that DOE's R&D transitions to markets through field validation, demonstration projects, public-private partnerships, bankable business model development, and the dissemination of high-quality market data.
4. **Policy and Valuation:** provides data, tools, and analysis to support policy decisions and maximize the value of energy storage.
5. **Workforce Development:** educates the workforce, who can then research, develop, design, manufacture, and operate energy storage systems.

Program Organization:

1. **Advanced Research Projects Agency - Energy (ARPA-E):** ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021, ARPA-E selected and/or obligated \$48,281K in funding to Energy Storage-related projects through ARPA-E's

Supporting Entrepreneurial Energy Discoveries (SEED) Exploratory Topic and Open 2021 programs as well as Duration Addition to Electricity Storage (DAYS) extension. In FY 2022, ARPA-E is targeting approximately \$45,000K in funding to Energy Storage-related projects through ARPA-E's Electric Vehicles program. The assessment process for new programs is now underway and any potential future investments in Energy Storage will be determined for FY 2023.

2. **Energy Efficiency and Renewable Energy (EERE):** EERE will continue to fund energy storage R&D for both stationary and mobility applications in support of both the Long Duration Storage Energy Earthshot and EV battery cells goal.
 - a. *Advanced Manufacturing Office (AMO):* AMO will continue to collaborate with multiple offices, including Office of Electricity (OE), and sister offices in EERE on projects to overcome manufacturing barriers and eliminate gaps in manufacturing capabilities of innovative integrated energy storage systems such as thermal energy storage, long duration energy storage, etc. Additionally, AMO's efforts in industrial decarbonization include exploring opportunities for innovation and impact through incorporating energy storage into manufacturing processes and/or facilities.
 - b. *Building Technologies Office (BTO):* BTO will continue its support for energy storage, focusing primarily on thermal energy storage research, more sophisticated controls for storage enabling grid-interactive buildings, deployment of heat pumps with thermal energy storage, and cost reductions of heat pumps with thermal energy storage.
 - c. *Geothermal Technologies Office (GTO):* GTO proposes a Reservoir Thermal Energy Storage (RTES) initiative aimed at unlocking the terawatt-scale thermal energy storage of using the Earth as our battery. GTO will conduct new pilots and demonstrations that build on prior years of early-stage research to demonstrate technical feasibility, grid integration, and long-term storage opportunities for renewable energy systems. These projects will consider where geothermal energy storage can be used in combination with other renewable energy generation and energy efficient technologies to create industrial and community energy systems that are fully decarbonized.
 - d. *Hydrogen Fuel Cell Technologies Office (HFTO):* HFTO's work in energy storage includes RD&D related to hydrogen production, hydrogen storage, and reversible fuel cell technologies, as well as systems integration RD&D. For example, HFTO funds efforts focused on integrating renewables, nuclear, and other resources with hydrogen production, storage, and end uses across applications as well as infrastructure components. Work also includes support for the National Renewable Energy Lab's Advanced Research on Integrated Energy Systems (ARIES).
 - e. *Solar Energy Technologies Office (SETO):* SETO's work in energy storage focuses on thermal energy storage (TES) integrated with concentrating solar-thermal power (CSP) systems, both for electricity generation as well as industrial process heating applications. CSP funding will continue to support high-efficiency, reliable thermal energy storage technologies to support the Energy Storage Grand Challenge and Long Duration Storage Energy Earthshot, with a particular focus on technologies using solid particles as the heat transfer medium, leveraging the SETO funded megawatt-scale Gen3 CSP test facility currently under construction.

- f. *Strategic Programs (SP)*: SP will continue to support the ESGC Policy & Valuation Track, which provides data, tools, and technical analysis that help policymakers and other energy system decision-makers maximize the value of energy storage.
 - g. *Vehicle Technologies Office (VTO)*: VTO's Battery R&D activity supports early-stage R&D of high-energy and high-power battery materials, cells, and battery development that can enable industry to significantly reduce the cost, weight, volume, and charge time of plug-in electric vehicle batteries.
 - h. *Water Power Technologies Office (WPTO)*: WPTO, through the HydroWIREs initiative, will provide funding for hydropower hybrid demonstrations, a comprehensive Hydropower Futures Study to quantify emission and cost reductions enabled by increased hydropower flexibility and new pumped storage hydropower (PSH) development, and expansion of the PSH Valuation Guidebook to include non-power value.
 - i. *Wind Energy Technologies Office (WETO)*: WETO supports the energy storage crosscut through multi-office collaboration in hybrid system design, hardware, control, and demonstration to hybrid systems involving combinations of technologies such as wind, hydropower, solar, battery storage, or hydrogen.
3. **Federal Energy Management Program (FEMP)**: FEMP focuses on key services that help agencies meet energy- and water-reduction requirements and goals. With more than 350,000 energy-utilizing buildings and 600,000 vehicles, the federal government is the nation's largest energy consumer. Energy used in buildings and facilities represents about 40% of the total site-delivered energy use of the federal government, with vehicle and equipment energy use accounting for 60%. FEMP will provide technical assistance to Federal agencies to integrate energy storage technologies into their decarbonization and climate adaption strategies.
4. **Fossil Energy and Carbon Management (FECM)**: To achieve ESGC objectives, FECM's Repurposing Fossil Energy Assets program focuses on the integration of long-duration energy storage technologies with a variety of fossil assets, including co-locating energy storage with some strategic fossil assets, which provides many benefits including improved asset flexibility and efficiency, improved grid reliability, and reduced greenhouse gas emissions.

Additionally, energy storage enables many heavily decarbonized use cases; for example, the integration of hydrogen energy storage systems with hydrogen turbine power production. In FY 2021, FECM selected 29 energy storage projects at a range of host sites across the U.S. that will be down selected to advance a few promising projects up the Technology Readiness Level scale. In FY 2023, FECM proposes \$9 million for pilot-scale field testing of integrated grid scale (>10MWh) long duration energy storage systems with fossil assets to demonstrate progress toward commercialization, assess technical and commercial viability, and enable widespread deployment. FECM will continue to focus on advancing energy storage concepts that can leverage abandoned or under-utilized fossil assets, including repurposing coal power plants with thermal energy storage and repurposing oil and gas infrastructure for geologic H₂ storage.

5. **Nuclear Energy (NE)**: NE supports R&D to enable flexible plant operation while utilizing the full capacity of a nuclear plant, including coproduction of hydrogen, to enhance the flexibility of the plant. The quick response time of electrolysis allows the system to balance electricity demand by quickly increasing or decreasing hydrogen production. If more power is needed, stored hydrogen can also be used in heat engines to provide additional electrical generation. NE is also modeling and developing thermal extraction, storage, and distribution systems for providing

both industrial process heat, as well as energy storage for the grid, where peak power turbines can be used to convert the stored thermal energy into electricity. NE is assessing thermal storage with various types of reactors, to include the current light water reactors and advanced reactors with various operating temperatures ranging from 300 to 900 degrees Celsius.

In FY 2023, NE will support activities in:

- a. Energy system modeling and simulation to develop a modeling framework for economic dispatch optimization of integrated energy systems;
- b. Energy distribution R&D to characterize and verify performance of thermal energy distribution systems;
- c. Energy storage R&D to evaluate performance, reliability, and cost for thermal energy storage systems; and
- d. Energy conversion R&D to assess thermal storage capacity and efficiency of energy conversion with heat pump cycles, chemical systems, and turbomachinery.

6. Office of Clean Energy Demonstrations: As part of OCED's management of the oversight and execution of the Advanced Reactor Demonstration Program demonstration projects, OCED will support the development of the Sodium sodium-cooled fast reactor demonstration. This project will incorporate a molten salt thermal storage system capable of boosting electrical output from 345 MW to a peak of 500 MW for 5.5 hours. While BIL provided significant funding that will support this cost-shared award, annual appropriations are necessary for DOE to fully fund the likely federal contribution for later phases of the project. To that end, while responsibility for these projects was transferred to OCED in FY 2022, the FY 2022 Enacted included \$30 million in the Office of Nuclear Energy budget for this award.

7. Office of Electricity (OE): OE's role in the Energy Storage crosscut focuses on grid-scale energy storage. The OE Energy Storage program leads a national effort to ensure a more flexible, resilient, and equitable North American power grid through increased deployment of bi-directional electrical energy storage. Through FY 2023, OE plans to continue to invest in new battery technologies that utilize low-cost, abundant, and safe materials, such as aqueous soluble organics; zinc-manganese dioxide; and sodium. OE also supports power conversion and balance of plant technologies, which account for an increasing proportion of storage system costs. OE will also continue to reinforce the importance of energy storage safety through new sensing and mitigation technologies, system testing, codes and standards development, and public outreach. OE has continued to refine and validate open-source software tools and analytical models for optimal value, sizing, and location, based on field deployments. OE also conducts and will continue in FY 2023 to conduct extensive outreach and capacity building for regulators, communities, and other key decisionmakers.

Using FY 2022 and prior appropriations, OE is funding the construction of the Grid Storage Launchpad (GSL), a major facility for validation, acceleration, and collaboration of next generation storage materials. FY 2023 energy storage research funding includes support for an inaugural cohort of fellows to be hosted at dedicated spaces within the GSL after it begins operation. Post-graduate level academics, entrepreneurs, or other high-potential innovators with early-stage concepts for new storage technologies will accelerate storage development by leveraging GSL's advanced capabilities, such as: *in operando* characterization (atomic-level monitoring of batteries as they charge and discharge), cell pack fabrication, and kW-scale testing.

The Rapid Operational Validation Initiative (ROVI) is another effort to facilitate commercial deployment of storage at scale by integrating analytical methods with field data collected from other ESGC demonstration and manufacturing activities to deliver usable projections. ROVI implements the “Testing and Validation” portion of the Energy Storage System Research, Development, and Deployment Program mandated by sec. 3201(b) of the Energy Act of 2020. In FY 2023, OE seeks to develop methodologies that would enable investment-grade performance projections at twice the speed of combined real time field/lab testing and modeling (for instance, 1 year of testing provides 2 years of projections).

8. **Office of Technology Transitions (OTT):** OTT leads the Technology Transition track for ESGC and leverages that role to conduct coordinated market and economic analyses to pursue energy storage commercialization opportunities. Prior efforts include publication of the Energy Storage Market Report and analysis of energy storage for remote and underserved communities. In FY 2023, OTT efforts will include market and economic analysis to identify and pursue technology commercialization opportunities and coordination of energy storage-related technology transfer activities across the DOE lab complex.
9. **Science (SC):** SC supports foundational, crosscutting, fundamental energy storage research, including the Joint Center for Energy Storage Research (JCESR) Energy Innovation Hub and Energy Frontier Research Centers (EFRCs), that underpin the technology offices activities. In FY 2023, after 10 years of support for JCESR, the Batteries and Energy Storage Hub program will be openly recompeted. Core research activities through FY 2023 include crosscutting science that is relevant to electrochemical energy storage as well as hydrogen and fuel cells. Included in the hydrogen portion of the crosscut is the Fuels from Sunlight Energy Innovation Hub program and EFRCs related to hydrogen research. The research emphasizes understanding of phenomena and discoveries of new materials and chemistries for these technologies.

In FY 2023, the Request includes support for a new research modality, the Energy Earthshot Research Centers (EERCs), which will work toward the stretch goals of the DOE Energy Earthshots and will provide a solid bridge between SC and the Energy Technology Offices. Through strong alignment with the technology offices, EERCs will address key research challenges at the interface between currently supported basic and applied R&D activities to bridge the R&D gap.

In addition, research grants and National Laboratory research will continue to support postdoctoral, graduate, and undergraduate research activities. Other programs include support of graduate student internships at National Laboratories, as well as Small Business Innovation Research topics in membranes for electrochemical systems. SC user facilities will continue to host broad community research and industrial users who advance energy storage technologies.

Energy-Water Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	7,671	0	TBD	TBD
Advanced Research Projects Agency - Energy*	7,671	0	TBD	TBD
Energy Efficiency and Renewable Energy	84,885	84,885	80,750	+4,135
Advanced Manufacturing	45,000	45,000	40,000	-5,000
Bioenergy Technologies	5,750	5,750	15,000	+9,250
Solar Energy Technologies	0	0	750	+750
Water Power Technologies	34,135	34,135	25,000	-9,135
Fossil Energy and Carbon Management	4,000	4,000	8,000	+4,000
Nuclear Energy	2,000	2,000	2,500	+500
Reactor Concepts RD&D	0	0	1,000	+1,000
Fuel Cycle Research and Development	2,000	2,000	1,500	-500
Science	8,500	8,500	17,000	+8,500
Basic Energy Sciences	8,500	8,500	12,000	+3,500
Biological and Environmental Research	0	0	5,000	+5,000
Weatherization and Intergovernmental Programs	500	500	500	0
Grand Total	107,556	99,885	108,750	+17,135

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

The Energy-Water crosscut is a DOE-led activity focusing on advancing transformational technology and innovation to meet the global need for safe, secure, and affordable water while maintaining an environmentally responsible water life cycle. Water is critical to human health, economic growth, and agricultural productivity and is intimately tied to the energy sector because the production of useable water requires energy and the production of energy requires water. The United States has historically benefitted from access to low-cost water supplies, but changes in freshwater supplies due to climate change and population growth are threatening U.S. economic competitiveness and water security. Until recently, the United States has had an abundance of fresh water sources that are relatively cheap and easy to treat for various end users – municipalities, utilities/power, industrial, agriculture, and resource extraction.

This large-scale, centralized water infrastructure is challenged by new pressures due to climate change, increased competition for water resources, an aging water infrastructure, and regulatory hurdles. This is forcing water users across the United States, especially those experiencing extreme drought, aridification, and water stress, to look toward non-traditional water sources (e.g., brackish groundwater, seawater, wastewater). Improvements in water and energy efficiency and resiliency are being sought in both our water and energy systems. Efforts to integrate renewables and to recover and reuse valuable

co-products from wastewater (i.e., fertilizer, hydrogen, biofuels, biopower, biochemicals, critical materials, and water reuse) are underway. An immediate opportunity lies ahead, as the U.S. is poised to invest billions in the Nation's infrastructure for long overdue repairs to water and energy systems through forward-looking investments that enhance environmental justice, equity, resiliency, cybersecurity, and climate preparedness. DOE has a significant role to bridge this by investing in research, development, and demonstration (RD&D) that enables an energy-water infrastructure that is more sustainable, climate adaptive, and equitable for the 21st century and beyond.

Coordination Efforts:

The Energy-Water activities are being coordinated by the Office of the Undersecretary for Science and Innovation, with leadership from each of the Offices involved. The Energy-Water crosscut provides RD&D, technology, climate modeling and analysis, assessment tools, technical support to manufacturers and wastewater treatment facilities, informed policy, planning and financing tools, and workforce development to replace America's outdated and deteriorating water infrastructure across municipalities, industry, utilities, agriculture, and resource extraction (i.e., oil and gas, mining), integrated with the rebuilding of the energy infrastructure.

The Offices of Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM), Science (SC), the Advanced Research Projects Agency-Energy (ARPA-E), Nuclear Energy (NE) and Weatherization and Intergovernmental Programs (WIP) participate in the Energy-Water crosscut. Numerous activities across DOE have focused on different aspects of these issues, such as: the Advanced Manufacturing Office's Energy-Water Desalination Hub (led by the National Alliance for Water Innovation (NAWI)) and the Better Plants program; the Solar Energy Technologies Office Solar Thermal Desalination research and development (R&D) and Prizes; the Water Power Technologies Office Waves to Water Prize and Water Resilience; FECM's produced water RD&D and analysis; and SC's 2017 Basic Research Needs Workshop and report for energy and water. DOE's strong innovation role is needed to develop technologies that address both opportunities and risks inherent in the integration of energy and water systems to strengthen their connected resiliency, reliability, and efficiency. As an example, DOE is addressing the energy and costs associated with treating non-traditional water sources that contain higher salinity and other constituents, while exploiting opportunities to recover water for reuse as well as valuable co-products, thus reducing the overall carbon footprint of water and wastewater systems.

In addition to the funding offices identified here, various crosscutting offices (including the Office of Economic Impact & Diversity, Office of Policy, the Artificial Intelligence and Technology Office, and the Office of Technology Transitions) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments.

In 2021, DOE led a Congressional Report on the Energy-Water-Food nexus. In FY 2022 and ongoing in FY 2023, EERE will have a dedicated staff to lead regular coordination meetings across DOE and with other agencies. This internal DOE and interagency RD&D collaboration improves our Nation's and community-level energy, water, and food security; improves water resiliency and water quality in our watersheds; provides for modernization of irrigation systems; reduces the energy and water intensity across all sectors of our economy; and provides local economic development opportunities. Particularly, this institutional alignment of RD&D offers new economic markets that can provide both urban and rural areas with profitable and sustainable options for growth.

DOE through EERE is also responsive to new Statutory Requirements from the Energy Act of 2020, SEC. 1010. ENERGY AND WATER FOR SUSTAINABILITY. 10 (a) NEXUS OF ENERGY AND WATER FOR SUSTAINABILITY for establishing a new joint DOE and Department of Interior (DOI) office, interagency coordination, and a strategic plan for RD&D investments across the federal landscape that will be developed and released in 2022.

The Office of Science activities that advance climate modeling are coordinated through the U.S. Global Change Research Program, an interagency effort under the Office of Science and Technology Policy (OSTP).

Crosscut Objectives:

- ***Inform Investment Decisions:*** Advance Earth system modeling, simulation, and analysis tools essential for informing energy infrastructure investment decisions that have the potential for large-scale deployment and in turn benefit national security and environmental justice.
- ***Drive innovation for Water Remediation:*** Develop projects that lead to water remediation associated with produced water from fossil extraction in addition to water produced as a result of large-scale geologic storage of CO₂.
- ***Enable a Diverse, Safe, and Secure Water Supply:*** Conduct RD&D, modeling, and analysis leading to a portfolio of technologies that enable pipe parity for 90% of nontraditional water sources. A nontraditional water supply achieves pipe parity when the key metrics (i.e. cost, energy performance, environmental externalities process adaptability, reliability, sustainability, etc.) of supplying water from the nontraditional source is equivalent to that of the next available option.
- ***Provide Technical Assistance for Energy-Water Efficiency:*** Partner with stakeholders across the country to make water and wastewater treatment more energy- and water-efficient by providing robust technical assistance and tools as well as facilitating the sharing of best practices. This effort also includes building out a workforce that is well trained, diverse, and inclusive to meet the needs of a more sustainable and secure 21st century energy-water infrastructure and beyond.
- ***Increase Viable Resource Recovery and Water Reuse:*** Develop technology to convert wastewater into a renewable power source (biopower, biofuels, hydrogen, renewable natural gas) or a recycled feedstock (recovered biochemical, fertilizers, critical materials, and reusable water) - ultimately decarbonizing our water/wastewater treatment and creating recycled feedstock.
- ***Develop Resilient Energy-Water Systems:*** Leverage climate, hydrologic, and grid modelling activities from across the participating Offices as well as alternative opportunities for hydropower development to understand and quantify the resilience challenges and opportunities for integrated energy-water systems in the face of climate change.

Crosscut Action Areas: DOE program offices will:

1. ***Advance Understanding of the Earth's Water Cycle:*** Develop the physical, biogeochemical, and dynamical underpinning of fully coupled climate and Earth System Models (ESMs), in coordination with other Federal efforts, leading to an advanced understanding of the Earth's water cycle. The research specifically focuses on quantifying and reducing the uncertainties in these system models, based on more advanced process representations, sophisticated software, robust couplers, diagnostics, performance metrics, and advanced data analytics.

2. **Develop Science and Technologies for Desalination:** Continue to support ongoing RD&D and analysis activities to be closely coordinated across DOE offices and other agencies such as Environmental Protection Agency, DOI, and U.S. Department of Agriculture, who were involved in roadmaps developed in 2021. The science of separations and membranes funded in SC will feed into the technology-focused aims of applied programs.
3. **Provide Tools and Training for Water Efficiency:** Enable an increase in technical assistance for water efficiency to provide tools and training for water efficiency improvements and sharing of best practices at existing facilities.
4. **Develop Resilient Energy-Water Systems:** Continue to build and ramp up climate change and hydrologic modelling work as well as develop integrating models built for water and grid purposes. Leverage ongoing work related to quantification of resilience benefits from integration and development opportunities as they relate to hydropower infrastructure.

Program Organization:

1. **Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. ARPA-E selected and/or obligated funding to Energy-Water-related projects through ARPA-E's Open 2021 program. For example, Open 2021 projects support research and development on "Systems Two Phase Cooling" and "Helical Turbulator for Robust Nucleate Boiling Cold Plate." The assessment process for new programs is underway and any potential future investments in Energy-Water will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE):** EERE will continue to focus on energy water nexus activities including:
 - a. **Advanced Manufacturing Office (AMO):** AMO activities include:
 - The Energy-Water Desalination Hub (i.e., NAWI) will continue to build its alliance and perform meaningful R&D on desalination technologies.
 - Advanced water resource recovery systems and decarbonization through development of new water/wastewater treatment systems.
 - Technical assistance programs such as Better Plants, Innovative Technology Validations, and Combined Heat and Power as well as Small Business Innovation Research/Small Business Technology Transfer, Lab Embedded Entrepreneurship Program (LEEP), HPC4Manufacturing, Technology Commercialization Fund, Energy Icorps, and National Laboratory annual operating plans for modeling and analysis.
 - Additional work will be developed through the strategic plan for the Nexus of Energy Water Sustainability (NEWS) interagency RD&D strategy plan, as required by the Energy Act 2020, Section 1010.
 - b. **Bioenergy Technologies Office (BETO):** DOE's Bioenergy Technologies Office (BETO) supports RD&D on strategies to manage wet wastes, including municipal wastewater, food waste, and manures. BETO is continuing to support technology demonstrations that can effectively manage manures and other wet agricultural wastes to support rural economies and reduce greenhouse gas emissions—fugitive methane in particular—from these wastes. BETO also supports community-based technical assistance to identify

waste management solutions in rural and urban areas and will support joint office partnerships in FY 2023 to improve wastewater treatment in urban communities.

- c. *Solar Energy Technologies Offices (SETO)*: SETO funded activities in FY 2022 and FY 2023 primarily consist of market and technology analyses to help support the development and identification of promising solar thermal desalination systems and markets. This supports the two ongoing rounds of the Solar Desalination Prize, funded in FY 2019-FY 2021, which are working on developing pilot tests of innovative technologies.
 - d. *Water Power Technologies Office (WPTO)*: WPTO activities include:
 - The Marine Energy program has funded the Waves To Water (W2W) Prize from FY 2019-FY 2021 with prize culmination during FY 2022 followed by the development of long-term duration and reliability testing of wave powered system designs and sub-assemblies. FY 2023 will continue this work, at a reduced level from FY 2022.
 - Irrigation Modernization research is being conducted to better understand innovative modernization scenarios, through the development of IrrigationViz – a design decision support tool to help irrigation district managers consider multiple modernization scenarios which will eventually lead to a larger physical demonstration program.
 - Hydrology and climate activities include the Grid Modernization and Laboratory Consortium Water Risk project, which examines the impacts and risk to grid operations due to varying climate and hydrologic drivers and different infrastructure futures. WPTO will develop initiatives that will enhance long-term data collection at basin scales to enhance water and energy resiliency planning.
 - WPTO is investigating alternative opportunity contexts for development of low-impact hydropower where the primary goal of the project is to identify and exploit the water, environmental, and/or social benefits that communities have prioritized for themselves and provide technical assistance to communities to promote these values.
 - WPTO is examining how water risk and resilience propagates through the electric grid and vice versa. Work includes developing case studies and models to support and be responsive to utilities and communities.
3. **Fossil Energy and Carbon Management (FECM)**: In FY 2023, FECM will focus on the following areas and activities:
- a. Produced water research on multipronged approaches for characterizing constituents and managing the cleaning of water as part of the broader effort to transform produced and extracted water from a waste to a resource. FECM partners with the Water De-Salination Hub and with research universities engaged in the study of characterizing, cleaning, treating, and managing produced water to develop and assess commercially viable technology through public private partnerships with the energy industry to achieve these goals. Additionally, FECM will continue work to develop and advance technologies that can economically treat produced water for beneficial re-use, protect water resources, reduce water use, and address induced seismicity related to underground injection of produced water.

- b. NAWI – FECM/National Energy Technology Laboratory (NETL) provided input and support in developing NAWI’s roadmap. Additionally, NETL serves as a subcontractor to a current NAWI award.
- 4. **Nuclear Energy (NE):** NE supports early stage, cost-shared R&D that enables technological advances in uranium mining, conversion, and transportation capabilities in the United States as well as conducting evaluations and assessments related to these areas. In FY 2021, DOE released a public funding opportunity announcement (FOA) to request proposals for R&D that reduce water usage and/or improve the extraction efficiency associated with uranium production. Mining sites are often located in underserved communities and locations with limited water resources. Improvements to mining technology spurred by R&D may enable local economic opportunities while reducing the amount of water used during uranium production. In FY 2022 and FY 2023, NE will fund cost-shared R&D for uranium mining and processing technologies that reduce water usage and/or improve extraction efficiency and resource utilization for uranium production. The Reactor Concepts RD&D’s Light Water Reactor Sustainability program will also support preliminary R&D to investigate opportunities to improve the existing fleet of nuclear reactor’s cooling water usage.
- 5. **Science (SC):** SC provides foundational knowledge and state-of-the-art capabilities in support of crosscut objectives and has supported theoretical and experimental science related to understanding chemical and biological processes, separations, materials, and geochemistry related to energy-water research for many years.
 - a. *Basic Energy Sciences (BES):* For BES, the research focus in this area is identified in the 2017 Basic Research Needs (BRN) workshop for Energy and Water. Priority research directions identified in the workshop report include the prediction and control of molecular-to-macroscopic properties and behavior of complex, multicomponent fluids; mechanistic understanding and control of interfaces and transport in complex and extreme environments; the codesign of dynamic interactions between materials and reactive fluids for unprecedented tunability of purification, transformation, and transport processes in energy-water systems; and revolutionary advances in approaches to quantify, sense, predict, and manipulate coupled physical, chemical, and biological processes in subsurface environments. In 2018, BES made 3 new awards for Energy Frontier Research Centers to advance priority research directions identified in the 2017 BRN workshop. This area remains a priority for Energy Frontier Research Centers (EFRCs) in FY 2022 with a re-competition of awards made in FY 2018. Support for the Energy-Water Nexus crosscut will continue through the EFRCs in FY 2023.
 - b. *Biological and Environmental Research (BER):* Presently, BER research contributes to reducing the greatest uncertainties in model predictions, e.g., involving clouds and aerosols. In the last decade, DOE research has made considerable advances in increasing the reliability and predictive capabilities of these models using applied mathematics, access to DOE’s fastest computers, and systematic comparisons with observational data to improve confidence in model predictions and thus the ability to use the model predictions to develop climate resilient infrastructure, including the Nation’s energy infrastructure.
 - i. Specifically, the current research will begin to incorporate artificial intelligence and machine learning capabilities and enable more sophisticated research based on higher model resolution, and the new version will add advanced capabilities for exploring changing water cycles on watershed and coastal hydrological systems

down to spatial scales of 3 km. Additional core research to underpin emerging and future Earthshots will also be initiated.

- ii. Overall, BER's research focuses on quantifying and reducing the uncertainties in these system models (including the Earth's water cycle), based on more advanced process representations, sophisticated software, robust couplers, diagnostics, performance metrics, and advanced data analytics. Priority model components include the ocean, sea-ice, land-ice, atmosphere, terrestrial ecosystems, and human activities.

Grid Modernization Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	18,363	0	TBD	TBD
Advanced Research Projects Agency – Energy*	18,363	0	TBD	TBD
Cybersecurity, Energy Security and Emergency Response	96,000	96,000	125,000	+29,000
Energy Efficiency and Renewable Energy	188,950	139,213	267,000	+78,050
Advanced Manufacturing	2,000	0	0	-2,000
Building Technologies	49,300	19,725	20,000	-29,300
Hydrogen and Fuel Cell Technologies	46,000	28,000	17,000	-29,000
Renewable Energy Integration	0	0	57,000	+57,000
Solar Energy Technologies	53,000	53,000	83,500	+30,500
Vehicle Technologies	18,000	18,000	20,000	+2,000
Water Power Technologies	15,000	13,850	27,500	+12,500
Wind Energy Technologies	5,650	6,638	42,000	+36,350
Fossil Energy and Carbon Management	3,726	3,726	5,000	+1,274
Hydrogen with Carbon Management	2,075	2,075	0	-2,075
Crosscutting Research	1,513	1,513	0	-1,513
Point-Source Carbon Capture	138	138	0	-138
TBD	0	0	5,000	+5,000
Grid Deployment Office	0	0	84,700	+84,700
Grid Planning & Development	0	0	16,200	+16,200
Grid Technical Assistance	0	0	29,500	+29,500
Wholesale Market Technical Assistance & Grants	0	0	19,000	+19,000
Interregional & Offshore Transmission Planning	0	0	20,000	+20,000
Nuclear Energy	298,000	287,000	52,000	-246,000
Crosscutting Technology Development	10,000	10,000	9,000	-1,000
Light Water Reactor Sustainability	13,000	2,000	3,000	-10,000
Advanced SMR RD&D	115,000	115,000	40,000	-75,000
Advanced Reactor Demonstration Program	160,000	160,000	0	-160,000
Office of Clean Energy Demonstrations	0	0	175,052	+175,052
Energy Demonstrations	0	0	150,052	+150,052
Advanced Reactor Demonstrations	0	0	25,000	+25,000
Office of Electricity	193,720	193,720	279,800	+86,080
Transmission Reliability & Resilience	48,220	48,220	37,300	-10,920
Energy Delivery Grid Operations Technology	0	0	39,000	+39,000
Resilient Distribution Systems	50,000	50,000	50,000	0
Cyber Resilient & Secure Utility Communications Networks	0	0	20,000	+20,000
Energy Storage Research	57,000	57,000	81,000	+24,000
20-OE-100 Grid Storage Launchpad	23,000	23,000	0	-23,000

Transformer Resilience & Advanced Components	7,500	7,500	22,500	+15,000
Applied Grid Transformation Solutions	0	0	30,000	+30,000
DCEI Energy Mission Assurance	1,000	1,000	0	-1,000
Transmission Permitting and Technical Assistance	7,000	7,000	0	-7,000
Grand Total	798,759	719,659	988,552	+208,156

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

The DOE Grid Modernization crosscut encompasses activities focused on research, development, demonstration, and deployment (RDD&D) to ensure an affordable, resilient, flexible, secure, sustainable, equitable, and reliable grid. The portfolio of work helps integrate all sources of electricity, improve the security of our Nation's grid, solve challenges of energy storage and distributed generation, and provide a critical platform for U.S. competitiveness and innovation in a global energy economy. These efforts directly enable this Administration's goals to achieve a 50-52% reduction in greenhouse emissions by 2030, zero emissions grid by 2035, and a net-zero greenhouse gas emissions economy by 2050.

Through the Grid Modernization crosscut, DOE coordinates activities across the Offices of Electricity (OE), Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM), Grid Deployment Office (GDO), Nuclear Energy (NE), Clean Energy Demonstrations, Cybersecurity, Energy Security, and Emergency Response (CESER), and Advanced Research Projects Agency-Energy (ARPA-E).

The Grid Modernization crosscut assesses and advances regional and national grid modernization efforts, technology and market developments, and institutional barriers affecting generation, transmission, distribution, and end-use technologies. It incorporates and regularly iterates on the most updated data, analyses, and projects from across a number of DOE offices.

The Grid Modernization Initiative (GMI) is core partnership of OE, EERE, FECM, NE and CESER to drive the crosscut and to co-fund foundational research through competitive opportunities as well as work with the National Laboratories, especially through the Grid Modernization Laboratory Consortium (GMLC).

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment of: cybersecurity and cyber resilience for the energy sector and rural and municipal utilities; advanced nuclear reactor demonstration; energy storage and system reliability work; smart grid investments and programs to assess risks, prevent outages and facilitate transmission. These investments are essential in addressing the supply chain and technology needs to support growth in clean energy and the grid.

Coordination Efforts:

The Grid Modernization crosscut coordinates across six priority research pillars that will enable the Administration's decarbonization goals. The six pillars are: devices and integrated systems; operations; planning; markets, policies, and regulations; resilient and secure systems; and flexible generation and load.

In addition to the offices identified above others (including the Office of Economic Impact & Diversity, Office of Policy, Office of Technology Transitions, Loan Programs Office, and the Artificial Intelligence and Technology Office) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments.

Crosscut Objectives:

The Grid Modernization crosscut works to advance high priority objectives concerning the complex U.S. grid system.

- ***Operating a Decarbonized Grid:*** Develop and advance new procedures and underlying technologies required for the operation of a national-level, decarbonized grid by 2035.
- ***Addressing Infrastructure Needs and Interdependencies:*** Address challenges and identify new opportunities for the improvement of the electricity grid and interdependent infrastructure, such as natural gas pipelines and communications.
- ***Preparing for Evolving Uncertainties:*** Support and inform careful planning and monitoring of all assets and a more robust risk-assessment process for potential failures, including to all societal income levels, to improve resilience against all malicious threats, natural disasters, climate change impacts, and other systemic risks such as human error or dependence on other critical systems.
- ***Accommodating Diverse Markets, Policies, and Business Models:*** Address analytical gaps to allow for data-driven decisions by policymakers and develop new business models as well as market and policy approaches that work effectively with an evolving grid.

Crosscut Action Areas:

DOE program offices will:

1. ***Accelerate Innovation, Demonstration, and Deployment of Tools and Technologies:*** Fund cost-shared RDD&D to accelerate the pace of technological innovation, especially where market fragmentation impedes the ability of individual entities to capture the value of research investments.
2. ***Provide Direct Technical Assistance Utilizing World-Class Capabilities:*** Provide technical assistance to public and private sector grid related entities, drawing upon unique technical capabilities of the National Laboratories and DOE program offices.
3. ***Support Private Sector Innovation Investments:*** Catalyze private sector innovation through the expertise within DOE and its National Laboratories, working in collaboration with other key stakeholders to help establish the technological foundation for grid modernization.
4. ***Invest in Regionally-Focused Partnerships and Initiatives:*** Address unique regional issues to deliver collaborative partnerships and initiatives that are tailored to regional needs as well as able to deliver national benefits.
5. ***Support Peer-to-Peer Information Exchange:*** Convene technical experts, synthesize, and help communicate across DOE and to external stakeholders, without being prescriptive.

Program Organization:

1. ***Advanced Research Projects Agency - Energy (ARPA-E):*** As defined by its authorization under the America COMPETES Act, the Advanced Research Projects Agency – Energy (ARPA-E) catalyzes transformational energy technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact energy projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021, ARPA-E selected and/or obligated \$18,363K in grid modernization funding to projects through the ARPA-E Grid Optimization (GO) Competition and

Open 2021 programs. The assessment process for new programs is now underway and any potential future investments in Grid Modernization will be determined in FY 2023.

2. **Cybersecurity, Energy Security and Emergency Response (CESER):** CESER integrates cybersecurity activities across DOE and coordinates with other DOE offices to ensure cybersecurity is built in across different R&D programs. CESER leverages DOE's National Laboratories to advance the goal of securely modernizing the Nation's electric grid. All of CESER's cybersecurity risk management tools and technologies funding is included in the GMI. For FY 2023, this includes developing cyber situational awareness and analytics including the newly announced DOE Electricity Industrial Control Systems (ICS) effort; cradle to grave supply chain cybersecurity, including programs like Cybersecurity Testing for Industrial Control Systems (CyTRICS) and digital subcomponent enumeration, and mitigation efforts; developing tools, guidance, and practices that help energy organizations' understanding and management of cybersecurity risk; cyber resilience through cyber engineering by way of programs such as the Consequence-driven Cyber-informed Engineering (CCE); and collaborations with universities to support workforce development and to stimulate innovation by students to address cyber risks to energy infrastructure.
3. **Fossil Energy and Carbon Management (FECM):** FECM ensures that the perspective for fossil generation and fuel security is reflected in the Department's grid efforts. In FY 2023, FECM will continue to fund four FECM projects involving three of the GMI topic areas: 1) Design and Optimize Infrastructure for Tightly Coupled Hybrid Systems that focuses on incorporating advanced power plant technologies into existing model frameworks; 2) Near-Term Reliability and Resiliency will look at reliability issues due to changing generations of energy sources over the next ten years in electricity regions across the country; 3) Blockchain for Optimized Security and Energy Management (BLOSEM) involves DOE's National Energy Technology Laboratory and the use of blockchain to secure energy systems; 4) Digital Twin Reinforcement Learning focuses on artificial intelligence to detect new and previously unknown cyber threats.
4. **Energy Efficiency and Renewable Energy (EERE):**
 - a. *Building Technologies Office (BTO):* BTO's RDD&D on advanced and grid-interactive technologies, such as controls, interoperability, and energy storage, will partner with industry stakeholders to develop and deploy grid-interactive efficient buildings related systems, capable of connecting with the power grid in new and increasingly adaptive manners to help with overall energy system efficiency, reliability, resilience, environmental performance, and energy affordability. These capabilities are an integral and necessary part of a decarbonized power system that maximizes use of renewable resources and can significantly reduce energy use at times when this provides a valuable option for utilities and their customers.
 - b. *Hydrogen and Fuel Cell Technologies Office (HFTO):* HFTO funds RD&D in energy storage and grid integration (including the National Renewable Energy Laboratory's Advanced Research on Integrated Energy Systems (ARIES) and R&D on reversible fuel cell technologies. In addition, HFTO's portfolio includes systems development and integration, including hybrid energy systems such as wind/offshore-wind to hydrogen, and microgrids for underserved communities, along with supporting analysis.
 - c. *Vehicle Technologies Office (VTO):* VTO will continue laboratory and industry-led projects to develop secure vehicle-grid connection and communication technologies, as well as high power grid-tied charging systems.

- d. *Wind Energy Technology Office (WETO)*: WETO will prioritize RD&D in offshore transmission analysis and technology advancement, grid reliability and resilience, wind control and cybersecurity research, and crosscutting demonstrations in grid-enhancing technologies and hybrid energy systems. This body of work will align with the Renewable Energy Grid Integration Action Plan, developed to align grid activities across EERE and OE to enable a just transition to a grid that supports a decarbonized power system by 2035 and a zero-emission economy by 2050, all while maintaining the reliability, affordability, security, and resilience of the energy system.
- e. *Solar Energy Technologies Office (SETO)*: SETO will support analysis and RDD&D of grid integration technologies at the bulk power and distribution system levels to allow reliable, resilient, and secure grid planning and operation with increasing amounts of solar, energy storage, hybrid systems, and other inverter-based assets.
- f. *Renewable Energy Integration (REI)*: REI will expand power system planning and operations support to communities looking to deploy larger amounts of renewable energy, provide analysis-based technical assistance to power system operators and regulators, demonstrate expanded provision of reliability services from wind and solar generation, and support the integration of renewable generation into heavy-duty electric truck corridor demonstrations.
- g. *Water Power Technologies Office (WPTO)*: WPTO, through the HydroWIRE initiative, will provide funding for hydropower hybrid demonstrations through a comprehensive Hydropower Futures Study to quantify emission and cost reductions enabled by increased hydropower flexibility and new PSH development, and expansion of the PSH Valuation Guidebook to include non-power values.

5. **Grid Deployment Office (GDO)**: GDO catalyzes development of new and upgraded high-capacity electric transmission lines nationwide and deployment of transmission and distribution technologies to improve the resilience of our Nation's electric infrastructure. Massive deployment of renewable energy and build out of transmission infrastructure is necessary for 100% clean electricity by 2035 and net-zero emissions economy-wide by 2050. GDO works in strong partnership with energy sector stakeholders on a variety of grid initiatives to achieve a clean, reliable, resilient, and equitable grid.

All of GDO activities fall under the grid modernization crosscut. In FY 2023, GDO will accelerate the planning and development of transmission through the National Transmission Planning Study and interregional transmission plans; provide grid technical assistance activities to enable policy and investment decisions; assist regions and states in improving or establishing wholesale electricity markets; and help develop offshore wind transmission infrastructure.

6. **Nuclear Energy (NE)**: In FY 2023, NE will continue to support targeted research with industry, universities, and National Laboratories through competitive funding opportunities and directed research, such as improved simulation methods to better understand how new capabilities change the way nuclear plants interact with the electrical grid and quantify the dynamic response rates of the plants that are equipped with integrated energy systems (IES). NE plans to perform probabilistic analysis to evaluate IES performance in extreme weather scenarios when variable resources may be unavailable. Additionally, NE will conduct regional studies on IESs that include thermal energy storage systems and on their co-product markets and optimal storage use. NE also plans to support a study of U.S. electricity markets to assess whether they are incentivizing the investments necessary to ensure reliable supply, and if not, what mechanisms

could be introduced to ensure that the value each generation's source provides to the grid is reflected in market prices.

- 7. Office of Clean Energy Demonstrations (OCED):** OCED will initiate a new competition in FY 2023 to support commercial-scale demonstrations related to the integration of renewable and distributed energy systems. The goal of this new investment area is to support demonstrations that de-risk controlling flexible loads from renewable energy, energy storage, electric vehicle (EV) charging, and other facilities into the U.S. transmission and distribution grids. This may include support for demonstrations of innovative hybrid generation systems, as well as the utilization of energy storage technologies, EV charging, controllable loads from buildings and industrial facilities, and other approaches for cost effective integration of renewable energy, as well as the demonstration of operational flexibility, consumer behavior changes, and grid services provision.

Additionally, OCED will provide additional funding via annual appropriations for additional project management and technical oversight of the two Advanced Reactor Demonstration Program demonstrations: the TerraPower Sodium sodium fast reactor and the X-energy Xe-100 high-temperature gas reactor previously funded via NE. Sustained support for these demonstrations are a key component of DOE's strategy to meet Administration's goals of 100 percent clean energy generation by 2035 and net-zero emissions by 2050.

- 8. Office of Electricity (OE):** Grid modernization is a critical aspect of all OE programs, therefore the entire OE program, except OE Program Direction funding, is included in the GMI. In FY 2023, OE plans to continue pursuing research for technologies to improve grid reliability, resilience, efficiency, flexibility, and functionality that are built from inception to automatically detect, reject, and withstand cyber incidents, regardless of the threat to the electricity delivery system. OE will also continue to develop core analytic, assessment, and engineering capabilities that can evolve as the technology and policy needs mature to support decision making involving complex interdependencies among energy infrastructure systems, such as between electricity and natural gas systems.

OE plans to continue support for private sector innovation investment in data platforms and advanced communications/control designs, regional and national deployment through cooperative agreements, and is completing construction of the Grid Storage Launchpad with FY 2022 funding to consolidate existing materials research and new characterization and testing capabilities focused on grid scale energy storage research.

Hydrogen Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	34,342	0	TBD	TBD
Advanced Research Projects Agency – Energy*	34,342	0	TBD	TBD
Energy Efficiency and Renewable Energy	155,900	166,500	217,500	+61,600
Advanced Manufacturing	5,000	10,000	20,000	15,000
Hydrogen & Fuel Cell Technologies	150,000	150,000	186,000	+36,000
Solar Energy Technologies	0	5,100	7,500	+7,500
Water Power Technologies	0	0	1,000	+1,000
Wind Energy Technologies	900	1,400	3,000	+2,100
Fossil Energy and Carbon Management	88,700	88,700	116,000	+27,300
Advanced Turbines	27,000	27,000	27,000	0
Gasification Systems	19,000	19,000	26,000	+7,000
Solid Oxide Fuel Cells	30,000	30,000	5,000	-25,000
Simulation-Based Engineering	500	500	6,000	+5,500
Point Source Carbon Capture	5,500	5,500	20,000	+14,500
Energy Storage Grand Challenge	5,000	5,000	6,000	+1,000
Natural Gas Decarbonization and Hydrogen Technologies	1,700	1,700	26,000	+24,300
Nuclear Energy	23,000	12,000	12,000	-11,000
Crosscutting Technology Development	10,000	10,000	9,000	-1,000
Light Water Reactor Sustainability	13,000	2,000	3,000	-10,000
Office of Technology Transitions	0	0	100	+100
Science	17,000	17,386	60,400	+43,400
Basic Energy Sciences	17,000	17,386	60,400	+43,400
Grand Total	318,942	284,586	406,000	+121,400

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

The DOE Hydrogen crosscut encompasses activities across multiple offices in DOE that sponsor research, development, demonstration, and deployment (RDD&D) to foster innovations and develop widely available, net-zero emission, cost-competitive technologies for the production, storage, and delivery of hydrogen, and for its end use as a chemical feedstock or fuel. Hydrogen is a versatile energy carrier that can be produced with net-zero greenhouse gas emissions by using diverse domestic resources including renewables, nuclear, and fossil fuels with carbon capture and storage. Accordingly, hydrogen is an enabling piece of DOE's portfolio of solutions to achieve an abundant, reliable, and affordable supply of clean energy to meet our climate goals and maintain our prosperity throughout the 21st century and beyond.

Crosscut activities will focus on enabling clean hydrogen for hard-to-decarbonize applications in industry and heavy-duty transport, as well as in power generation and energy storage. A crosscutting team comprising DOE program offices of Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM), Science (SC), Nuclear Energy (NE), Technology Transitions (OTT), and the Advanced Research Projects Agency-Energy (ARPA-E) coordinates these activities, including the Hydrogen Energy Earthshot, which is a highly ambitious production cost target to reach \$1 for 1 kg of clean hydrogen in one decade. The Hydrogen Energy Earthshot is one of the Department's top RDD&D focus areas where innovation breakthroughs are needed to address the climate crisis and create high-paying domestic jobs in clean energy.

Hydrogen as an energy carrier can be produced using diverse domestic resources and can be used in a wide range of end-use sectors, and as such, several DOE offices are involved in developing different hydrogen production and delivery methods as well as application spaces. By integrating those efforts, each office benefits from joint analyses and assessments and therefore more effectively targets their funding to the highest priority areas and avoids duplication of efforts.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment for clean hydrogen hubs, clean hydrogen electrolysis and clean hydrogen manufacturing and recycling. These investments are essential in addressing the supply chain and technology needs to support growth in clean energy.

Coordination Efforts:

The Hydrogen crosscut coordinates activities aligned with the DOE Hydrogen Program Plan, which outlines key activities and a matrix of roles and responsibilities across the pipeline of hydrogen production, delivery, storage, and end use RDD&D efforts. The team meets regularly to coordinate the DOE Hydrogen Program strategy. The offices also meet monthly at a technical level across relevant DOE offices to share status, progress, and gaps, as well as meet monthly with other agencies involved in hydrogen activities. Plans also include Hydrogen Shot Summits and workshops, a joint Annual Merit Review and Peer Evaluation Meeting, a Basic Energy Sciences Roundtable to address research gaps, joint regional analysis, lifecycle emissions and supply chain assessments, and joint proposal peer reviews for solicitations.

In addition to the funding offices identified here, various crosscutting offices (including the Offices of Economic Impact & Diversity, Policy, and Artificial Intelligence and Technology) may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments. Coordination with the Office of Clean Energy Demonstrations will be essential to maximize BIL related hydrogen provisions going forward.

Crosscut Objectives:

The Hydrogen crosscut team works to achieve objectives identified through Hydrogen Shot and the DOE Hydrogen Program Plan.

- ***Achieve Hydrogen Production Goals:*** Conduct research, development, and demonstration (RD&D) to achieve \$1/kg clean hydrogen cost target in one decade per the Hydrogen Shot target.
- ***Enable Market Competitive End Uses and Hydrogen Infrastructure:*** Enable viable end uses for hydrogen in hard-to-decarbonize sectors (e.g., steel/chemicals manufacturing, heavy-duty

transport, power generation/storage) through RDD&D and by addressing institutional barriers such as safety, codes, and standards.

- **Address Resource and Sustainability Requirements:** Assess availability of primary energy, water, materials, and other inputs to ensure holistic, sustainable, net-zero life-cycle emissions pathways, and ensure stewardship of our communities and the environment.
- **Innovate:** Foster fundamental science and applied research and development (R&D) to enable breakthroughs along the value chain of hydrogen technologies including fuel cells, electrolyzers, turbines, and end uses.

Crosscut Action Areas: Through the Hydrogen crosscut, DOE program offices EERE, FECM, SC, NE, OTT, ARPA-E, and the Office of Clean Energy Demonstrations (OCED), will:

1. **Strengthen Cross-DOE Coordination and Collaboration:** Ensure an integrated approach to RDD&D hydrogen activities to include analysis of complex and integrated systems, workshops, joint funding opportunities, and Principal Investigator meetings, community/stakeholder engagement, and data/information sharing.
2. **Support Fundamental and Applied R&D and Technology Transfer:** Establish the foundational scientific infrastructure, knowledge base, innovation, and technology transfer activities to enable DOE to meet the crosscut objectives.
3. **Launch Demonstration Projects:** Establish Hydrogen Hubs and demonstration projects, aligned with the Hydrogen Shot and the H2@Scale initiative, and use data to guide future RD&D.
4. **Conduct Systems Analysis:** Conduct life cycle, resource, regional, and techno-economic analyses to guide the portfolio and strategy.
5. **Promote Hydrogen Safety Sharing:** Share best practices and resources and make hydrogen safety a priority in our activities and projects.
6. **Coordinate on Workforce/STEM and Diversity, Equity, and Inclusion:** Collaborate on best practices and accelerate progress towards common goals.

Program Organization:

1. **Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021, ARPA-E selected and/or obligated \$34,342K in hydrogen-related funding to projects through ARPA-E's Renewable Energy to Fuels' Utilization of Energy-dense Liquids Integration and Testing (REFUEL+IT) and Open programs. The assessment process for new programs is now underway and any potential future investments in Hydrogen will be determined in FY 2023.
2. **Energy Efficiency and Renewable Energy (EERE):** EERE programs will collaborate to maximize impact in FY 2023:
 - a. **Advanced Manufacturing Office (AMO):** AMO will invest in developing and deploying hydrogen and fuel cell technologies to advance the economic use of low-carbon hydrogen for industrial processes, including high temperature electrolyzer manufacturing R&D.
 - b. **Hydrogen and Fuel Cells Technologies Office (HFTO):** EERE's entire HFTO activities are included in this crosscutting investment. Efforts supported include hydrogen production, delivery/infrastructure, storage, fuel cells, and end uses, including systems development and integration, as well as safety, codes, standards, and workforce development.

- c. *Solar Energy Technologies Office (SETO)*: SETO supports the RD&D of concentrating solar thermal power systems that can be used for hydrogen production or in conjunction with hydrogen as a chemical feedstock for decarbonized industrial processes.
- d. *Water Power Technologies Office (WPTO)*: As part of the HydroWIREs funding opportunity, WPTO will support the demonstration of hybrid energy storage multi-resource configurations such as floating photovoltaics and hydrogen storage.
- e. *Wind Energy Technologies Office (WETO)*: WETO supports the hydrogen crosscut through multi-office collaboration in hybrid system design, hardware, control, and demonstration to hybrid systems involving combinations of technologies such as wind, hydropower, solar, battery storage, or hydrogen.

- 3. Fossil Energy and Carbon Management (FECM):** FECM focuses primarily on hydrogen production from carbon-based or fossil resources, coupled to carbon capture and storage (CCS) to achieve carbon-neutral hydrogen, as well as large scale power generation using turbines or solid oxide fuel cells (SOFC) and large scale/geological hydrogen storage. FECM has invested considerable resources to support the development of gasification systems with pre-combustion carbon capture for producing clean hydrogen as a feedstock for fuel as well as hydrogen turbines and fuel cells for electricity generation.

In FY 2023, FECM plans include lifecycle cost and technoeconomic analyses for co-gasification of wastes (i.e., legacy coal waste, plastics, sustainably sourced biomass); building a gasification test facility; development of fundamental combustion knowledge for other carbon-free fuels such as ammonia; development of modular heat engines that can be used to decarbonize energy and industry ecosystems; investment in field-testing of 10–25-kW SOFC systems running on both natural gas and hydrogen in a real environment at third-party data center locations.

Within the Office of Resource Sustainability, efforts will focus on technologies for carbon-neutral hydrogen production from stranded methane sources, as well as hydrogen (and ammonia) transportation, and geologic storage technologies that leverage existing natural gas infrastructure as well as supporting analytical tools and models. Hydrogen research will focus on cutting edge, next-generation conversion technologies, blending hydrogen with natural gas, and leveraging existing transportation and storage infrastructure to handle high volume fractions of hydrogen.

- 4. Nuclear Energy (NE):** NE focuses on enabling hydrogen production from nuclear power, including the existing fleet of reactors and advanced reactors. In FY 2022, NE continues to negotiate two projects selected with EERE Hydrogen Fuel Technology Office (HFTO) for hydrogen production demonstration at nuclear power plants.

In FY 2023, NE will continue to:

- a. Advance technical feasibility, economic potential, and license considerations to validate the feasibility and business case for producing hydrogen at nuclear power plants in different regions of the country;
- b. Perform R&D on the physics and control of thermal delivery systems that couple nuclear reactors to high-temperature steam electrolysis at increasing scale;
- a. Develop full-scope nuclear plant simulators to help develop operating concepts and human factors that will enable nuclear power plants to dispatch energy safely and efficiently to the

- hydrogen plant when switching to full production of electricity for the grid according to real-time market signals; and
 - b. Demonstrate industrial/chemical hydrogen applications using hydrogen produced with heat and electricity from existing nuclear reactors (in collaboration with EERE).
5. **Office of Technology Transitions (OTT):** OTT will continue to collaborate with DOE offices to:
- a. Conduct market and economic analysis to identify commercialization opportunities, risks, and challenges across the RDD&D continuum.
 - b. Expand analysis and industry engagement activities to identify and pursue commercialization projects and pathways.
6. **Science (SC):** *Basic Energy Sciences (BES)* provides foundational knowledge and state-of-the-art capabilities in support of the Hydrogen Crosscut objectives and continues to support theoretical and experimental science related to understanding hydrogen technologies and materials that will continue through FY 2023. In FY 2023, the Request includes support for a new research modality, the Energy Earthshot Research Centers (EERCs), which will work toward the stretch goals of the DOE Energy Earthshots and will provide a solid bridge between SC and the Energy Technology Offices. Through strong alignment with the technology offices, EERCs will address key research challenges at the interface between currently supported basic research and applied research and development activities to bridge the R&D gap.

Key activities include supporting scientific discoveries and major scientific tools to transform our understanding of hydrogen-related technologies including hydrogen storage, production, utilization, and conversion. SC operates major x-ray, neutron, nanoscience, and high-performance computing user facilities that provide advanced synthesis, fabrication, characterization, and computational capabilities to this community for basic, applied, and industrial research.

SC research enables breakthrough advances to hydrogen production beyond conventional approaches such as electrolysis; related work is conducted by the Fuels from Sunlight Hub program and the Energy Frontier Research Centers, which complement the technology-specific RD&D supported by DOE's applied energy offices and provides foundational knowledge that can bring advances to many areas of technology development.

Further, SC enables advances in synthesis, catalysis, modeling, artificial intelligence/machine learning, analytical instrumentation at user facilities, high-performance computing, and bio-inspired approaches. Key basic research focus areas include: novel materials for hydrogen storage, membranes for separations, purification, ion transport, novel materials, chemical processes for production and use of hydrogen such as design of nanoscale catalysts, bio-inspired materials and processes, and solar hydrogen production. SC increases understanding of the role of critical elements such as rare earth elements and platinum group metals used in catalysts to reduce their use and dependence on such materials in coordination with the Critical Minerals and Materials Crosscut.

Industrial Decarbonization Crosscut

Funding by Appropriation and Program Control (\$K)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	103,164	0	TBD	TBD
Advanced Research Projects Agency - Energy*	103,164	0	TBD	TBD
Energy Efficiency and Renewable Energy	388,006	388,006	639,390	+251,384
Advanced Manufacturing	165,506	165,506	315,700	+150,194
Bioenergy Technologies	105,500	105,500	109,000	+3,500
Hydrogen and Fuel Cell Technologies	117,000	117,000	176,150	+59,150
Solar Energy Technologies	0	0	32,675	+32,675
Strategic Programs	0	0	5,865	+5,865
Fossil Energy and Carbon Management	251,600	251,600	235,000	-16,600
Hydrogen with Carbon Management	63,300	63,300	31,500	-31,800
Point-Source Carbon Capture	86,300	86,300	81,500	-4,800
Carbon Transport and Storage	79,000	79,000	122,000	+43,000
Carbon Dioxide Conversion	23,000	23,000	0	-23,000
Nuclear Energy	36,000	28,500	44,000	+8,000
Advanced Reactor Technologies	8,500	8,500	16,000	+7,500
Crosscutting Technology Development	10,000	10,000	9,000	-1,000
Light Water Reactor Sustainability	13,000	2,000	3,000	-10,000
National Reactor Innovation Center	4,500	8,000	16,000	+11,500
Office of Technology Transitions	0	0	100	+100
Science	13,700	30,700	88,700	+75,000
Basic Energy Sciences	13,700	30,700	88,700	+75,000
Grand Total	792,470	698,806	1,007,190	+317,884

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

The Decarbonizing Industry crosscut engages multiple offices across DOE to foster innovations and enables scale up of cost-competitive, low-emissions technologies to achieve the DOE goal of decarbonizing energy intensive and high greenhouse gas (GHG)-emitting industries to achieve net-zero greenhouse gas emissions, economy-wide, by no later than 2050. The crosscut leverages research, development, demonstration and deployment (RDD&D) across the pillars of industrial decarbonization: energy efficiency; electrification; low carbon fuels, feedstocks and energy sources; and carbon capture and storage (CCS).

The U.S. industrial sector is considered a hard-to-decarbonize sector of the energy economy, due in part to the diversity of energy inputs into a wide array of heterogeneous industrial processes and operations. In 2020, the industrial sector accounted for 33% of the nation's primary energy use and 30% of energy-

related carbon dioxide (CO₂) emissions¹ with refining, chemicals, iron and steel, cement, and food products representing the top energy-consuming sectors.

Given the technologies and systems interdependencies across the decarbonization pillars, crosscut activities will be an enabling piece of DOE's portfolio of solutions to achieve a net zero carbon economy by 2050, with the potential to contribute to a reduction of 400 million metric tons of CO₂ of industrial emissions by 2050 in the most energy and emissions intensive industrial subsectors. Additionally, industrial decarbonization investments can improve manufacturing productivity, develop innovative products, and meet expanding societal needs while enabling jobs and maintaining our prosperity throughout the 21st Century and beyond.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of technology development, demonstration, scale-up, and deployment for industrial emissions reduction, industrial research and assessments, support state manufacturing and advanced energy manufacturing and recycling. These investments are essential in addressing the supply chain and technology needs to decarbonize industry.

Coordination Efforts:

The Industrial Decarbonization crosscut is coordinated with regular meetings across representatives from Energy Efficiency and Renewable Energy, Fossil Energy and Carbon Management, Science, Nuclear Energy, Office of Technology Transitions and Advanced Research Projects Agency - Energy, with focused discussions on industry. FY 2023 activities include developing and executing research, development, demonstration, and deployment (RDD&D) coordination, budget development, and strategic planning for the crosscut that is informed by the Industrial Decarbonization Roadmap, a Congressionally directed report.

In addition to the offices identified here, other technology offices such as Office of Electricity, Office of Clean Energy Demonstrations, Office of Cybersecurity, Energy Security and Emergency Response and other crosscutting offices such as Office of Economic Impact & Diversity, Office of Policy, Artificial Intelligence and Technology Office, and Loan Programs Office may contribute staff time and coordinate with the RDD&D funding offices to enhance the impact of the Department's investments.

Crosscut Objectives:

Given the reliance on carbon and variation of energy sources, uses, and product mixes, it will be critical to proactively pursue multiple decarbonization approaches in parallel, which include the following:

- **Address Energy Efficiency:** Conduct RDD&D to enable energy efficiency in hard-to-decarbonize sectors ranging from energy intensive unit operations (e.g., process heating) to facilities/systems operations. This includes, for example, waste heat recovery and flexible combined heat & power (CHP) approaches that have the potential to significantly reduce energy consumption and associated GHG emissions in the near term, and that will also be able to transition to fully clean (zero carbon-emitting) energy sources in the mid- to long-term (i.e., ensure that unintended fossil fuel lock-in does not occur).
- **Decarbonize Operations:** Fossil fuel energy use in operations, as well as some processes inherent to manufacturing (e.g., cement production, fermentation of biofuels) generate CO₂. In

¹ EIA (Energy Information Administration), Annual Energy Outlook 2021 with Projections to 2050. 2021. https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf.

addition to utilizing zero carbon generation electricity, carbon capture, and sequestration (CCS) can reduce emissions at the source. RDD&D focuses on technologies that can improve capture performance; generate lower carbon intensive products (i.e., ethanol, H₂, cement) convert CO₂ into valuable products, in some cases, products that can augment those produced in the industrial sector such as cement and curing to concrete; and safely store CO₂ in geologic formations. Viable CCS and CO₂ conversion pathways need both a value proposition as well as assessment of the availability of primary energy, water, and other inputs to ensure holistic, sustainable, low-life cycle emissions pathways, and ensure stewardship of our communities and the environment.

- **Transition Energy Sources:** RDD&D focuses on hydrogen, low carbon fuels and feedstocks, solar thermal, and electrification so they can be cost-effectively used to reduce energy and emission intensity. Low-carbon and sustainably sourced biomass feedstocks may also offer an effective alternative to replace current petroleum-based feedstocks for a variety of high-volume chemical products leading to significant GHG emissions reductions.
- **Innovate Alternate Pathways and New Technologies:** The current predominantly linear production system of materials extraction to manufacturing to product use to disposal does not optimize around energy or GHG emissions; circular economy approaches, and reverse supply chain may provide entirely new opportunities for energy/emissions improvements in concert with new economic opportunities for transformative material and resource utilization. Opportunities exist to foster fundamental science and applied R&D aligned with other crosscuts and DOE priorities such as advanced manufacturing including biomanufacturing; circularity for critical materials, plastics, and water; as well as entirely new pathways for carbon dioxide removal (CDR) approaches via reaction of CO₂ with alkaline by-products or waste (e.g., mine tailings) to produce synthetic aggregates, which can serve as replacements for sand and gravel.

Crosscut Action Areas:

The Industrial Decarbonation crosscut will:

1. **Strengthen Cross-DOE Coordination and Collaboration:** Ensure an integrated approach including clearly defined “swim lanes” and “relay points,” integrated systems analysis, workshops and Principal Investigator meetings, community/stakeholder engagement, and data/information sharing.
2. **Support Fundamental and Applied R&D and Technology Transfer:** Establish the foundational scientific infrastructure, knowledge base, innovation, and technology transfer to enable DOE to meet program goals.
3. **Conduct Front-end Engineering Design Studies and Launch Demonstration Projects:** Conduct front-end engineering design (FEED) studies as way to build confidence in technical and cost performance of subsequent full-scale builds. Establish Decarbonizing Industry demonstration projects in priority areas aligned with pre-demonstration stage DOE investments and use data to guide future RDD&D.
4. **Conduct Systems Analysis:** Conduct life cycle, resource, regional, and techno-economic analyses to guide the portfolio and strategy.
5. **Promote Information and Data Sharing:** Share best practices and resources to accelerate progress across the Technology Readiness Level (TRL) value chain.
6. **Coordinate on Workforce/STEM and Diversity, Equity, and Inclusion:** Collaborate on best practices and accelerate progress towards common goals.

Program Organization:

- 1. Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. In FY 2021, ARPA-E funded Decarbonizing Industry / projects related to Sulfur Hexafluoride (SF₆)-Free Routes for Electrical Equipment, Harnessing Emissions into Structures Taking Inputs from the Atmosphere (HESTIA), and Open 2021 programs. ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in Decarbonizing Industry will be determined in FY 2023.
- 2. Energy Efficiency and Renewable Energy (EERE):** In FY 2023, EERE will support Industrial Decarbonization through applied research, development, and demonstration that pursues all pathways to decarbonization.
 - a. *Advanced Manufacturing Office (AMO):* AMO broadly covers approaches to decarbonize industry with a strong focus on lowering GHG emissions through energy and materials efficiency, industrial electrification, and transformative uses of low-carbon fuels, feedstocks, and energy sources. Representative research, development, and demonstration (RD&D) topics include process intensification, electrochemistry-driven materials transformations, electrified and intensified thermal processes as well as low thermal budget processes, material efficiency and circular economy approaches, smart and sustainable manufacturing, and strategic energy management. Programs are rolled out through public-private partnerships (e.g., Institutes and Hubs); AMO will support RD&D projects (to develop and demonstrate the next generation of targeted technologies that will address high GHG-emitting industrial subsectors, as well cross-cutting technologies that will have impact across multiple industrial subsectors); partnerships with industry to address direct and indirect emissions from their processes, facilities and operations; and creative approaches to develop the workforce and next generation of innovators.
 - b. *Bioenergy Technologies Office (BETO):* BETO supports industrial decarbonization through the development of alternative feedstocks, and energy efficient conversion processes to produce fuels, chemicals, and materials. BETO's alternative feedstocks R&D focuses on technologies to produce sustainable, cost-effective, conversion-ready feedstocks, including biomass and wastes, such as CO₂. BETO also supports RD&D conversion technologies that can utilize these alternative feedstocks to replace traditional manufacturing processes and fossil-derived chemicals with leap-frog technologies that use significantly less energy inputs and reduce GHG emissions.
 - c. *Hydrogen and Fuel Cell Technologies Office (HFTO):* HFTO funds RD&D to enable affordable carbon-free hydrogen to address hard-to-decarbonize applications across sectors. Within the hard-to-decarbonize industrial and chemical processes, HFTO supports RD&D focused on demonstrating the ability of clean hydrogen as a feedstock (ammonia production) or as a direct reducing agent (i.e., steel production). Efforts may also include demonstrating clean hydrogen as a heat source for processes like steel and cement production.
 - d. *Solar Energy Technologies Office (SETO):* SETO supports the RD&D of industrial processes driven by solar thermal energy. This activity includes both low-temperature systems focused on low-cost embodiments of existing technologies, and the development of components and system designs for high-temperature systems that are difficult to decarbonize through electrification. Low temperature systems, in the range of 100 to 300 °C target a levelized cost of heat (LCOH) of 1 cent per kWh-thermal or lower, which would constitute at least a 50 percent decrease in

current LCOH. High temperature systems work includes the development of solar thermal pathways for the carbon-emission-free production of energy-intensive chemicals, commodities, and fuels, like ammonia, steel, cement, and hydrogen.

- e. *Strategic Programs (SP)*: SP analyzes crosscutting issues that affect EERE technologies, such as integration of EERE technologies into the energy system, changing demand for energy, and efficient use of limited resources to enable the transition to a net-zero carbon emission economy.

3. Fossil Energy and Carbon Management (FECM): In FY 2023, FECM will support the Decarbonizing Industry crosscut in several ways, including:

- a. RDD&D on CCUS including technical feasibility, economic potential, and siting/systems considerations to co-locate large industrial facilities with CCUS availability.
- b. RDD&D on the production of hydrogen with CCUS from fossil resources/wastes (such as plastics and co-production using biomass, where available).
- c. RDD&D on turbines that can utilize hydrogen, ammonia, and other low carbon fuels for power generation to be used in industrial applications, as well as hybrid and integrated systems to maximize efficiency.
- d. Reversible solid oxide fuel cells/solid oxide electrolyzer cells, focused on natural gas and co-producing hydrogen, in coordination with EERE's HFTO.
- e. Large scale transport and geological energy storage, including hydrogen or hydrogen carriers such as ammonia at scale to support bulk power generation.
- f. R&D on integrating DAC systems with industrial facilities to leverage waste heat opportunities.
- g. R&D on installation of Bioenergy with Carbon Capture and Storage (BECCS) and Biomass Carbon Removal and Storage (BiCRS) systems at industrial facilities.

5. Nuclear Energy (NE): In FY 2023, NE will support industrial decarbonization in several ways, including:

- a. Developing the methods for thermal extraction, storage and distribution; as well as operations and control systems for direct use of heat generated from the existing light water reactor fleet.
- b. Developing architectural and engineering models and investor-grade reports to detail the opportunities for providing clean thermal and electrical energy for industrial applications with the existing light water reactor fleet (e.g., hydrogen, ammonia, metals, chemicals, and fuels).
- c. Development of site integration methods and practices for collocating microreactors and small modular reactors with distributed industrial applications for use of both clean heat and clean electrical power from nuclear energy (e.g., refineries, chemical plants, mineral processing, data centers).
- d. Development of reactor technologies that produce high grade heat (500 C to 900 °C) suitable for use in most chemical and industrial processes.
- e. Cost analysis of advanced reactor technologies to identify pathways for cost reduction and the economic viability for integration of advanced reactors with industrial applications.
- f. Feasibility studies for upgrading lower temperature (300 °C) heat sources with heat pumps.
- g. Exploring opportunities to use low-cost, clean nuclear heat for broad-spectrum material recycling processes.
- h. Using nuclear energy source to improve the yield of bio-refineries.

4. Office of Technology Transitions (OTT): OTT will continue to collaborate with DOE offices to:

- a. Conduct market and economic analysis to identify commercialization opportunities, risks and challenges across the RDD&D continuum.
 - b. Expand analysis and industry engagement activities to identify and pursue commercialization projects and pathways.
- 5. Science (SC):** Basic Energy Sciences provides foundational knowledge and state-of-the-art capabilities in support of crosscut objectives, including theoretical and experimental science related to understanding opportunities for decarbonizing industry. The research to support this crosscut is also discussed in the Critical Materials and Minerals, and Advanced Manufacturing crosscut narratives. In FY 2023, SC will support the Industrial Decarbonization crosscut in several ways, including:
- a. Support scientific discoveries and major scientific tools to transform our understanding of materials and conversion processes related to chemicals, low carbon fuels (including hydrogen), and manufacturing processes. SC operates major x-ray, neutron, nanoscience, and high-performance computing user facilities that provide advanced synthesis, fabrication, characterization, and computational capabilities to this community for basic, applied, and industrial research.
 - b. Enable advances in synthesis, catalysis, modeling, artificial intelligence/machine learning, analytical instrumentation at user facilities, high-performance computing, and bio-inspired approaches. Key basic research focus areas include: novel materials for low carbon fuels/feedstocks (e.g., hydrogen in coordination with the Hydrogen crosscut), membranes for separations, design of catalysts at the nanoscale, co-design for manufacturing (combining disciplines and computation for a “whole systems” approach), and synthesis science for scale-up from initial discoveries to bridge the gap to applied research and commercial application.
 - c. Increase understanding of the use of critical materials in manufacturing processes and reducing the dependence on such materials in coordination with the Critical Minerals Crosscut.
 - d. Enable advances in biomanufacturing, to replace or improve performance relative to petroleum-derived products.

Subsurface Energy Innovation Crosscut

Funding by Appropriation and Program Control (\$ Thousands)

Appropriation and Program Control	FY 2021 Enacted	FY 2022 CR Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)
Advanced Research Projects Agency - Energy	15,712	44,000	TBD	TBD
Advanced Research Projects Agency – Energy*	15,712	44,000	TBD	TBD
Energy Efficiency and Renewable Energy	106,000	106,000	202,000	+96,000
Geothermal Technologies Office	106,000	106,000	202,000	+96,000
Fossil Energy and Carbon Management	11,500	11,500	13,000	+1,500
Carbon Management	10,000	10,000	10,000	0
Resource Sustainability	1,500	1,500	3,000	+1,500
Science	10,715	11,017	17,378	+6,663
Advanced Scientific Computing Research	5,715	6,017	4,378	-1,337
Basic Energy Sciences	5,000	5,000	13,000	+8,000
Grand Total	143,927	172,517	232,378	+104,163

*ARPA-E funding is determined annually based on programs developed through office and stakeholder priorities. Therefore, funding for FY 2023 is not available at this time.

Summary:

Subsurface clean energy applications hold massive untapped potential for solving the climate crisis. However, our ability to assess, access, and monitor the subsurface quickly and economically is insufficient to mitigate financial and environmental risk for deployment. Common risk drivers include *a)* uncertainty in subsurface resource properties; *b)* inability to monitor reservoir dynamics that can trigger seismicity and/or leakage; and *c)* prohibitive costs and timelines to access subsurface resources. The Subsurface Energy Innovation (SEI) Crosscut funds research, development, demonstration, and deployment (RDD&D) to improve the accuracy, precision, and speed with which subsurface resources can be assessed, accessed, and monitored. Such advancements will allow the technologies listed below to become market-competitive, scalable, and permanent clean energy solutions, and create tens of thousands of good-paying jobs:

- *Geothermal energy*, which requires dramatic cost reductions in Enhanced Geothermal System (EGS) capability to increase its footprint beyond 0.5 percent of U.S. electricity generation;
- *Geologic carbon storage*, currently happening at 0.1 percent of the rate necessary to meet our climate goals;
- *Geologic hydrogen storage*, currently only feasible in unique and rare geologic features;
- *Sustainable critical mineral extraction*, necessary to reduce high American import reliance; and
- *Geologic hydrogen sourcing*, a new and potentially cost-effective, zero-emission source of hydrogen.

SEI Crosscut activities reduce the uncertainty and cost burden facing these technologies through the production and application of tools, data products, and workstreams that improve our observational, decision-making, and operational capabilities. Such activities require advancements across fundamental science, and applied RDD&D. The SEI Crosscut will leverage the integration of state-of-the-art High-

Performance Computing (HPC) resources, Artificial Intelligence (AI), Machine Learning (ML), and simulation capabilities with applied technology workstreams necessary to build subsurface simulation and interpretation visualization, prediction, and decision-making tools.

Bipartisan Infrastructure Law (BIL) – In FY 2023, in addition to the annual appropriations request, BIL funding will support the initial stages of planning and execution of demonstration of enhanced geothermal systems and carbon storage validation and testing projects. These investments are essential in addressing the supply chain and technology needs to support growth in clean energy.

Coordination Efforts:

The Department of Energy (DOE) houses the entire range of technological expertise across the RDD&D chain required for innovation in the subsurface for clean energy advancement including: Office of Science (SC) Basic Energy Sciences and Advanced Scientific Computing Research Offices, Energy Efficiency and Renewable Energy (EERE)'s Geothermal Technologies Office (GTO), Advanced Research Projects Agency - Energy (ARPA-E), Fossil Energy and Carbon Management (FECM) with the Artificial Intelligence and Technology Office (AITO) providing technical support and staff time.

In addition to developing and implementing a cross-agency subsurface RDD&D Strategy, priorities include joint efforts on information sharing and engagement with external stakeholders and technology experts. Additionally, the SEI Crosscut will prioritize the establishment of new partnerships and maintenance of existing partnerships with other Federal agencies, such as the Department of Interior and the United States Geological Survey (USGS), the National Science Foundation, and the National Aeronautics and Space Administration.

Crosscut Objectives:

- ***Significantly improve our understanding of the nation's deep subsurface resources:*** Recent advancements in geophysical data acquisition and HPC can drive significant improvements in our current ability to assess the subsurface properties and integration of already-collected subsurface data from previously drilled or orphaned wells, abandoned mines, and other legacy projects, which can greatly improve the current understanding of subsurface properties. The SEI Crosscut will develop the understanding of the phenomena, tools, methods, and data products necessary for rapid, accurate assessment of the deep subsurface at the meter scale. RDD&D activities include the development of new sensors and telemetry systems, the interpretation of signals using HPC, the development of methods and understanding to integrate and interpret subsurface properties from disparate data sources, and the creation of publicly available, high-resolution subsurface resource datasets.
- ***Monitor subsurface engineering activity, and make operational decisions, in real time:*** The geological engineering required to deploy subsurface clean energy applications can drive changes to the original subsurface environment. Such changes can lead to operational and/or environmental risks that can jeopardize project success and widespread technology adoption. These risks can be avoided, however, through operational decision-making informed by accurate, continuous, real-time monitoring of subsurface operations. SEI Crosscut efforts drive improvements in all the technological components of this objective, including data acquisition and processing, operational decision-making workflows informed through AI, and responsive subsurface engineering hardware.

- ***Access the deep subsurface quickly and economically:*** Subsurface clean energy technologies require the deployment of precise drilling techniques that allow for the targeted exploitation of a resource. Many of these techniques, such as horizontal and directional drilling, have been successfully demonstrated in the domestic oil and gas sector. SEI Crosscut efforts drive both the creation of drilling equipment and methods and the effective and efficient technology transfer of the state-of-the-art within the oil and gas, mining, aerospace, and other relevant industries. Such efforts will include original RDD&D to improve drilling speed, bit materials, casing materials, and well completion technologies as well as externally focused workshops, public meetings, and information requests to foster technological collaboration with the private sector.
- ***Engineer the subsurface to optimize benefit and minimize risk:*** To expand subsurface clean energy technologies to the scale that will be required in the coming decades, technologies that will allow for the manipulation and the engineering of the subsurface will be needed. Such technologies may include stimulation or other permeability enhancements, methods to plug leaks or otherwise reduce permeability, methods to manipulate reactivity or surface tension, pressure control through a combination of injection and production, and approaches to enable in situ mining/extraction of critical minerals or materials. SEI crosscut efforts will include the development and in situ testing of such technologies in a variety of geologies and subsurface conditions.
- ***Drive job transition opportunities for fossil community workers:*** Aggressive growth in subsurface clean energy applications could provide job transition opportunities for nearly 100,000 American workers with relevant technical skillsets who have been trained in the fossil fuel extraction industry.

Crosscut Action Areas: DOE's EERE, FECM, SC, ARPA-E, and AITO work collaboratively to:

1. ***Conduct guiding quantitative technological analyses:*** engage in cross-office strategic analysis to identify technical objectives and resources required to meet Administration clean energy goals pertaining to subsurface clean energy applications.
2. ***Expand cross-DOE RDD&D coordination informed by quantitative analysis:*** develop cross-office information requests, roundtables, and funding opportunities designed to achieve technical objectives identified from analyses.
3. ***Collaboratively engage with industry to promote technology transfer:*** develop both public and targeted workshops, roundtables, and forums to facilitate opportunities for experts in industry to ensure DOE programming is aligned with the industry state-of-the-art, and foster synergies where available.
4. ***Collaboratively engage with the oil and gas workforce to promote a just transition:*** engage in public-facing outreach to promote workforce development activities designed to increase the size of the subsurface clean energy workforce.
5. ***Guide responsible and trustworthy infrastructure, autonomy, and AI outcomes:*** engage in cross-office strategic analysis to establish scenario-based benchmarks and develop test and evaluation criteria to mitigate biases and risks.
6. ***Support infrastructure development that allows sharing of data, AI/ML models, algorithms, results, and lessons learned across offices:*** Establish an AI Integrated Development Environment strategy and actionable planning team that facilitates interoffice collaboration leading to an

integrated platform that provides users secure and streamlined access to high-quality data, models, tools, and computing power.

Program Organization:

- 1. Advanced Research Projects Agency - Energy (ARPA-E):** As defined by its authorization under the America COMPETES Act, ARPA-E catalyzes transformational technologies to enhance the economic and energy security of the United States. ARPA-E funds high-potential, high-impact projects that are too risky to attract private sector investment but could significantly advance the ways to generate, store, distribute and use energy. ARPA-E selected and/or obligated funding to Subsurface projects through ARPA-E's Open 2021 program. For example, Open 2021 projects support research and development on "Repurposing Infrastructure for Gravity Storage Using Underground Potential Energy" and "Electro-Hydraulic Fracturing for Enhanced Geothermal Systems." In FY 2022, ARPA-E is targeting funding to Subsurface projects through ARPA-E's Mining Innovations for Negative Emissions Resource Recovery (MINER) program. ARPA-E is developing programs for transformational research across a wide range of energy technologies and applications. The assessment process for new programs is now underway and any potential future investments in Subsurface will be determined FY 2023.

- 2. Energy Efficiency and Renewable Energy (EERE):**

Geothermal Technologies Office (GTO): In FY 2023 GTO will support Crosscut objectives through focused RD&D on exploration, characterization, reservoir monitoring, and drilling-based verification of advanced exploration technologies and methods. Exploration and characterization activities will focus on improving targeting the breadth of geothermal resources across temperature ranges and applications through improvements in multi-physics inversion methods and incorporation of machine learning models. GTO has partnered with USGS to perform large scale airborne geophysical surveys that support more focused future exploration activities. Additionally, broad data collection efforts will enable a significant increase in the discovery of hidden geothermal systems.

Subsurface accessibility will focus on RD&D directed at lowering the time to drill geothermal wells and decrease the costs of required materials and equipment. Activities will include efforts to adopt data driven workflows to increase the efficiency of geothermal drilling, adapting applicable technologies proven in the oil and gas well construction industry, directly addressing primary causes of "non-productive time", and the implementation of RD&D programs to reduce the materials costs associated with geothermal well development. Numerous drilling-related investigators are entering their final stages of activities and the development of well completion technologies, equipment, and workflows related to reservoir stimulation will continue to be an RD&D focus. The development and deployment of surface and subsurface reservoir monitoring technologies focusing on microseismic, electrical, and optical methods will continue.

Funding will also support data, modeling, and analysis activities that underpin the Department's RD&D portfolio. These efforts quantitatively assess the full value of geothermal electricity generation to the grid, development of real time analysis tools that leverage geothermal data, and the development of a pathway to improved permitting timelines, which are critical to increased geothermal deployment. Crosscutting activities such as machine learning, advanced

manufacturing, and a focus on technology commercialization will support the program in its focus on the energy transition.

3. Office of Fossil Energy and Carbon Management (FECM):

FECM supports the FY 2023 SEI Crosscut objectives through extensive expertise and capability related to the characterization, management, and extraction of subsurface resources, such as critical mineral (CM) extraction, as well as geologic storage of hydrogen and CO₂. FECM launched the Carbon Ore, Rare Earth and Critical Minerals (CORE-CM) initiative designed to address the upstream and midstream CM supply chain and downstream manufacturing of high-value, nonfuel, carbon-based products (CBP), to accelerate the realization of full potential for carbon ores and CM within the U.S basins. FY 2023 activities in this area include novel monitoring technologies, including geochemical and biological approaches, will help characterize mineral resources.

FECM activities in FY 2023 will capitalize on and integrate recent advances in geochemical, wellbore integrity, and fluid-structure interaction modeling derived from decades of field experience with underground gas storage in the oil and gas industry to drive greater uptake and acceptance of underground hydrogen storage (UHS). Such activities will allow for UHS operators to both dynamically track and adaptively manage UHS reservoirs to ensure existing barriers, such as induced seismicity and sulfate-reducing bacteria, are mitigated. Extensive outreach to and cooperation with the public and regulatory bodies are central to FECM UHS activities and are key to widespread application of the technology.

In FY 2023, the FECM Carbon Transport and Storage Program is supporting the Science-Informed Machine Learning to Accelerate Real-Time (SMART) decision making to enable real-time performance monitoring of CO₂ storage, with more intuitive visualization capabilities, and a rapid virtual learning environment to assess performance scenarios. SMART has launched its second phase, in which ML-driven technologies shown to be promising in phase 1 will be developed for field deployment and testing. Multiple National Laboratories will also embark on developing sensors, downhole power systems, and telemetry technologies to add to the data streams that will enable SMART's ML-driven processes. These activities will drive the integration of SMART capabilities into operational commercial scale CO₂ storage projects, spurring adoption by industry as a lower cost paradigm for safely operating CO₂ storage projects.

4. Science (SC): SC provides foundational knowledge and state-of-the-art capabilities in support of crosscut objectives, such as novel computational algorithms in material properties and fluid flow data analysis and management, high performance computation, and subsurface material characterization.

- a. *Advanced Scientific Computational Resources (ASCR):* ASCR provides state-of-the-art HPC facilities as well as R&D that develops physics-informed deep learning techniques to address long-standing subsurface challenges. ASCR's investment in the Subsurface project involves understanding and predicting the behavior of hundreds of thousands of deep wells drilled to characterize reservoirs. The Subsurface project, funded through ASCR's Exascale Computing Project (ECP), is developing a high-resolution reservoir simulator, integrating the complex

multiphysics processes occurring from kilometer to micron scales to study and prevent well bore failure for CO₂ sequestration in saline reservoirs. This project focuses on the science challenge of overcoming the failure of a wellbore for CO₂ sequestration in saline reservoirs, with consideration of a wellbore segment of up to 100 meters and times up to 1 year. In addition, ECP's Earthquake Simulation (EQSIM) project is creating an end-to-end capability to simulate earthquakes from the initiation of a fault rupture to surface ground motions and ultimately to infrastructure response.

- b. *Basic Energy Sciences (BES)*: BES supports computational/theoretical and experimental science aimed at understanding geomechanically, chemical, hydrological, and interfacial chemical and materials behavior that provides the foundational knowledge to advance subsurface energy technologies through awards to universities and DOE National Laboratories. Specific areas of research that support the SEI Crosscut goals include:
 - i. Mineral dissolution, nucleation, and phase equilibria in confined and interfacial environments, including characterization at the molecular level with x-ray/neutron sources and advanced computational chemistry.
 - ii. The individual and collective dynamical properties, structures, and characteristic microseismic signatures of interacting fracture systems, integrating modeling, laboratory, and field observations.
 - iii. Leverage of the unique capabilities at SC scientific user facilities, such as x-ray light sources (for high-resolution imaging of the time-dependence of geochemical/mechanical interactions in rock samples) and leadership class (exascale) computing (for predictive modeling of processes across scales and ML simulations of massive data sets to connect data to the underlying processes).

Funding in FY 2023 will focus on connecting subsurface data to underlying geophysical processes. Research will support efforts to understand how geophysical signals – such as those measured as ultrasound/thermoacoustic emissions (active) and acoustic (passive) emissions in the laboratory, and seismic signals in the field – arise from geophysical processes that transfer stress and dynamically open and close fractures. The goal is to understand these processes so that they can be predicted and ultimately controlled.

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 Nuclear Nonproliferation
- Naval Reactors
- Defense Environmental Cleanup
- Nuclear Energy
- Energy Efficiency and Renewable Energy
- Fossil Energy R&D
- Strategic Petroleum Reserve
- Legacy Management
- Loans Program Office
- Enterprise Assessments
- Environment, Health, Safety and Security
- Energy Information Administration
- Specialized Security Activities
- NNSA Federal Salaries and Expenses
- Chief Financial Officer
- Chief Information Officer

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 to help management ensure effective and efficient S&S program implementation. Figure 1 shows comparable overall funding for S&S in the FY 2021 Enacted, FY 2022 Annualized CR and the FY 2023 Request.

Figure 1: Overall DOE S&S Funding

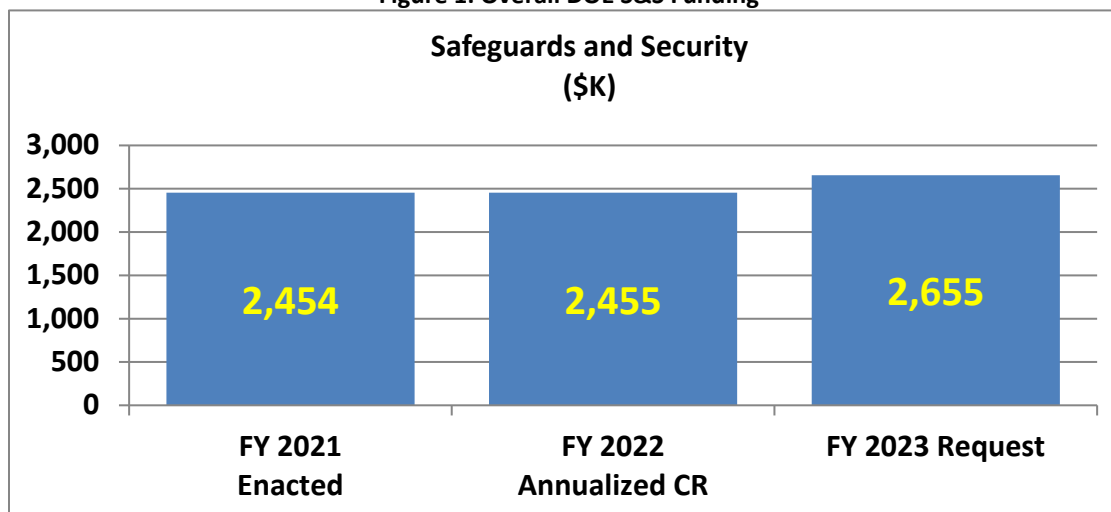


Table 1: Functional Components of S&S

The S&S crosscut budget is comprised of the functional components shown in the following table.

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 IT resources and networks, to include modernizing cybersecurity defenses by protecting federal networks, improving information-sharing between the U.S. government and the private sector on cyber issues, and strengthening the United States' ability to respond to incidents when they occur.
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 always properly controlled and accounted for.
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 safeguards and security by program.

Highlights:

In FY 2023, the Department's overall S&S investment (field and HQ) is \$2.7 billion, an increase of +\$200.4 million, or 8.2%, above the FY 2021 Enacted level.

By functional element, DOE is making strategic investments in Cybersecurity (+\$31 million, or +6.8%), Protective Forces (+\$89.2 million, or +11.5%), Physical Security Systems (+\$43.7 million, or 25.6%), there are decreases in security infrastructure/construction (-\$3.0 million, or -5.8%) and Program Management (-9.5 million, or -6.4%).

By program, there are significant increases from FY 2021 Enacted to FY 2023 Request for Weapons Activities (+\$76 million, or +5.6%) for additional security requirements associated with mission growth across the nuclear security enterprise, including plutonium pit production and preparation for operation of the Uranium Processing Facility at the Y-12 National Security Complex. Additionally, there are notable increases in the Office of Science (+\$68.5 million, or +56.6%) Fossil Energy & Carbon Management (+\$3.9 million, or +34.1%) and the Office of the Chief Information Officer (+\$20.6 million or +28.6%) primarily for investments in cybersecurity in response to Executive Order 14028, Improving the Nation's Cybersecurity.

Table 2: S&S Funding by Program (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Safeguards and Security (S&S) by Program					
Chief Financial Officer	1,410	1,410	3,500	2,090	148.2%
Chief Information Officer	71,800	71,800	92,361	20,561	28.6%
Defense Environmental Cleanup	320,771	320,771	309,573	-11,198	-3.5%
Defense Nuclear Nonproliferation	294	336	350	56	19.0%
Energy Efficiency and Renewable Energy	12,950	12,950	15,450	2,500	19.3%
Energy Information Administration	920	1,105	1,405	485	52.7%
Enterprise Assessments	9,505	9,505	9,535	30	0.3%
Environment, Health, Safety and Security	73,614	73,614	80,430	6,816	9.3%
Federal Salaries and Expenses	2,816	2,872	2,917	101	3.6%
Fossil Energy & Carbon Management	11,304	11,304	15,154	3,850	34.1%
Legacy Management	2,433	2,433	2,675	242	9.9%
Naval Reactors	1,157	1,157	1,141	-16	-1.4%
Nuclear Energy	149,800	149,800	156,600	6,800	4.5%
Science	121,000	121,000	189,510	68,510	56.6%
Specialized Security Activities	283,500	283,500	306,067	22,567	8.0%
Strategic Petroleum Reserve	25,262	25,262	26,325	1,063	4.2%
Title 17: Loan Guarantee Program	388	338	353	-35	-9.0%
Weapons Activities	1,365,551	1,365,600	1,441,531	75,980	5.6%
Total, Program S&S	2,454,475	2,454,757	2,654,877	200,402	8.2%

Table 3: S&S Funding by Functional Cost Element (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
S&S by Functional Cost Element					
Cybersecurity	457,358	456,879	488,365	31,007	6.8%
Headquarters S&S	283,500	283,500	306,067	22,567	8.0%
Information Security	81,680	83,180	92,031	10,351	12.7%
Material Control and Accountability	46,836	47,707	60,941	14,105	30.1%
Personnel Security	81,269	76,379	86,085	4,816	5.9%
Physical Security Systems	170,354	171,854	214,014	43,660	25.6%
Program Management	148,711	147,693	139,171	-9,540	-6.4%
Protective Forces	774,599	788,250	863,815	89,216	11.5%
Security Infrastructure	51,506	40,506	48,512	-2,994	-5.8%
Security Investigations	9,763	9,910	9,578	-185	-1.9%
Transportation Security	348,899	348,899	346,298	-2,601	-0.7%
Total, Functional S&S	2,454,475	2,454,757	2,654,877	200,402	8.2%

**Protective Forces
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Protective Forces					
Defense Environmental Cleanup	188,572	188,572	192,648	4,076	2.2%
Energy Efficiency and Renewable Energy	3,215	3,215	3,600	385	12.0%
Environment, Health, Safety and Security	33,303	33,303	40,000	6,697	20.1%
Fossil Energy & Carbon Management	3,072	3,072	3,164	92	3.0%
Legacy Management	649	649	670	21	3.2%
Nuclear Energy	71,705	85,356	88,497	16,792	23.4%
Science	44,200	44,200	50,000	5,800	13.1%
Strategic Petroleum Reserve	19,113	19,113	19,690	577	3.0%
Weapons Activities	410,770	410,770	465,546	54,776	13.3%
Total, Protective Forces	774,599	788,250	863,815	89,216	11.5%

Mission

The Protective Forces element of field and headquarters 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 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 prevention, recapture and recovery operations involving the use of special weapons systems and tactics to prevent access to special nuclear material or effect recovery from unauthorized control.

Highlight:

- For Weapons Activities, increase reflects additional security requirements associated with growth across the nuclear security enterprise, in particular the plutonium pit production mission at Los Alamos National Laboratory.

**Physical Security Systems
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Physical Security Systems					
Defense Environmental Cleanup	28,504	28,504	28,600	96	0.3%
Energy Efficiency and Renewable Energy	815	815	925	110	13.5%
Environment, Health, Safety and Security	7,379	7,379	6,238	-1,141	-15.5%
Fossil Energy & Carbon Management	1,195	1,195	171	-1,024	-85.7%
Legacy Management	120	120	127	7	5.8%
Nuclear Energy	10,075	11,575	12,203	2,128	21.1%
Science	20,180	20,180	34,260	14,080	69.8%
Strategic Petroleum Reserve	1,051	1,051	1,141	90	8.6%
Weapons Activities	101,035	101,035	130,349	29,314	29.0%
Total, Physical Security Systems	170,354	171,854	214,014	43,660	25.6%

Mission

The Physical Security Systems element of field and headquarters 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.

Highlight:

- For Science, the increase will support the first stages of implementation of HSPD-12 for uncleared long-term contractor personnel and the associated modernization of personnel access control systems. These systems also mitigate active shooter and workplace violence, as well as providing control and compartmentalization of classified matter, intellectual property, sensitive information, and hazardous materials.
- For Weapons Activities, the increase is associated with mission growth across the nuclear security enterprise (NSE) including pit production and UPF preparation efforts.

**Information Security
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Information Security					
Defense Environmental Cleanup	5,911	5,911	5,447	-464	-7.8%
Energy Efficiency and Renewable Energy	515	515	575	60	11.7%
Environment, Health, Safety and Security	13,679	13,679	13,679	0	0.0%
Fossil Energy & Carbon Management	319	319	163	-156	-48.9%
Legacy Management	71	71	72	1	1.4%
Nuclear Energy	4,674	6,174	5,016	342	7.3%
Science	4,420	4,420	5,010	590	13.3%
Strategic Petroleum Reserve	231	231	238	7	3.0%
Weapons Activities	51,860	51,860	61,831	9,971	19.2%
Total, Information Security	81,680	83,180	92,031	10,351	12.7%

Mission

The Information Security element of field and headquarters 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.

Highlight:

For Weapons Activities, the increase in Information Security is associated with mission growth including pit production and UPF preparation efforts.

Cybersecurity

Funding Schedule (\$K)

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Field Cybersecurity*					
Science	37,520	37,520	81,260	43,740	116.6%
Weapons Activities (NNSA) ^a	251,472	251,472	215,451	-36,021	-14.32%
Defense Environmental Cleanup	41,460	41,460	30,299	-11,161	-26.9%
Nuclear Energy	20,476	19,812	23,916	3,440	16.8%
Energy Efficiency and Renewable Energy	7,200	7,200	9,200	2,000	27.8%
Fossil Energy & Carbon Management	5,022	4,772	9,678	4,656	92.7%
Strategic Petroleum Reserve	2,664	2,664	3,144	480	18.0%
Legacy Management	1,183	1,183	1,383	200	16.9%
Total, Cybersecurity	366,997	366,083	374,331	7,334	2.0%

*Cybersecurity amounts shown do not include Working Capital Fund or Energy Information Technology System contributions

Cybersecurity (including Headquarters Offices)

Field Cybersecurity	366,997	366,083	374,331	7,334	2.0%
Headquarters Cybersecurity	90,361	90,796	114,034	23,673	26.2%
Fossil Energy & Carbon Management (HQ only)	920	1,170	1,300	380	41.3%
Loan Program Office	288	288	303	15	5.2%
Enterprise Assessments	9,335	9,335	9,335	0	0.0%
Energy Information Administration	920	1,105	1,405	485	52.7%
Environment, Health, Safety and Security	5,688	5,688	5,830	142	2.5%
Chief Financial Officer	1,410	1,410	3,500	2,090	148.2%
Chief Information Officer	71,800	71,800	92,361	20,561	28.6%
Total, Cybersecurity (Field & HQ)	457,358	456,879	428,365	31,007	6.8%

Mission

The Cybersecurity element of field and headquarters S&S improves the nation's cybersecurity and protects the federal government networks, in line with Executive Order 14028, Improving the Nation's Cybersecurity. Recent cybersecurity incidents such as SolarWinds, Microsoft Exchange, and the Colonial Pipeline incident are a sobering reminder that U.S. public and private sector entities increasingly face sophisticated malicious cyber activity from both nation-state actors and cyber criminals. These incidents share commonalities, including insufficient cybersecurity defenses that leave public and private sector entities more vulnerable to incidents.

In FY 2023, the Department of Energy is making significant contributions toward modernizing cybersecurity defenses by protecting federal networks, improving information-sharing between the U.S. government and the private sector on cyber issues, and strengthening the United States' ability to respond to incidents when they occur. Investments in Cybersecurity at the Department will focus on the following key areas, as identified in EO 14028:

- Remove Barriers to Threat Information Sharing Between Government and the Private Sector. Ensure that IT Service Providers can share information with the government and require them to share certain breach information. Removing any contractual barriers and requiring providers to share breach information that could impact Government networks is necessary to enable more effective defenses of Federal departments, including DOE, and to improve the Nation's cybersecurity.
- Modernize and Implement Stronger Cybersecurity Standards. Help move DOE enterprise to secure cloud services and a zero-trust architecture, and mandate deployment of multifactor authentication and encryption within a specific time period. Outdated security models and unencrypted data have led to compromises of systems in the

^a The reduction in Weapons Activities cybersecurity funding reflects a reclassification of certain initiatives from the Cybersecurity program to the Information Technology subprogram to better display pure cybersecurity funding.

public and private sectors. DOE will increase its adoption of security best practices, by accelerating movement to a zero-trust security model and secure cloud services, and consistently deploying foundational security tools such as multifactor authentication and encryption.

- **Improve Software Supply Chain Security.** Continue to mature and expand the Information and Communication Technology Supply Chain Risk Management Program to improve the security of software and hardware. Too much of our hardware and critical software is shipped with significant vulnerabilities that our adversaries exploit.
- **Improve Investigative and Remediation Capabilities.** Improve cybersecurity threat hunting and response through improved logging and data analytics. Create cybersecurity event log and data retention requirements for DOE enterprise. Modernized perimeter sensors, improved data storage and search capabilities will improve the organization's ability to detect intrusions, mitigate those in progress, and determine the extent of an incident after the fact.

The amounts given here are program funds and do not include security elements that are within software applications developed for the Department's programmatic or administrative purposes, whether directly or indirectly funded. They do include IT Security and Compliance entries within the IT Investment portfolio. Highlights of cybersecurity activities can be found within the individual program budget requests.

Field Cybersecurity Highlights:

- Increase for Science will support investments in cyber infrastructure and cyber capability including new cyber tools, incident response enhancements, cyber workforce development, data protections, and protections for unique SC facilities and capabilities that cannot be protected with commercial tools and to strengthen protection at federal and M&O sites in the areas of: Cyber Threat Intelligence, Incident Response, Incident Recovery, Novel Security Techniques, Infrastructure Refresh, Industrial Control System Protection, Continuous Diagnostics and Mitigation, and Controlled Unclassified Information Protection. Additionally, the Request will continue implementation of Executive Order 14028 requirements at both federal and Management & Operating contract sites.

Headquarters (HQ) Cybersecurity Highlights:

- Increase for Chief Information Officer reflects dedicated cyber reserve fund for the entire DOE complex to address requirements of Executive Order 14028 Improving the Nation's Cybersecurity.

**Personnel Security
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Personnel Security					
Defense Environmental Cleanup	12,647	12,647	11,792	-855	-6.8%
Energy Efficiency and Renewable Energy	215	215	240	25	11.6%
Environment, Health, Safety and Security	6,442	6,442	6,192	-250	-3.9%
Fossil Energy & Carbon Management	285	285	358	73	25.6%
Legacy Management	75	75	76	1	1.3%
Nuclear Energy	9,554	4,714	5,593	-3,961	-41.5%
Science	5,500	5,500	8,480	2,980	54.2%
Strategic Petroleum Reserve	661	661	561	-100	-15.1%
Title 17: Loan Guarantee Program	100	50	50	-50	-50.0%
Weapons Activities	45,790	45,790	52,743	6,953	15.2%
Total, Personnel Security	81,269	76,379	86,085	4,816	5.9%

Mission

The Personnel Security element of field and headquarters S&S supports the access authorization program and ensures 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 Act 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.

Highlights:

- For Weapons Activities, the increase reflects additional security requirements associated with mission growth across the nuclear security enterprise, in particular the plutonium pit production mission at Los Alamos National Laboratory and UPF preparation efforts.
- For Science, the increase will provide additional FTEs to support the increased HSPD-12 access authorization functions and the increased functions for the increased processing and vetting of foreign nationals.
- For Nuclear Energy, decrease reflects the implementation of full cost recovery for security clearance activities by requesting program organizations.

**Material Control and Accountability
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Material Control and Accountability					
Defense Environmental Cleanup	7,176	7,176	6,735	-441	-6.1%
Nuclear Energy	5,505	6,376	5,825	320	5.8%
Science	2,465	2,465	2,800	335	13.6%
Weapons Activities	31,690	31,690	45,581	13,891	43.8%
Total, Material Control and Accountability	46,836	47,707	60,941	14,105	30.1%

Mission

The Material Control and Accountability (MC&A) element of field S&S provides assurance that nuclear materials are properly controlled and always accounted for. 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.

Highlight:

- For Weapons Activities, the increase is associated with mission growth across NNSA's NSE, including for pit production and UPF preparation efforts.

**Program Management
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Program Management*					
Defense Environmental Cleanup	25,742	25,742	26,231	489	1.9%
Energy Efficiency and Renewable Energy	820	820	720	-100	-12.2%
Environment, Health, Safety and Security	5,940	5,940	7,591	1,651	27.8%
Fossil Energy & Carbon Management	491	491	320	-171	-34.8%
Legacy Management	335	335	347	12	3.6%
Nuclear Energy	11,193	10,175	11,450	257	2.3%
Science	6,715	6,715	7,700	985	14.7%
Strategic Petroleum Reserve	1,542	1,542	1,551	9	0.6%
Weapons Activities	95,933	95,933	83,261	-12,672	-13.2%
Total, Program Management	148,711	147,693	139,171	-9,540	-6.4%

* In Weapons Activities, titled, *Security Program Operations and Planning*.

Mission

The Program Management element of field and headquarters 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.

Highlight:

- For Weapons Activities, the decrease is due to use of estimated available uncosted uncommitted funding, inclusive of SPP recoveries offset by an increase in requirements associated with growth across the nuclear security enterprise (NSE), including plutonium pit production and UPF preparation efforts.

**Security Investigations
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Security Investigations*					
Defense Environmental Cleanup	1,656	1,656	1,464	-192	-11.6%
Defense Nuclear Nonproliferation	294	336	350	56	19.0%
Energy Efficiency and Renewable Energy	170	170	190	20	11.8%
Enterprise Assessments	170	170	200	30	17.6%
Environment, Health, Safety and Security	1,183	1,183	900	-283	-23.9%
Federal Salaries and Expenses	2,816	2,872	2,917	101	3.6%
Naval Reactors	1,157	1,157	1,141	-16	-1.4%
Weapons Activities	2,317	2,366	2,416	99	4.3%
Total, Security Investigations	9,763	9,910	9,578	-185	-1.9%

*NE and SC Security Investigations costs for Federal Employees are subsumed within Personnel Security.

Mission

The Security Investigations element of field and headquarters 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. Funding provides for initial single scope background investigations, periodic reinvestigations, and initial and reinvestigation national agency checks.

Highlight:

- No major changes in Security Investigations funding from FY 2021 Enacted to the FY 2023 Request.

**Transportation Security
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Transportation Security					
Defense Environmental Cleanup	215	215	965	750	348.8%
Weapons Activities	348,684	348,684	345,333	-3,351	-1.0%
Total, Transportation Security	348,899	348,899	346,298	-2,601	-0.7%

Mission

Transportation security provides for the secure transport of weapons, weapons components, and nuclear materials to support Stockpile Management 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 and other Department elements requiring this capability. The STA program supports Departmental initiatives to convert weapons-grade material for use or disposal. STA supports other DOE programs, including Environmental Management; and others, including the National Aeronautics and Space Administration, and international shipments in cooperation with Canada, the United Kingdom, and France.

Highlight:

- For Weapons Activities, the decrease reflects the procurement of a replacement aircraft in FY 2021, offset by increases for the Mobile Guardian Transporter (MGT) and for Program Direction.

**Security Infrastructure/Construction
Funding Schedule (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	\$ Change FY23 vs. FY21	% Change FY23 vs. FY21
Security Infrastructure/Construction					
Defense Environmental Cleanup	8,888	8,888	5,392	-3,496	-39.3%
Nuclear Energy	16,618	5,618	4,100	-12,518	-75.3%
Weapons Activities	26,000	26,000	39,020	13,020	50.1%
Total, Security Infrastructure/Construction	51,506	40,506	48,512	-2,994	-5.8%

Mission

Security Infrastructure provides critical security infrastructure investments and protection enhancements necessary to ensure adequate protection of DOE sites and personnel.

Highlights:

- For Weapons Activities, the increase reflects SIRP projects to be executed that include sensor, camera, lighting, and communication refreshes, and smaller capital equipment projects.
- For Nuclear Energy, decrease reflects the required project funds for Phase IIB offset by the completion of the consolidated training facility at the Central Facilities Area.

Research and Development Crosscut

(dollars in thousands)

R&D and Related Equipment and Construction	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Basic Research	5,540,345	5,646,297	6,319,228	+778,883	+14%
Applied Research	5,649,489	5,704,772	6,834,055	+1,184,566	+21%
Development	3,714,950	3,730,247	5,392,865	+1,677,915	+45%
Subtotal, Research and Development	14,904,784	15,081,316	18,546,147	+3,641,363	+24%
R&D Related Construction	2,044,279	1,910,067	1,930,039	-114,241	-5.6%
R&D Related Equipment	-828,954	1,889,956	1,481,372	+2,310,326	-279%
Subtotal, R&D and Related Facilities	1,215,325	3,800,023	3,411,411	+2,196,085	+181%
Total, R&D and Related Equipment and Construction	16,120,109	18,881,339	21,957,558	+5,837,449	+36%

Summary

The FY 2023 Request includes an overall increase of \$5.8 billion (or 36 percent) in Research and Development (R&D) and Related Equipment and Construction compared with FY 2021 Enacted. The increase in Development of \$1.7 billion (or 45 percent) reflects the emphasis on moving R&D efforts through the technology transfer chain to meet the “build back better” goal.

The Department has identified challenging goals in the effort to avoid the worst effects of anthropogenic climate change and mitigate the effects of changes that can no longer be avoided. These goals towards decarbonization across all segments of the economy will be managed across the Department through crosscutting activities, enabling synergies that can be developed only through the collaboration and coordination of multiple Department offices. Each R&D related crosscut is described in its own section in the budget justification and new crosscuts have been added in response to the Administration goal of a carbon free economy by 2050 through a concerted effort in transportation, agriculture, industry, and electric power generation. Each DOE office has contributions to the overall success of our R&D efforts. These are summarized as follows.

Office of Science (SC) supports a balanced research portfolio of basic scientific research probing some of the most fundamental questions in areas such as: high energy, nuclear, and plasma physics; materials and chemistry; biological and environmental systems; applied mathematics; next generation high-performance computing and simulation capabilities; and basic research for advancement in new energy technologies. The SC FY 2023 Request increases investments in Administration priorities including basic research on climate change and clean energy, artificial intelligence (AI) and machine learning (ML), and biopreparedness. SC’s Reaching a New Energy Sciences Workforce (RENEW) initiative doubles to expand targeted efforts to increase participation and retention of underrepresented groups in SC research activities. SC initiates three new research initiatives to include Energy Earthshots; Funding for Accelerated, Inclusive Research (FAIR); and Accelerate Innovations in Emerging Technologies (Accelerate). The Request also supports ongoing investments in priority areas including microelectronics, critical materials, quantum information science (QIS), exascale computing, fundamental science to transform manufacturing, and accelerator science and technology. These initiatives position SC to address new research opportunities through more collaborative, cross-program efforts.

The SC portfolio has two principal thrusts: direct support of scientific research and direct support of the design, development, construction, and operation of unique, open-access scientific user facilities. The SC basic research portfolio includes extramural grants and contracts supporting nearly 29,000 researchers located at over 300 institutions and the 17 DOE national laboratories, spanning all fifty states and the District of Columbia. The portfolio of 28 scientific user facilities serves nearly 34,000 users per year. SC programs invest in foundational science, including basic research for the advancement of clean energy, to transform our understanding of nature and strengthen the connection between advances in fundamental science and technology innovation.

Energy Efficiency and Renewable Energy (EERE) accelerates the research, development, demonstration, and deployment (RDD&D) of technologies and solutions to equitably transition America to net-zero greenhouse gas emissions economy-wide by no later than 2050, creating good paying jobs, and ensuring the clean energy economy benefits all Americans, especially

Research and Development Crosscut

workers and communities impacted by the energy transition and those historically underserved by the energy system and overburdened by pollution. To achieve this mission, EERE is increasing investment in the integration of clean energy technologies that are ready to be demonstrated and deployed, as well as R&D activities that advance early-stage technologies with a clear path to deployment. EERE's FY 2023 investment strategy focuses on investments in five priority areas central to the U.S. greenhouse gas profile: decarbonizing the electricity sector; decarbonizing transportation across all modes: air, sea, rail, and road; decarbonizing energy-intensive industries; reducing the carbon footprint of buildings; and decarbonizing the agriculture sector, including a focus on the energy-water nexus. The Request prioritizes increased investments in these priority areas critical to reduce emissions in the near term drastically, while investing in research to ensure American leadership and competitiveness in advanced clean energy technology.

Office of Cybersecurity, Energy Security, and Emergency Response (CESER) seeks to accelerate and expand efforts to strengthen the nation's energy sector against cyber threats and mitigate vulnerabilities. CESER's R&D investments aim to bolster critical infrastructure capabilities by developing game-changing cybersecurity risk management tools, technologies, methodologies, and guidance that aid the energy sector in securing energy infrastructure for the present and future. These tools and technologies will help energy industry identify, protect, detect, respond, and recover in the face of increasingly advanced cyber threats. CESER has instituted coordination and integration of cybersecurity requirements in research and development efforts across DOE's science and energy programs, building cybersecurity into the energy delivery system components. CESER will supplement these efforts with development, demonstration and deployment of crosscutting tools leveraging emerging technologies and techniques such as machine learning, underlying data from cyber-physical systems, and quantum information sciences. CESER has also expanded its scope to include RD&D to address risks to the energy sector from non-cyber hazards such as physical attack and impacts of climate change, e.g., increased wildfires and severe hurricanes. CESER will develop tools that help with risk characterization and analysis and enable early detection and mitigation of these risks.

Office of Electricity (OE) supports R&D for new technologies to strengthen, transform, and improve electricity delivery infrastructure so consumers have access to resilient, secure, and clean sources of electricity. OE provides solutions to technical, market, institutional, and operational failures that go beyond any one utility's ability to solve. OE works to ensure that our Nation's electricity delivery system can accommodate all the changes at generation and load sides of the grid and ensure reliable, resilient, and secure operations of the decarbonized electric grid.

Nuclear Energy (NE) supports efforts to move to new and innovative advanced reactors, small modular reactors, and microreactors from the conceptual and development stages into the commercial energy sector. NE executes its mission through investments in early-stage research and development efforts with the national laboratories, U.S. universities, and industry technical organizations, as well as through partnerships with the U.S. industry and commercial stakeholders to develop and demonstrate advanced reactor technologies and designs. NE focuses on three major mission areas: the nation's existing reactors, the development of advanced nuclear reactor concepts, and fuel cycle technologies. Investments in these areas leverage the tremendous innovation capacity of the United States' National Laboratories, universities, and advanced reactor developers to transform America's power sector. Safe and secure nuclear energy delivers carbon-free power continuously, with high reliability, over long periods of time. NE will leverage creative funding mechanisms - such as prizes, competitions, technical assistance, and programs targeted to small businesses; thereby enabling the commercialization of climate change and clean energy innovations that will activate job creation, expanding other public impact outcomes, and yielding a more geographically diverse and impactful research portfolio.

Fossil Energy and Carbon Management (FECM) supports increased funding for a revitalized perspective on fossil energy that advances carbon reduction and mitigation in sectors and applications that are difficult to decarbonize, including the industrial sector, with technologies and methods such as carbon capture and storage, hydrogen, and direct air capture—all while ensuring that overburdened communities are protected from increases in cumulative pollution. The Request will fund DOE's role in supporting the new Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. The FECM Request will help fulfill President Biden's 'build back better' objective in a way that supports communities left behind, workers translating their skills to new positions in various areas, such as, building carbon capture and hydrogen systems on existing industrial and power plant facilities, and reinforcing existing pipelines to minimize methane emissions. FECM's Request, its new name indicative of a new approach responsive to its research imperatives, shows increases for Point-Source Carbon Capture, Carbon Dioxide Conversion, Carbon Transport and

Storage, and Carbon Dioxide Removal.

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Advanced Research Projects Agency – Energy (ARPA-E) supports the delivery of innovative, investable opportunities to the commercial sector. ARPA-E will continue to deliver value to the U.S. economy with continued emphasis on maintaining a diverse portfolio of projects. The Department proposes to expand ARPA-E’s scope to include R&D on climate adaptation and resilience innovations. This will enable work beyond the energy technology-focused projects necessary to meet the Administration’s goals to adapt and strengthen resilience from the most devastating impacts of climate change.

ARPA-E projects cover a broad range of advanced technology topics, with a growing focus on additional scale-up of the most promising projects that have demonstrated success in technical development, project management, and definition of commercial pathways. ARPA-E executes its budget through funding opportunity announcements that address applications that are not represented in its present portfolio and develops new opportunities opened by the outcomes of previous programs.

Office of Clean Energy Demonstrations (OCED) supports activities to accelerate and prove the design, construction, and operation of high-impact demonstration projects, at or near a commercial-scale, with the purpose of generating publicly available technical, economic, and environmental performance data essential to developers, financiers, regulators, policymakers, utilities, manufacturers, end users and other stakeholders. OCED investments are part of a clear progression and transition between the research, development, and laboratory and pilot-scale demonstration projects within DOE technology offices and initial full and commercial-scale deployments supported by the private sector or other programs, such as the Loan Programs Office, ensuring coherent strategies for advancing and deploying clean energy technologies and systems. Funding decisions are made to support scalable outcomes that lead to commercialization and deployment. In FY 2023, OCED will initiate a new competition in FY 2023 to support commercial-scale projects that demonstrate technologies, or the manufacturing of technologies that integrate renewable and distributed energy systems with broader energy networks. The goal of this new investment area is to support demonstrations that de-risk technologies needed to manage variable generation; control flexible loads; and integrate energy storage electric vehicle (EV) charging, and other facilities into the U.S. transmission and distribution grids.

National Nuclear Security Administration contributes directly and crucially to U.S. nuclear security R&D by supporting key investments in science and technology innovation that support the stewardship of the nuclear weapons stockpile, modernize the nuclear security enterprise, protect the United States from weapons of mass destruction threats, enable science-based certification of the stockpile, and provide the U.S. Navy with nuclear reactors that meet complex evolving requirements.

Administrative and Support Functions: The Department’s funding estimates of R&D activities include those administrative and support functions that are necessary to the success of the R&D programs consistent with government-wide and international reporting practices. These include program direction, safeguards and security, and infrastructure costs. The following table details funding of R&D in the budget by categories; basic, applied, development, equipment, and related construction; and program office.

Research and Development Crosscut

(dollars in thousands)

Basic Research	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Cybersecurity, Energy Security, and Emergency Response	5,139	2,250	0	-5,139	-60%
Defense Nuclear Nonproliferation	158,215	157,596	179,084	+20,869	+13%
Electricity	14,146	14,146	15,185	+1,039	+7%
Science	5,362,845	5,472,305	6,124,959	+762,114	+14%
Subtotal, Basic Research	5,540,345	5,680,297	6,373,043	+828,883	+15%

(dollars in thousands)

Applied Research	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Advanced Research Projects Agency--Energy	213,500	213,500	350,075	+136,575	+64%
Bonneville Power Administration Fund	2,000	1,000	1,000	-1,000	-50%
Cybersecurity, Energy Security, & Emergency Response	48,120	32,237		-48,120	-100%
Defense Environmental Cleanup (EM)	11,500	11,500	8,214	-3,286	-29%
Defense Nuclear Nonproliferation	195,197	164,212	203,806	+8,609	+4%
Electricity	56,453	56,453	86,119	+29,666	+53%
Energy Efficiency and Renewable Energy	676,784	676,784	1,046,682	+369,898	+55%
Fossil Energy and Carbon Management	691,633	691,633	841,230	+149,597	+22%
Global Clean Energy Manufacturing	-	-	20,000	+20,000	N/A
Nuclear Energy	770,756	770,756	1,096,648	+325,892	+42%
Weapons Activities	2,983,546	3,086,697	3,180,281	+196,735	+7%
Subtotal, Applied Research	5,649,489	5,704,772	6,834,055	+1,184,566	+21%

(dollars in thousands)

Development	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Advanced Research Projects Agency--Energy	213,500	213,500	350,075	+136,575	+64%
Bonneville Power Administration Fund	1,000	1,000	1,000	-	N/A
Cybersecurity, Energy Security, & Emergency Response	11,664	26,990	220,000	+208,336	+1,786%
Defense Environmental Cleanup (EM)	23,500	23,500	16,786	-6,714	-29%
Defense Nuclear Nonproliferation	114,819	105,325	124,835	+10,016	+9%
Electricity	75,587	75,587	84,588	+9,001	+12%
Energy Efficiency and Renewable Energy	1,378,725	1,378,725	2,106,555	+727,830	+53%
Global Clean Energy Manufacturing	-	-	34,000	+34,000	N/A
Naval Reactors	1,140,270	1,140,270	1,312,770	+172,500	+15%
Nuclear Energy	258,926	258,926	338,365	+79,439	+31%
Office of Clean Energy Demonstrations	-	-	167,000	+167,000	N/A
Weapons Activities	496,959	506,424	636,891	+139,932	+28%
Subtotal, Development	3,714,950	3,730,247	5,392,865	+1,677,915	+45%

Research and Development Crosscut

(dollars in thousands)

R&D Construction	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Electricity	25,137	25,137	-	-25,137	-100%
Defense Nuclear Nonproliferation	24,481	24,481	26,164	+1,682	+7%
Energy Efficiency and Renewable Energy	40,000	61,000	119,000	+79,000	+198%
Manufacturing and Energy Supply Chains	-	-	18,000	+18,000	N/A
Naval Reactors	330,000	330,000	455,265	+125,265	+38%
Nuclear Energy	37,000	37,000	7,300	-29,700	-80%
Science	1,343,109	1,187,956	1,221,513	-121,596	-9%
Weapons Activities	244,552	244,493	82,797	-161,756	-66%
Subtotal, R&D Related Facilities	2,044,279	1,910,067	1,930,039	-114,241	-5.6%

(dollars in thousands)

R&D Equipment	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Advanced Technology Vehicles Manufacturing Loan Program Account	-1,893,000	-	-	+1,893,000	-100%
Bonneville Power Administration Fund	267,000	267,000	267,000	-	N/A
Construction, Rehabilitation, Operation & Maintenance, Western Area Power Administration	5,000	3,000	9,000	+4,000	+80%
Construction, Rehabilitation, Office of Nuclear Energy	37,000	37,000	7,300	-29,700	-80%
Defense Nuclear Nonproliferation	24,500	24,500	26,164	+1,664	+7%
Energy Efficiency and Renewable Energy	-	39,000	-	-	N/A
Federal Energy Management Program	-	-	117,000	+117,000	N/A
Fossil Energy and Carbon Management	29,000	29,000	25,000	-4,000	-14%
Naval Reactors	1,000	1,000	25,100	+24,100	2,410%
Operation and Maintenance, Southwestern Power Administration	10,000	10,000	11,000	+1,000	+10%
Title 17 Innovative Technology Loan Guarantee Program	-96,000	22,000	150,000	+246,000	-256%
Transmission Facilitation Fund	-	380,000	-	-	N/A
Science	238,706	239,739	246,988	+8,282	+3%
Weapons Activities	547,840	437,717	396,820	-151,020	-28%
Western Area Power Administration, Borrowing Authority, Recovery Act	-	400,000	200,000	+200,000	N/A
Subtotal, Major Equipment	-828,954	1,889,956	1,481,372	+2,310,326	-279%

Research and Development Crosscut

(dollars in thousands)

R&D and Related Equipment & Construction	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs FY 2021	% Change
Advanced Technology Vehicles Manufacturing Loan Program Account	-1,893,000	-	-	+1,893,000	-100%
Advanced Research Projects Agency--Energy	427,000	427,000	700,150	+273,150	64%
Bonneville Power Administration Fund	270,000	269,000	269,000	-1,000	-0.4%
Construction, Rehabilitation, Operation & Maintenance, Western Area Power Administration	5,000	3,000	9,000	+4,000	+80%
Construction, Rehabilitation, Office of Nuclear Energy	37,000	37,000	7,300	-29,700	-80%
Cybersecurity, Energy Security, & Emergency Response	64,923	61,477	220,000	+155,077	+239%
Defense Environmental Cleanup (EM)	35,000	35,000	25,000	(10,000)	-29%
Defense Nuclear Nonproliferation	517,212	476,114	560,053	+42,840	+8%
Electricity	171,323	171,323	185,892	+14,569	+9%
Energy Efficiency and Renewable Energy	2,095,509	2,155,509	3,272,237	+1,176,728	+56%
Federal Energy Management Program	-	-	117,000	+117,000	N/A
Fossil Energy and Carbon Management	720,633	720,633	866,230	+145,597	+20%
Global Clean Energy Manufacturing	-	-	54,000	+54,000	N/A
Manufacturing and Energy Supply Chains	-	-	18,000	+18,000	N/A
Naval Reactors	1,471,270	1,471,270	1,793,135	+321,865	+22%
Nuclear Energy	1,066,682	1,066,682	1,442,313	+375,631	+35%
Office of Clean Energy Demonstrations	-	-	167,000	+167,000	N/A
Operation and Maintenance, Southwestern Power Administration	10,000	10,000	11,000	+1,000	+10%
Title 17 Innovative Technology Loan Guarantee Program	-96,000	22,000	150,000	+246,000	-256%
Transmission Facilitation Fund	-	380,000	-	-	N/A
Science	6,944,660	6,900,000	7,593,460	+648,800	+9%
Weapons Activities	4,272,898	4,275,331	4,296,789	+23,892	+1%
Western Area Power Administration, Borrowing Authority, Recovery Act	-	400,000	200,000	+200,000	N/A
R&D and Related Equipment & Construction	16,120,109	18,881,339	21,957,558	+5,837,449	+36%

Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)

(dollars in thousands)

SBIR/STTR	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 vs. FY 2021	% Change
Advanced Research Projects Agency-Energy	14,308	14,308	23,470	+9,162	+64%
Cybersecurity, Energy Security & Emergency Management	1,077	1,276	912	-165	-15%
Defense Environmental Cleanup	1,278	1,278	1,022	-256	-20%
Defense Nuclear Nonproliferation	13,202	13,975	14,705	+1,503	+11%
Electricity	4,646	4,646	6,151	+1,505	+32%
Energy Efficiency and Renewable Energy	80,472	68,102	102,180	+21,708	+27%
Fossil Energy and Carbon Management	15,226	15,226	19,733	+4,507	+30%
Nuclear Energy	18,893	18,893	25,679	+6,786	+36%
Office of Clean Energy Demonstrations	0	0	6,096	+6,096	N/A
Science	181,980	187,982	207,774	+25,794	14%
Total, SBIR/STTR	331,082	325,686	407,722	76,640	+23%

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. 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 specified for nonexempt extramural R&D. The percentages are 3.2% for SBIR and 0.45% for STTR programs, a total of 3.65% assessed for all contributing programs. The above table shows only the total by program with the precise splits by program determined in execution. 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)].

DOE SBIR/STTR Programs Office

The SBIR/STTR Programs Office works collaboratively with nine participating R&D program offices to administer the programs: the Office of Science; Cybersecurity, Energy Security and Energy Preparedness; Environmental Management (Defense Environmental Cleanup); Defense Nuclear Nonproliferation (within the National Nuclear Security Administration); Electricity; Energy Efficiency and Renewable Energy; Fossil Energy and Carbon Management; Nuclear Energy; and Clean Energy Demonstrations. Each office makes awards commensurate with its allocation and collaborates with other offices during execution, 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 Office of 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.

In the implementation of SBIR/STTR, DOE assesses each program office at the minimum required percentages for both SBIR and STTR to meet expenditure requirements. DOE’s current methodology is to vary the allocations such that each office will make the same total SBIR and STTR contribution, but the amounts given to SBIR and STTR will be adjusted to provide executable amounts, while in total DOE will meet the expenditure requirements for both SBIR and STTR.

Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)

ARPA-E SBIR/STTR Program

ARPA-E executes its SBIR/STTR programs separate from the DOE-wide SBIR/STTR program. The ARPA-E SBIR/STTR program employ the same rigorous merit review, accelerated contracting, funding, and active project management as all other ARPA-E programs. The ARPA-E SBIR/STTR Program focuses on targeted, mission-relevant areas where the agency believes that small business provides the best opportunity for innovative technology development.

Contractor Pensions and Other Postretirement Benefits

This section of the budget provides projected costs of contractor defined benefit (DB) pension plan contributions and other postretirement benefit reimbursements. The DB pension plan contributions are provided in Section I below for FY 2021 through FY 2023 by plan. The section also shows the allocations of those contributions to the following Department of Energy (DOE) Departmental Elements:^a

- National Nuclear Security Administration (NNSA)
- Office of Environmental Management (EM)
- Office of Science (SC)
- Office of Energy Efficiency and Renewable Energy (EERE)
- Office of Nuclear Energy (NE)

Information regarding projected reimbursements for other postretirement benefits (primarily medical) is provided 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 contractually required by DOE to assume sponsorship of the existing contractor DB pension plans and other postretirement benefit plans for incumbent employees. DOE reimburses the costs of the contractors' contributions to DB pension plans and the benefits paid from other postretirement benefit plans. These costs are typically allocated as indirect costs, though DOE does directly pay the costs of some legacy plans.^b

Due to the timing of the required annual valuation for the 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. 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 contractor employees whose costs are reimbursed by various programs, the allocation of contributions among NNSA, the Program Offices, and Reimbursable Work 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.^c

The American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA) became law in March and November 2021, respectively, and included several changes which affect the funding of qualified single employer and multiple employer defined benefit plans. In general, the provisions of the new legislation affecting multiemployer plans will not affect the two multiemployer pension plans which are included in this report. The provisions also do not impact the State plans included in this report. However, the changes affecting single and multiple employer plans will significantly reduce expected minimum required contributions in the future. The changes associated with ARPA and IIJA are included based on the best estimates of contractors in January 2022.

^a Tables include projected contributions from "Reimbursable Work" and "Other" entities (e.g., DOE departmental administration, classified programs, etc.). Reimbursable Work also includes the costs associated with the Naval Reactors contractor's plans covered by its contract with the Department of the Navy.

^b The NNSA legacy University of California (UC) plans and the East Tennessee Technology Park Pension Plan for Grandfathered Employees rely on direct costs. For fiscal years starting in FY 2022, NNSA and EM plan to directly fund the reimbursement of the unfunded liability of the Savannah River Nuclear Solutions, LLC Multiple Employer Pension Plan.

^c These allocations were provided by the contractors to the DOE in January 2022 and represent contractors' expectation of work for these years.

Section I - Contractor DB Pension Plan Contributions^d

DOE reimburses contractors for pension contributions at levels that are at least equal to the minimum required contribution (MRC) by the Employee Retirement Income Security Act (ERISA), as amended by ARPA and IIJA. The MRC is determined on a plan year basis. Only two of the contractor plans have a plan year that coincides with the federal fiscal year and, therefore, the majority of fiscal year pension allocations are spread across two plan years. At a minimum, plan sponsors of single or multiple employer plans^e in which the plan assets were less than liabilities in the prior year must make quarterly contributions during the plan year with the first contribution due 3½ months after the beginning of the plan year and any outstanding amount due 8½ months after the plan year ends.

Contractors develop long-term projections of future asset investment returns that affect estimates of future MRCs for each plan. Asset returns that are higher or lower than the projected long-term investment returns affect future MRCs, though the provisions of ERISA ensure that these effects are somewhat smoothed by allowing recognition over a two (single/multiple) or a five-year period (multiemployer/state). In calendar year 2021, market returns were generally positive and equaled or exceeded most contractors' expected asset return for 2021. The actual investment returns in calendar year 2021 will predominantly affect MRCs beginning in Fiscal Year 2023 though there could be some impact in FY 2022 depending on the funded status of the plan. DOE evaluated the impact of the actual calendar year 2021 investment returns on the individual DB plans as part of its annual pension plan review process. The FY 2022 contribution amounts reflect the better than expected asset return.

Reimbursement of contractor costs in excess of the MRC requires specific approval. Reimbursements requested in excess of the MRC are reviewed by the cognizant program office, the Office of the Chief Financial Officer, the Office of Management, and the Office of the General Counsel through an annual pension management plan process. Table 1 provides information related to plans where funding in excess of the MRC was requested during FY 2021, and it includes the MRC, the contribution approved, and the actual amount contributed during FY 2021. In FY 2021, requests by contractors for reimbursement of contributions in excess of the MRC for 18 plans were approved. Contributions in excess of the MRC were approved primarily to minimize volatility for future payments and mitigate increases in future contribution requirements.

Table 1: FY 2021 Contributions in Excess of the MRC (\$K)

Plan	Program Office	FY 2021 Congressional Budget Justification	FY 2021 Estimated Minimum Required Contribution	Preliminary Additional Amount Requested in Year of Execution	Amount Reported in September 2021	Final FY 2021 Amount Approved and Contributed
East Tennessee Technology Park Pension Plan for Grandfathered Employees	EM	16,359	11,695	17,680	29,375	29,375
Pension Plan for Eligible Bettis Employees and Retirees	NNSA	30,500	-	30,500	30,500	30,500
Pension Plan of the Pacific Northwest Laboratories, Battelle Memorial Institute	Science	45,000	-	45,000	45,000	45,000
Retirement Program for Employees of Consolidated Nuclear Security, LLC at the U. S. Department of Energy Facilities at Oak Ridge, Tennessee	NNSA	64,500	39,800	12,200	52,000	52,000
Idaho National Laboratory Employee Retirement Plan	NE	50,000	-	60,000	60,000	60,000

^d DOE has reimbursed contributions for 32 funded DB pension plans and 13 non-qualified DB pension plans in FY 2021. Non-qualified plans have no assets and are funded on a pay-as-you-go basis.

^e A 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 maintained pursuant to a collective bargaining agreement; a multiemployer plan is a plan maintained pursuant to a collective bargaining agreement between an employee organization and more than one employer.

Plan	Program Office	FY 2021 Congressional Budget Justification	FY 2021 Estimated Minimum Required Contribution	Preliminary Additional Amount Requested in Year of Execution	Amount Reported in September 2021	Final FY 2021 Amount Approved and Contributed
Salaried Employee Pension Plan for KAPL Employees and Retirees	NNSA	30,500	-	30,500	30,500	30,500
Pension Plan for KAPL Employees in Participating Bargaining Units	NNSA	3,400	-	3,400	3,400	3,400
Triad Defined Benefit Pension Plan (TCP1)	NNSA	122,985	-	136,800	136,800	136,800
LLNS Defined Benefit Pension Plan	NNSA	50,000	-	85,000	85,000	85,000
National Renewable Energy Laboratory Retirement Plan	EERE	30,000	11,654	22,054	33,708	33,708
Consolidated Nuclear Security, LLC Retirement Plan for Bargaining Unit Members of the Pantex Guards Union	NNSA	2,100	-	2,600	2,600	2,600
Retirement Plan for Bargaining Unit Employees of the Metal Trades Council of Consolidated Nuclear Security, LLC	NNSA	7,600	4,200	4,400	8,600	8,600
NTESS Retirement Income Plan	NNSA	111,148	-	105,443	105,443	105,444
Savannah River Nuclear Solutions, LLC Multiple Employer Pension Plan	EM	296,000	195,420	100,580	296,000	296,000
Pension Plan for Employees at ORNL	Science	102,000	-	150,000	150,000	150,000
NNSS Staff Pension Plan	NNSA	1,776	72	1,105	1,177	1,177
NNSS IGAN Pension Trust Fund	NNSA	2,482	678	1,833	2,511	2,511
West Valley Pension Plan	EM	4,490	3,670	10,481	14,151	14,151
Total		970,840	267,189	819,576	1,086,765	1,086,765

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 expected data impact the future costs of these plans; participants retiring earlier and/or living longer than expected may increase costs; compensation increases that are higher than expected will increase the costs. The most significant assumptions affecting the contribution amounts are those assumptions with respect to future market conditions. In particular, the difference between actual experience of the markets and the assumption of the expected return on investments earned by the plans each future year, as well as future corporate bond yields, have the largest impact on the ultimate contributions that will be reimbursed by the DOE. For example, the actual contributions for fiscal year 2023 will not be known until January 2023 at the earliest because these contributions will be determined based on the asset value as of December 31, 2022, and the discount rate in effect at that time. Estimated contributions above the MRC submitted during this budget process do not receive final approval until the year of execution.

Therefore, it is important to emphasize that the actual amounts reimbursed for the applicable fiscal years shown will almost certainly vary 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 January 2022. The non-qualified plan amounts equal the expected benefit payments which were provided by the contractors for the prior year's financial statements. This information has been reviewed by NNSA, relevant DOE Program Offices, and by the Office of the Chief Financial Officer.

- Table 2 provides aggregate FY 2021 actual and FY 2022 and FY 2023 estimated pension plan contributions eligible for reimbursement for all plans.
- Table 3 provides plan-by-plan FY 2021 actual contributions and FY 2022 and FY 2023 estimated pension contributions eligible for reimbursement by NNSA, the DOE, and reimbursable work customers

Table 2: NNSA and DOE Program Office Actual Contributions for FY 2021 and Projected Contributions for FY 2022 and FY 2023 (\$K)
Based on January 2022 data and allocated by Program Office ^f

Program Office	FY 2021	FY 2022	FY 2023
NNSA	637,147	536,522	344,452
EM	362,393	344,340	311,431
SC	142,114	141,966	76,687
EERE	59,108	49,261	30,970
NE	24,518	17,824	2,178
Reimbursable Work	149,930	144,468	57,718
Other	32,189	41,248	18,231
Total	1,407,399	1,275,629	841,668

There may be small variances in totals due to rounding. Numbers may not add.

Table 3 provides the following information for each plan:

Plan name and Plan type: Single employer, multiemployer, 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 qualified 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 certain 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 years 2021-2023 with 2021 representing actual contributions and contributions for later years based on submissions as outlined in footnote f.

^f Final information for FY 2021 contributions was reported in October 2021 while projected contributions for FY 2022 and on were reported in January 2022 for all departmental elements.

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)
Based on January 2022 data and allocated by Program Office ^g

Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
East Tennessee Technology Park Pension Plan for Grandfathered Employees	EM-Partially Closed	2021	29,375	-	29,375	-	-	-	-	-
	Multiemployer	2022	19,800	-	19,800	-	-	-	-	-
		2023	20,700	-	20,700	-	-	-	-	-
University of California Retirement Plan - Lawrence Berkeley National Laboratory	SC-Open	2021	52,244	423	157	35,171	6,797	256	8,270	1,170
	State	2022	49,879	424	105	33,773	6,350	205	7,956	1,067
		2023	46,840	398	98	31,715	5,963	192	7,471	1,002
Pension Plan for Eligible Bettis Employees and Retirees	NA-Closed	2021	30,500	16,775	-	-	-	-	13,725	-
	Single	2022	25,900	14,245	-	-	-	-	11,655	-
		2023	23,100	12,705	-	-	-	-	10,395	-
Pension Plan of the Pacific Northwest Laboratories, Battelle Memorial Institute	SC-Open	2021	45,000	9,540	810	7,875	5,760	900	14,085	6,030
	Single	2022	45,000	9,270	810	8,010	5,850	990	14,535	5,535
		2023	-	-	-	-	-	-	-	-
Retirement Program for Employees of Consolidated Nuclear Security, LLC at the U. S. Department of Energy Facilities at Oak Ridge, Tennessee	NA-Closed	2021	52,000	49,920	-	-	-	-	2,080	-
	Single	2022	58,400	56,064	-	-	-	-	2,336	-
		2023	48,700	46,752	-	-	-	-	1,948	-
HPMC Occupational Health Services Retirement Plan	EM-Closed	2021	522	-	522	-	-	-	-	-
	Single	2022	-	-	-	-	-	-	-	-
		2023	-	-	-	-	-	-	-	-
Hanford Multi-Employer Pension Plan	EM-Closed	2021	92,679	-	92,679	-	-	-	-	-
	Multiemployer	2022	99,859	-	99,859	-	-	-	-	-
		2023	95,951	-	95,951	-	-	-	-	-

^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)
Based on January 2022 data and allocated by Program Office ^g

Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
Idaho National Laboratory Employee Retirement Plan	NE-Closed	2021	60,000	3,420	26,500	214	1,088	16,520	11,192	1,066
	Multiple	2022	50,000	2,405	26,500	175	765	10,925	8,675	555
		2023	-	-	-	-	-	-	-	-
Salaried Employee Pension Plan for KAPL Employees and Retirees	NA-Closed	2021	30,500	16,775	-	-	-	-	13,725	-
	Single	2022	26,900	14,795	-	-	-	-	12,105	-
		2023	25,000	13,750	-	-	-	-	11,250	-
Pension Plan for KAPL Employees in Participating Bargaining Units	NA-Closed	2021	3,400	1,870	-	-	-	-	1,530	-
	Single	2022	2,700	1,485	-	-	-	-	1,215	-
		2023	2,400	1,320	-	-	-	-	1,080	-
Kansas City Division Hourly Employees' Pension Plan	NA-Closed	2021	-	-	-	-	-	-	-	-
	Single	2022	-	-	-	-	-	-	-	-
		2023	-	-	-	-	-	-	-	-
Honeywell Retirement Earnings Plan for Aerospace Employees at the Kansas City Division	NA-Closed	2021	-	-	-	-	-	-	-	-
	Single	2022	-	-	-	-	-	-	-	-
		2023	-	-	-	-	-	-	-	-
Triad Defined Benefit Pension Plan (TCP1)	NA-Closed	2021	136,800	116,922	1,724	3,721	602	602	11,300	1,929
	Multiple	2022	132,600	113,771	1,591	3,580	530	530	10,608	1,989
		2023	1,430	1,227	17	39	6	6	114	21
University of California Retirement Plan - Lawrence Livermore National Laboratory Retained Segment	NA-Frozen	2021	61,990	61,990	-	-	-	-	-	-
	State	2022	1,109	1,109	-	-	-	-	-	-
		2023	24,192	24,192	-	-	-	-	-	-

^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)
Based on January 2022 data and allocated by Program Office ^g

Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
LLNS Defined Benefit Pension Plan	NA-Closed	2021	85,000	63,750	-	2,550	850	-	13,600	4,250
	Single	2022	95,700	70,818	-	2,871	957	-	17,226	3,828
		2023	60,000	46,200	-	1,800	600	-	9,600	1,800
Fluor-BWXT Portsmouth, LLC USW Career Pension Plan for Appendix A USW-Represented Employees	EM-Closed	2021	1,844	-	1,844	-	-	-	-	-
	Single	2022	2,666	-	2,666	-	-	-	-	-
		2023	495	-	495	-	-	-	-	-
University of California Retirement Plan - Los Alamos National Laboratory Retained Segment	NA-Frozen	2021	53,970	53,970	-	-	-	-	-	-
	State	2022	18,472	18,472	-	-	-	-	-	-
		2023	32,036	32,036	-	-	-	-	-	-
National Renewable Energy Laboratory Retirement Plan	EE-Closed - Hybrid	2021	33,707	-	-	1,011	26,292	-	4,719	1,685
	Single	2022	23,000	-	-	1,380	17,480	-	2,990	1,150
		2023	23,000	-	-	1,380	17,480	-	2,990	1,150
Golden SVCS, LLC Pension Plan	SC-Closed	2021	1,308	-	1,046	262	-	-	-	-
	Multiple	2022	1,040	-	832	208	-	-	-	-
		2023	370	-	274	96	-	-	-	-
Mission Support and Test Services, LLC (MSTS) Employee Retirement Plan	NA-Closed-Hybrid	2021	17,505	14,950	945	-	-	-	1,190	420
	Single	2022	17,300	15,016	865	-	-	-	986	433
		2023	18,485	16,045	924	-	-	-	1,054	462
Consolidated Nuclear Security, LLC Retirement Plan for Bargaining Unit	NA-Closed	2021	2,600	2,600	-	-	-	-	-	-
	Single	2022	2,800	2,800	-	-	-	-	-	-

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)Based on January 2022 data and allocated by Program Office ^g

Members of the Pantex Guards Union		2023	2,800	2,800	-	-	-	-	-	-
^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.										
Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
Retirement Plan for Bargaining Unit Employees of the Metal Trades Council of Consolidated Nuclear Security, LLC	NA-Closed	2021	8,600	8,600	-	-	-	-	-	-
	Single	2022	8,200	8,200	-	-	-	-	-	-
		2023	7,900	7,900	-	-	-	-	-	-
Consolidated Nuclear Security Retirement Plan for Non-Bargaining Pantex Location Employees	NA-Closed	2021	15,300	14,994	-	-	-	-	306	-
	Single	2022	15,200	14,896	-	-	-	-	304	-
		2023	13,900	13,622	-	-	-	-	278	-
NTESS Retirement Income Plan	NA-Closed	2021	105,443	65,691	527	2,109	2,003	949	32,371	1,793
	Single	2022	103,121	63,626	619	2,269	2,475	928	31,349	1,856
		2023	-	-	-	-	-	-	-	-
Savannah River Nuclear Solutions, LLC Multiple Employer Pension Plan	EM-Closed	2021	296,000	112,628	175,824	-	-	-	-	7,548
	Multiple	2022	296,000	109,076	169,312	-	-	-	-	17,612
		2023	296,000	112,658	172,953	-	-	-	-	10,390
DUF6 Pension Plan for Grandfathered Employees	EM-Partially Closed	2021	599	-	599	-	-	-	-	-
	Single	2022	-	-	-	-	-	-	-	-
		2023	-	-	-	-	-	-	-	-
USW Career Pension Plan for Appendix A USW-Represented Employees (Paducah)	EM-Closed	2021	1,572	-	1,572	-	-	-	-	-
	Single	2022	1,616	-	1,616	-	-	-	-	-

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)
Based on January 2022 data and allocated by Program Office ^g

2023	350	-	350	-	-	-	-	-
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^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
Pension Plan for Employees at ORNL	SC-Open	2021	150,000	14,250	150	88,800	15,600	5,250	19,800	6,150
	Single	2022	150,000	14,400	150	89,100	14,700	4,200	20,400	7,050
		2023	69,000	6,624	69	40,986	6,762	1,932	9,384	3,243
Waste Isolation Pilot Plant Pension Plan	EM-Open	2021	13,423	-	13,423	-	-	-	-	-
	Single	2022	19,100	-	19,100	-	-	-	-	-
		2023	19,100	-	19,100	-	-	-	-	-
West Valley Pension Plan	EM-Closed	2021	14,151	-	14,151	-	-	-	-	-
	Single	2022	-	-	-	-	-	-	-	-
		2023	-	-	-	-	-	-	-	-
NNS Staff Pension Plan	NA-Closed	2021	1,177	1,177	-	-	-	-	-	-
	Single	2022	140	140	-	-	-	-	-	-
		2023	47	47	-	-	-	-	-	-
NNS IGAN Pension Trust Fund	NA-Closed	2021	2,511	2,511	-	-	-	-	-	-
	Single	2022	989	989	-	-	-	-	-	-
		2023	1,314	1,314	-	-	-	-	-	-
Battelle Memorial Institute Excess Benefit and Supplemental Executive Pension Plans	NA-Closed	2021	31	7	1	5	4	1	9	4
	Non-Qualified	2022	8	2	0	1	1	0	3	1
		2023	8	2	0	1	1	0	2	1
	NA-Closed	2021	1,835	1,009	-	-	-	-	826	-

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)Based on January 2022 data and allocated by Program Office ^g

Executive and Supplemental Pension Plans for Designated Bettis Employees	Non-Qualified	2022	1,886	1,037	-	-	-	-	849	-
		2023	1,962	1,079	-	-	-	-	883	-

^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

Plan Name	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
Excess and Supplemental Pension Plan for Designated KAPL Employees	NA-Closed	2021	353	194	-	-	-	-	159	-
	Non-Qualified	2022	346	190	-	-	-	-	155	-
		2023	340	187	-	-	-	-	153	-
Triad 401(a)(17) Restoration Plan	NA-Closed	2021	274	235	3	7	1	1	23	4
	Non-Qualified	2022	263	226	3	7	1	1	21	4
		2023	267	229	3	7	1	1	21	4
Triad Restoration Plan	NA-Closed	2021	93	80	1	3	-	-	8	1
	Non-Qualified	2022	169	145	2	5	1	1	14	3
		2023	187	160	2	5	1	1	15	3
LLNS 401(a)(17) Restoration Plan	NA-Closed	2021	1,096	822	-	33	11	-	175	55
	Non-Qualified	2022	1,142	845	-	34	11	-	206	46
		2023	1,340	1,032	-	40	13	-	214	40
LLNS Restoration Plan	NA-Closed	2021	226	170	-	7	2	-	36	11
	Non-Qualified	2022	343	254	-	10	3	-	62	14
		2023	441	339	-	13	4	-	70	13
NTESS Nonqualified Pension Plan	NA-Closed	2021	2,367	1,475	12	47	45	21	727	40
	Non-Qualified	2022	2,304	1,422	14	51	55	21	701	41
		2023	2,274	1,435	14	52	48	20	662	43

Table 3: Actual FY 2021 and Projected FY 2022 and FY 2023 Contributions by Plan, NNSA, and Program Office (\$K)Based on January 2022 data and allocated by Program Office ^g

Savannah River Nuclear Solutions, LLC Nonqualified Pension Plan	EM-Frozen	2021	460	175	273	-	-	-	-	12
	Non-Qualified	2022	435	160	249	-	-	-	-	26
		2023	411	156	240	-	-	-	-	14

^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

	Plan status	Fiscal Year	Total	NNSA	EM	SC	EERE	NE	Reimbursable Work	Other
Washington Government Services Executive Pension Plan (TRU Solutions Participants Only)	EM-Frozen	2021	71	-	71	-	-	-	-	-
	Non-Qualified	2022	70	-	70	-	-	-	-	-
		2023	68	-	68	-	-	-	-	-
Washington Government Services Executive Pension Plan (West Valley Participants Only)	EM-Frozen	2021	184	-	184	-	-	-	-	-
	Non-Qualified	2022	177	-	177	-	-	-	-	-
		2023	172	-	172	-	-	-	-	-
Consolidated Nuclear Security, LLC Equalization Retirement Income Plan and Supplemental Retirement Income Plan	NA-Closed	2021	183	176	-	-	-	-	7	-
	Non-Qualified	2022	167	160	-	-	-	-	7	-
		2023	161	154	-	-	-	-	6	-
UT-Battelle Equalization Retirement Income Plan and Supplemental Retirement Income Plan	SC-Open	2021	506	48	-	299	53	18	67	21
	Non-Qualified	2022	827	79	1	491	81	23	112	39
		2023	929	89	1	552	91	26	126	44
Total		2021	1,407,399	637,147	362,393	142,114	59,108	24,518	149,930	32,189
		2022	1,275,629	536,522	344,340	141,966	49,261	17,824	144,468	41,248
		2023	841,668	344,452	311,431	76,687	30,970	2,178	57,718	18,231

^g May be small variances in totals due to rounding. For the Naval Reactors contractor's plans, Reimbursable Work includes the portion of contributions covered by the contract with the Department of the Navy.

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 drugs, 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 2022 and FY 2023 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.^h As mentioned in the pension section, the allocation of contributions among NNSA, the Program Offices, and Reimbursable Work, 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, simplify administration, or increase the efficiency of the delivery of benefits. These changes, effective January 1, 2021 or later, including adjusting plan options to include high deductible health plan options, putting in place Employer Group Waiver Plans (EGWP) and other programs to manage prescription drug costs, adjusting the premiums for health and dental plans, and adjusting eligibility rules for retiree health plans.

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 for FY 2022 and FY 2023 is based on expected reimbursements as reported by the DOE's respective contractors in January 2022; this information has been reviewed by the appropriate NNSA and DOE program office and the Office of the Chief Financial Officer. The information reported for FY 2021 is primarily based on information of final employer contributions as reported by the contractors for the FY 2021 agency financial statements. Table 5 provides these aggregate FY 2021-2023 projected other postretirement benefit reimbursements.

Table 5: FY 2021-2023 NNSA and DOE Program Office Projected Other Postretirement Benefits Payments (\$K)
Based on January 2022 data and allocated by Program Office^h

Program Office	FY 2021	FY 2022	FY 2023
NNSA	161,459	178,452	186,133
EM	64,765	69,303	70,819
SC	49,616	58,144	60,376
EERE	6,193	7,023	7,279
NE	5,551	7,137	7,300
Reimbursable Work	39,812	47,603	47,576
LM	36,634	39,875	38,662
Other	7,367	9,681	8,187
Total	371,396	417,217	426,332

There may be small variances in totals due to rounding. Numbers may not add in total.

^h The LM plans rely on direct costs.

Infrastructure

Infrastructure funding is managed within several programs and includes direct and indirect funding for capital equipment, maintenance and repair, minor construction, line-item construction, and excess facilities. The DOE program offices and 17 National Laboratories are working to research, develop, and deploy the clean energy technologies of the future, including battery storage, renewable power, electric vehicles, carbon capture, and resilient grid infrastructure. Infrastructure funding is to improve the reliability, efficiency, and capability of core infrastructure to meet mission requirements. The Department's Infrastructure activities are tied to its programmatic missions, goals, and objectives. DOE will also use its expansive loan authority to invest in American, and its regulatory authority to innovate in advanced building technologies, and energy efficient appliances. DOE prioritizes infrastructure investments to reduce safety risk by addressing numerous obsolete support and safety systems, to reduce mission risk by revitalizing facilities that are beyond the end of their design life, and to maximize return on investment while considering climate risk, improving sustainability, and working toward meeting the Department's climate action goals by addressing climate adaptability and resilience. This crosscut summarizes the infrastructure funding that is distributed through the budget volumes.

Descriptions of each program's Infrastructure components can be found in the budget justifications for:

- Defense and Non-defense Environmental Cleanup
- Defense Nuclear Nonproliferation
- Electricity
- Energy Efficiency and Renewable Energy
- Enterprise Assessments
- Fossil Energy Research and Development
- Legacy Management
- Naval Reactors
- Nuclear Energy
- Science
- Strategic Petroleum Reserve
- Weapons Activities

Table 1 provides a department-wide summary of infrastructure funding by Program, while Table 2 provides the breakout by category of expenditures.

Table 1. Overall DOE Infrastructure Funding by Program (FY 2021 – FY 2023)

Infrastructure by Program ² \$ in thousands	FY 2021 Enacted	FY 2022 Annualized	FY 2023 Request	FY 2023 vs FY 2021	% Change
Defense Environmental Cleanup	1,874,176	1,848,203	1,602,526	-271,650	-14.49%
Defense Nuclear Nonproliferation	271,220	260,167	223,296	-47,924	-17.67%
Electricity	23,000	23,000	0	-23,000	-100.00%
Energy Efficiency and Renewable Energy	110,443	50,050	201,600	91,157	82.54%
Enterprise Assessments	1,278	1,770	1,824	546	42.72%
Legacy Management	4,935	4,935	5,947	1,012	20.51%
Naval Reactors	445,271	446,466	657,584	212,313	47.68%
Nuclear Energy	76,977	64,683	40,803	-36,174	-46.99%
Science	1,858,793	1,745,533	1,844,921	-13,872	-0.75%
Strategic Petroleum Reserve	467,041	38,908	29,822	-437,219	-93.61%
Weapons Activities	4,546,865	4,720,965	5,461,294	914,429	20.11%
Fossil Energy & Carbon Management	31,336	39,092	44,820	13,484	43.03%
UED&D Fund	63,136	63,139	48,040	-15,096	-23.91%
Total, Infrastructure	9,774,471	9,306,911	10,162,477	388,006	3.97%

Table 2. Overall DOE Infrastructure Funding by Category (FY 2021 – FY 2023)

Infrastructure Category \$ in thousands	FY 2021 Enacted	FY 2022 Annualized	FY 2023 Request	FY 2023 vs FY 2021	% Change
Capital Equipment					
Defense Nuclear Nonproliferation	92,168	92,886	110,927	18,759	20.35%
Energy Efficiency and Renewable Energy	20,262	14,400	38,775	18,513	91.37%
Naval Reactors	1,000	7,000	41,600	40,600	4060.00%
Nuclear Energy	2,845	1,000	0	-2,845	-100.00%
Science	239,552	239,739	248,988	9,436	3.94%
Strategic Petroleum Reserve	6,795	6,795	0	-6,795	-100.00%
Weapons Activities	895,425	1,113,192	1,215,664	320,239	35.76%
Subtotal, Capital Equipment	1,258,047	1,475,012	1,655,954	397,907	31.63%
Excess Facilities					
Defense Environmental Cleanup	35,000	35,000	52,523	17,523	50.07%
Naval Reactors	21,930	21,930	61,007	39,077	178.19%
Science	1,349	1,291	2,858	1,509	111.86%
Weapons Activities	44,123	41,276	39,000	-5,123	-11.61%
Fossil Energy & Carbon Management	54	40	40	-14	-25.93%
Subtotal, Excess Facilities	102,456	99,537	155,428	52,972	51.70%
Line Item Construction³					
Defense Environmental Cleanup	1,082,564	1,082,564	675,264	-407,300	-37.62%
Defense Nuclear Nonproliferation	148,589	148,589	71,764	-76,825	-51.70%
Electricity	23,000	23,000	0	-23,000	-100.00%
Energy Efficiency and Renewable Energy	4,000	4,000	91,500	87,500	2187.50%
Naval Reactors	334,000	334,000	455,265	121,265	36.31%
Nuclear Energy	26,500	28,500	7,300	-19,200	-72.45%
Science	1,094,000	1,017,750	1,072,550	-21,450	-1.96%
Strategic Petroleum Reserve	425,774	0	0	-425,774	-100.00%
Weapons Activities	2,002,215	2,002,215	2,550,551	548,336	27.39%
UED&D Fund	63,136	63,139	48,040	-15,096	-23.91%
Subtotal, Line-Item Construction	5,203,778	4,703,757	4,972,234	-231,544	-4.45%
Maintenance and Repair⁴					
Defense Environmental Cleanup	669,327	643,354	787,910	118,583	17.72%
Energy Efficiency and Renewable Energy	16,760	18,550	19,400	2,640	15.75%
Enterprise Assessments	1,278	1,770	1,824	546	42.72%
Legacy Management	4,935	4,935	5,947	1,012	20.51%
Naval Reactors	46,936	46,936	50,192	3,256	6.94%
Nuclear Energy	39,817	32,583	33,503	-6,314	-15.86%
Science	322,714	303,867	308,685	-14,029	-4.35%
Strategic Petroleum Reserve	34,472	32,113	29,822	-4,650	-13.49%
Weapons Activities	1,055,719	1,058,354	1,106,599	50,880	4.82%
Fossil Energy & Carbon Management	19,282	19,780	19,780	498	2.58%
Subtotal, Maintenance and Repair	2,211,240	2,162,242	2,363,662	152,422	6.89%

Minor Construction

Defense Environmental Cleanup	87,285	87,285	86,829	-456	-0.52%
Defense Nuclear Nonproliferation	30,463	18,692	40,605	10,142	33.29%
Energy Efficiency and Renewable Energy	69,421	13,100	51,925	-17,496	-25.20%
Naval Reactors	41,405	36,600	49,520	8,115	19.60%
Nuclear Energy	7,815	2,600	0	-7,815	-100.00%
Science	201,178	182,886	211,840	10,662	5.30%
Weapons Activities	549,383	505,928	549,480	97	0.02%
Fossil Energy & Carbon Management	12,000	19,272	25,000	13,000	108.33%
Subtotal, Minor Construction	998,950	866,363	1,015,199	16,249	1.63%
Total, Infrastructure	9,774,471	9,306,911	10,162,477	388,006	3.97%

Capital Equipment

Capital equipment funding includes the cost of equipment either acquired by purchase or fabricated by a site/facility management contractor that exceeds the capitalization threshold of \$500,000. Included in the capital equipment funding are major items of equipment (MIEs). MIEs are listed individually in each program's budget justification.

Minor Construction

Minor Construction funding includes all minor construction projects. A Minor Construction Project is any construction project not specifically authorized by law for which the approved total estimated cost does not exceed the minor construction threshold¹. Minor Construction Projects, including Accelerator Improvement Projects (AIPs), that exceed \$5M are listed individually in each program's budget justification.

Line-Item Construction

Line-Item Construction funding includes all construction projects specifically authorized by law for which the approved total estimated cost exceeds the minor construction threshold [50 US Code 2741]. The funding captured in this crosscut includes the annual total project costs – both total estimated costs and other project costs. The individual line-item construction projects can be found in both the programs' construction projects summary and the individual project data sheets.

Maintenance and Repair

The Facilities Maintenance and Repair activities funded by this budget are intended to improve asset condition and maintain operability. This excludes maintenance of excess facilities (including high-risk excess facilities) necessary to minimize the risk posed by those facilities prior to disposition.

Excess Facilities

Excess Facilities are facilities no longer required to support the Department's needs, present or future missions or functions, or the discharge of its responsibilities. The funding to deactivate and dispose (D&D) of excess infrastructure, including stabilization and risk reduction activities at high-risk excess facilities, resulting in surveillance and maintenance cost avoidance and reduced risk to workers, the public, the environment, and programs is included. Also included is the maintenance of excess facilities (including high-risk excess facilities) necessary to minimize the risk posed by those facilities prior to disposition.

¹ 50 USC 2743 only allows authorized programs to conduct minor construction projects under annual National Defense Authorization Acts; 50 USC 2741 sets the minor construction threshold

² Does not include annual lease costs

³ Reflects Total Project Costs (TPC) for each Line-Item Construction Project

⁴ Includes both direct- and indirect-funded dollars.

Exascale Computing Initiative Crosscut

Funding by Appropriation and Program (\$K)

	FY 2021 Enacted	FY 2022 Annualized	FY 2023 Request	FY 2023 vs FY 2021 (\$ Change)	FY 2023 vs FY 2021 (% Change)
SC-ECP (17-SC-20)	\$168,945	\$129,000	\$77,000	-\$91,945	-54.4%
Argonne Leadership Computing Facility (ALCF)	\$150,000	\$150,000	\$150,000	—	0%
Oak Ridge Leadership Computing Facility (OLCF)	\$120,000	\$120,000	—	-\$120,000	-100%
Basic Energy Sciences	\$26,000	\$26,000	\$26,000	—	0%
Biological and Environmental Research	\$15,000	\$15,000	\$15,000	—	0%
Total, SC Exascale¹	\$479,945	\$440,000	\$268,000	-\$211,945	-44.2%
Advanced Simulation and Computing (ASC)					
-Advanced Technology Development & Mitigation (ATDM)	\$40,000	\$40,000	\$12,000	-\$28,000	-70.0%
<i>ECP Focus Area 1: Applications</i>	<i>\$15,000</i>	<i>\$15,000</i>	—	<i>-\$15,000</i>	<i>-100%</i>
<i>ECP Focus Area 2: Software</i>	<i>\$15,000</i>	<i>\$15,000</i>	<i>\$12,000</i>	<i>-\$3,000</i>	<i>-20%</i>
<i>ECP Focus Area 3: Hardware</i>	—	—	—	—	—
<i>ECI Stockpile Simulation</i>	<i>\$10,000</i>	<i>\$10,000</i>	—	<i>-\$10,000</i>	<i>-100%</i>
<i>ECI Stockpile Computing</i>	—	—	—	—	—
- Defense Applications and Modeling (DAM)	\$28,000	\$18,000	\$18,000	-\$10,000	-35.7%
- Computational Systems and Software Environment (CSSE)	\$124,000	\$145,000	\$130,000	\$6,000	4.8%
<i>Exascale System</i>	<i>\$100,000</i>	<i>\$125,000</i>	<i>\$110,000</i>	<i>\$10,000</i>	<i>10%</i>
<i>Next-Generation Computing Technologies</i>	<i>\$24,000</i>	<i>\$20,000</i>	<i>\$20,000</i>	<i>-\$4,000</i>	<i>-16.7%</i>
- Facility Operation and User Support (FOUS)	\$19,000	\$1,000	—	-\$19,000	-100%
- Exascale Class Facility Modernization (18-D-620) ²	\$29,200	—	—	-\$29,200	-100%
Total, NNSA Exascale	\$240,200	\$204,000	\$160,000	-\$80,200	-33.4%
Total, ECI	\$720,145	\$644,000	\$428,000	-\$292,145	-40.6%

¹ The SC-ECP project was initiated in FY 2017 and in FY 2018 funds to prepare the LCFs for deployment of at least one exascale system were included in ECI. The OLCF accepted their exascale system in 2022 and into operations in 2023 so is no longer included in the crosscut; funding for the ALCF is primarily focused on the acceptance of their exascale system.

² In FY 2021 and FY 2022, NNSA funded ASC as a subprogram to the higher-level Stockpile Research, Technology, and Engineering Program. At that time, NNSA funded ECFM through Programmatic Construction within Infrastructure and Operations. ECFM will reach CD-4 by end of FY 2022.

Summary:

The Exascale Computing Initiative (ECI) is a partnership between the Office of Science (SC) and the National Nuclear Security Administration (NNSA) to develop and deploy three exascale-capable computing systems with an emphasis on sustained performance for relevant applications and analytic computing to support DOE missions. In 2015, the National Strategic Computing Initiative (NSCI) was established to maximize the benefits of HPC for U.S. economic competitiveness, scientific discovery, and national security and within NSCI DOE has the responsibility for executing a joint program focused on advanced simulation through an exascale-capable computing program, which will emphasize sustained performance and analytic computing to advance DOE missions. The computing industry has reached a point where the continued improvement in processing performance requires technological breakthroughs to mitigate memory bottlenecks, reduce power consumption, and solve unique problems of computing at unprecedented scales. As a result, DOE's approach in ECI 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. It is imperative for the United States to retain its primacy in HPC to ensure its national security, economic prosperity, technological strength, and scientific and energy research leadership to prevent 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.

Crosscut Objectives:

ECI is currently comprised of three components: the Exascale Computing Project (ECP) which is focused on the research, development, and deployment of the exascale applications and software ecosystem; additional investments by NNSA and other SC Program offices for their mission-specific work; and the actual exascale system procurements and deployment at Argonne (Aurora), Lawrence Livermore (El Capitan), and Oak Ridge National Laboratories (Frontier). The DOE ECP is organized around three technical focus areas: 1) Application Development, targeting specific R&D activities and outcomes that address critical DOE applications and grand challenge problems; 2) Software Technology, with efforts that span low-level operational software to high-level applications development environments, including the software infrastructure to support large data management and workflows; and 3) Hardware and Integration, which supports vendor-based R&D efforts and the integration of ECP with the facilities projects that are delivering the exascale systems.

- ***Crosscut Objective 1:*** Successfully completed objective with the installation of Frontier at the Oak Ridge Leadership Computing Facility (OLCF) by September 20, 2021. By September 30, 2021, begin deployment (receiving and installing hardware) of at least one Exascale Computing system (DOE Agency Priority Goal).
- ***Crosscut Objective 2:*** ECP Application Development – Develop and enhance the predictive capability of applications critical to DOE in national security, clean energy, earth systems chemistry and materials.
- ***Crosscut Objective 3:*** ECP Software Technologies- Deliver expanded and vertically integrated software stack to achieve full potential of exascale computing.
- ***Crosscut Objective 4:*** ECP Hardware and Integration- Integrate delivery of ECP products on targeted systems at leading DOE HPC facilities.
- ***Crosscut Objective 5:*** In the 2022-2023 timeframe begin deployment of DOE's two additional exascale systems to support DOE's mission in scientific discovery and national security.

Program 'Action Areas':

1. ***Action Area 1:*** NNSA and DOE/SC will continue their close partnership to meet the ECI goals and objectives.
2. ***Action Area 2:*** In this focus area, ASCR will complete execution of applications critical to the scientific and energy missions of the Department and other Federal agencies on the OLCF's Frontier, the Nation's first exascale system.

In addition, the application teams will have access to Aurora, the nation's second exascale system located at the Argonne Leadership Computing Facility (ALCF), to initiate scale-up and execution activities.

3. **Action Area 3:** In partnership with NNSA, investments in the Software Technology focus area will provide the required software that effectively bridges between the other focus areas of the ECP. The ECP software technology effort will continue to harden the software stack on the OLCF's Frontier system while deploying the updated versions to Aurora and El Capitan, which will be sited at Lawrence Livermore National Laboratory (LLNL) in the 2022-2023 timeframe, respectively.
4. **Action Area 4:** Continue the support of the close integration between ECP and DOE HPC facilities, while deploying application and the software stack on the exascale platforms.
5. **Action Area 5:** SC: Basic Energy Sciences (BES) and Biological and Environmental Research (BER) exascale application development. Within this focus area BES is responsible for determining the scope and management of the Functional Material and Computational Chemistry programs and BER is responsible for determining the scope and management of the Earth Systems Modeling programs.
6. **Action Area 6:** ASCR will transition Frontier at ORNL to operations and initiate the acceptance testing process of Aurora at Argonne National Laboratory (ANL).
7. **Action Area 7:** NNSA will productionize the transferred Advanced Technology Development and Mitigation (ATDM) next-generation codes (to the ASC code base in FY 2022) to directly support the stockpile management and annual assessment activities.
8. **Action Area 8:** NNSA will accept delivery of El Capitan system at LLNL.

Program Organization:

1. SC (\$268M): See action areas, 1, 2, 3, 4, 5, and 6 above.
2. NNSA (\$160M): See action areas 1, 3, 4, 7, and 8 above.

ECP is being executed within a tailored project framework that follows the principles of 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 project director (FPD) from the ORNL Site Office has overall responsibility for execution of the project and the FPD reports to the cognizant SC and NNSA Headquarters program offices and are accountable to an Acquisition Executive, as defined in DOE Order 413.3B. Project execution is governed by a baselined schedule and cost envelope, using Office of Science processes, and follow defined processes for change control and management of contingency per the established ECP performance baseline.

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) has been established through an IPT charter with defined roles and responsibilities. The IPT supports the FPD who leads the IPT through the lifetime of the project.

**Energy Sector Cybersecurity
(\$K)**

Appropriation and Program Control	FY 2021 Enacted	FY 2022 Annualized	FY 2023 Request	FY 23 vs. FY 21 (\$ Change)
Cybersecurity, Energy Security, and Emergency Response	139,100	139,100	125,020	-14,080
Risk Management Technology & Tools	139,100	139,100	125,020	-14,080
Electricity	0	0	20,000	+20,000
Cyber Resilient and Secure Utility Communication Networks (SecureNet)	0	0	20,000	+20,000
Energy Efficiency and Renewable Energy	31,064	12,350	26,200	-4,864
Advanced Manufacturing Office (AMO)	14,000	0	0	-14,000
Bioenergy Technologies (BETO)	200	0	200	0
Building Technologies (BTO)	7,250	6,000	5,000	-2,250
Federal Energy Management Program (FEMP)	2,071	0	0	-2,071
Hydrogen and Fuel Cell Technologies (HFTO)	1,000	0	1,000	0
Solar Energy Technologies (SETO)	4,000	4,000	5,000	+1,000
Vehicle Technologies (VTO)	2,000	2,000	2,000	0
Water Power Technologies Office (WPTO)	13	350	5,000	+4,987
Wind Energy Technologies Office (WETO)	530	0	8,000	+7,470
Nuclear Energy	5,000	5,000	7,500	+2,500
Fossil Energy and Carbon Management	1,170	1,170	1,800	+630
Chief Information Officer	1,303	1,303	1,553	+250
Total, Energy Sector Cybersecurity	177,637	158,923	182,073	+4,436

Overview

The Department of Energy's (DOE's) FY 2023 budget request is aligned with the National Cyber Strategy and demonstrates the Administration's commitment to strengthening the Nation's cybersecurity capabilities and addressing the most pressing cyber threats. The FY 2023 budget supports DOE's responsibilities as Sector Risk Management Agency (SRMA) for cybersecurity for the energy sector, as established under the Fixing America's Surface Transportation (FAST) Act of 2015. As SRMA, DOE works closely with the critical infrastructure lead, the Department of Homeland Security (DHS), and our other federal partners including law enforcement and the intelligence community, as well as stakeholders across industry, and state and local governments, to secure the Nation's critical energy infrastructure from cyber threats and attacks.

Departmental Collaboration

As adversaries increase the frequency and sophistication of their malicious cyber activities, the Department has increased investment in cybersecurity to identify solutions to reduce risk for the energy sector, as well as the enterprise systems supporting the Department's internal operations. The FY 2023 request builds upon the strategy outlined in the Multiyear

Plan (MYP) for Energy Sector Cybersecurity and the establishment of the Office of Cybersecurity, Energy Security and Emergency Response (CESER).

Highlights and Major Changes

Office of Cybersecurity, Energy Security, and Emergency Response

The FY 2023 CESER budget request supports:

- CESER is lead for energy sector cybersecurity initiatives across the Department. In FY 2023, CESER will make investments in the following programmatic areas of Risk Management Tools & Technologies:
- **ADVANCE CYBERSECURITY TOOLS & TECHNOLOGIES FOR THE SECTOR**
Develop, demonstrate, deploy, and transition to practice next generation technology and tools for broad adoption in energy industry. These tools will focus on protection, monitoring, detection, response, containment, forensics, and recovery. The request supports competitive Funding Opportunity Announcements (FOA) and Lab Research Calls for the development of such tools for Information Technology (IT) and Operational Technology (OT) spaces. The request also supports the Grid Modernization Laboratory Consortium (GMLC) initiatives.
- **ADVANCED THREAT MITIGATION**
Enhance the speed and effectiveness of government and private sector bi-directional machine-to-machine threat information sharing and analysis. This initiative will use the latest available technology and architecture together with innovative partnerships in the energy sector to promote enhanced cyber protection for the sector. The vision is to dramatically increase the visible footprint across the energy sector infrastructure and to gain a higher level of threat detection capability. The request will allow for near-real-time capability for energy owners and operators, analyze their data, identify adversary activities, and execute mitigative measures.
- **CYBER RISK ASSESSMENT TOOLS**
Develop and transition to practice tools, guidance, and practices that help energy organizations' understanding and management of cybersecurity risk to systems, people, assets, data, and capabilities. The CESER Cybersecurity Capability Maturity Model (C2M2) and energy sector Cybersecurity Framework profiles initiatives improve understanding of cybersecurity capabilities, gaps and challenges facing electricity, oil, and natural gas sectors. These tools connect business context, critical resources and functions, and the related cybersecurity risks to enable an organization to focus and prioritize its cybersecurity efforts, consistent with its risk management strategy and business needs.
- **RESEARCH & DEVELOPMENT COORDINATION**
Coordinate with DOE applied program offices to streamline Research and Development (R&D) of cybersecure energy delivery systems preventing redundancies and gaps across electricity, fossil fuels, nuclear, and renewable technologies.
- **SITUATIONAL AWARENESS TOOLS**
The funding will enable CESER to continue providing visibility in sector threat environment and supplementing that with analytical capability to support the sector. This funding will enable expansion of CRISP and associated information sharing and situational awareness tools
- **CYBER TESTING FOR RESILIENT INDUSTRIAL CONTROL SYSTEMS (CyTRICS) (\$35 Million)**
CyTRICS is the Department of Energy's program for cybersecurity supply chain vulnerability testing, digital subcomponent enumeration, and mitigation. CyTRICS partners across energy sector stakeholders to identify threat-informed, high priority operational technology (OT) components, perform expert testing, share information about vulnerabilities in the digital supply chain, and inform improvements in component design and manufacturing. FY2022 funding will enable inclusion of two additional testing Labs (NREL and ORNL) and scaling up cyber supply chain testing of digital components in renewables and distributed energy systems. CyTRICS includes integrated cyber supply chain programs for the energy sector that leverage outputs of cyber vulnerability testing. These include integration with intelligence community programs, DOE CIO cyber supply chain programs, energy sector demonstration projects for automated generation and exchange of hardware and software bills of materials, and digital subcomponent supply

chain illumination tools.

Major Changes from FY 2021 Request

Cybersecurity R&D efforts have been reassigned from CESER CEDS to DOE applied program offices. CESER CEDS will coordinate with the other offices to streamline Research and Development (R&D) of cybersecure energy delivery systems preventing redundancies and gaps across electricity, fossil fuels, nuclear, and renewable technologies.

Electricity (OE)

OE's Cyber R&D program requested in FY 2022 is renamed to Cyber Resilient and Secure Utility Communications Networks, or SecureNet, in the FY 2023 Request.

The FY 2023 SecureNet request provides support to research and develop advanced solutions that focus on a security-by-design approach based on data and physics to address vulnerabilities of the grid and critical operational data acquisition, processing, communications, and control systems that are specific to the electricity delivery system, both transmission and distribution. It also addresses OE's responsibility for catalyzing energy sector cybersecurity associated with electricity delivery systems, providing an opportunity to strengthen the relationship with other OE research for accelerated results. CESER retains lead responsibility for crosscutting cybersecurity issues that span beyond electricity delivery systems, as well as for coordinating energy sector cybersecurity activities across the Department.

Office of Energy Efficiency and Renewable Energy

In FY 2023, EERE requests \$26.2 million for high priority RD&D with a clear path to deployment, technical assistance, and Development best practices to identify and mitigate cyber risks. Work supported by EERE complements the DOE Multiyear Plan for Energy Sector Cybersecurity and includes the following:

- Analysis of cybersecurity risks in integrated biorefineries, and other investments in the Bioenergy Technologies portfolio, to ensure projects are identifying risks and taking necessary precautionary measures. The Request supports efforts to develop and implement findings and recommendations throughout laboratory project portfolio and competitive solicitations.
- Cybersecurity work through the Building Technologies the Grid-interactive Efficient Buildings (GEB) Initiative. In addition to improving the energy efficiency of the overall building, this research focuses on making equipment more intelligent through next-generation sensors, controls, connectivity, and communication.
- Technical Assistance for facility related control systems and the integration of Distributed Energy Technologies and Integration to assist with climate adaptation and electrification strategies in Federal buildings and other installations through the Federal Energy Management Program.
- Continued support for Hydrogen at Scale (H2@Scale) investments which include a cybersecurity component. H2@Scale is a concept that explores the potential for wide-scale hydrogen production and utilization in the United States to enable resiliency of the power generation and transmission sectors, while also aligning diverse multibillion dollar domestic industries, domestic competitiveness, and job creation.
- Integration of cybersecurity into relevant distributed energy resource controls, bulk power system protections, and other Grid Modernization Lab Consortium activities supported by Solar Energy Technologies.
- Sustained support for cyber physical security of the charging of Plug-in Electric Vehicles (PEV) and the interface between PEV charging and the electric grid through Vehicles Technologies.
- Continued development of digital tools and a pilot program to simulate hydropower cyber-attack and subsequent recovery by Water Power Technologies.
- Support for efforts focused on setting up wind plant communication, control, and power system co-simulation environment and conducting wind plant cybersecurity assessment and risk mitigation through Wind Energy Technologies.

Office of Nuclear Energy

In FY 2023, NE requests \$7.5 million for the Nuclear Energy Enabling Technologies (NEET) Crosscutting Technology Development (CTD) subprogram to conduct research and development on methods to incorporate cybersecurity by design into advanced reactor concepts, advanced control architectures including autonomous and remote operations, standards

for reducing supply chain risks, and the cost-effective integration of nuclear safety risk management with cybersecurity risk management.

Office of Fossil Energy and Carbon Management (FECM)

In FY 2023, the Office of Fossil Energy and Carbon Management (FECM) (Headquarters) requests \$1.8 million to support central coordination of the strategic and operational aspects of cybersecurity and facilitates cooperative efforts for incident response and the implementation of Department-wide Identity, Credentials, and Access Management (ICAM).

Office of the Chief Information Officer

In FY 2023, CIO requests \$1.553M for the DOE Spectrum Management Program to manage DOE radio frequency spectrum-dependent resources for NNSA, Power Marketing Administrations (PMAs), Office of Secure Transportation, and National Laboratory spectrum-dependent assets. As the 9th largest holder of radio frequencies with more than 7,300 individual radio assignments, the Program provides technical, logistical, and administrative support, as well as ongoing oversight and advocacy at an inter-agency level in the National Capital Region. Critical DOE missions and essential functions utilizing Spectrum services include the National Power Grid, Interstate Electricity Transmission, Satellite Missions, Nuclear Emergency Search, Radiological Assistance, Secure Transportation and Safeguards, and Protective Force Communications.

**Advanced
Research Projects
Agency-Energy**

**Advanced
Research Projects
Agency-Energy**

Advanced Research Projects Agency - Energy
(\$K)

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
427,000	427,000	700,150

The U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) was established by the America COMPETES Act of 2007 (Public Law 110–69), as amended. The mission of ARPA-E is to enhance the economic, climate, and energy security of the United States through the development of advanced technologies that reduce imports of energy from foreign sources; reduce energy-related emissions, including greenhouse gases; improve the energy efficiency of all economic sectors; provide transformative solutions to improve the management, clean-up, and disposal of radioactive waste and spent nuclear fuel; improve the resilience, reliability, and security of infrastructure to produce, deliver, and store energy; mitigate the causes of, reverse the impact of, adapt to, or increase resilience against climate change; and monitor, analyze, and utilize climate emissions data. ARPA-E will ensure that the United States maintains a technological lead in developing and deploying advanced technologies. ARPA-E will identify and promote revolutionary advances in energy and climate-related applied sciences, translating scientific discoveries and cutting-edge inventions into technological innovations. It will also accelerate transformational technological advances in areas where industry by itself is not likely to invest due to technical and financial uncertainty. ARPA-E focuses on novel early-stage energy and climate research and development with technology applications that can be meaningfully advanced with a small investment over a defined period of time. ARPA-E coordinates its work with DOE's basic research and applied programs and other Federal research agencies to ensure work is not duplicated.

Public Law Authorizations

P.L. 95-91, "Department of Energy Organization Act" (1977)

P.L. 109-58, "Energy Policy Act of 2005"

P.L. 110-69, "America COMPETES Act of 2007"

P.L. 111-358, "America COMPETES Reauthorization Act of 2010"

P.L. 116-260, Section 10001, "Consolidated Appropriations Act, 2021" ARPA-E Amendments

Overview

ARPA-E has established a nimble, effective management structure and developed a portfolio of technical programs that is delivering innovative, investable opportunities to the commercial sector. ARPA-E will continue to deliver value to the U.S. economy with continued emphasis on maintaining a healthy portfolio of projects. These projects cover a broad range of topics, with a growing focus on additional scale-up of the most promising projects that have demonstrated success in technical development, project management, and definition of commercial pathways.

Since its inception in 2009 through September 2021, ARPA-E has provided approximately \$2.9 billion in funding to over 1,270 projects through focused programs and open funding solicitations. A total of 183 ARPA-E projects have attracted more than \$7.6 billion in private-sector follow-on funding, 266 project teams have partnered with other agencies for further development, and 109 companies have been formed from ARPA-E projects. In addition, ARPA-E project teams have generated 4,871 peer-reviewed journal articles and received 789 patents from the U.S. Patent and Trademark Office.

Projects that receive ARPA-E support are considered "high risk" and too early for private sector support. They are subject to strict technical and commercialization milestones intended to ensure accountability and transparency that enables rapid reprioritization of Agency funds towards only the most promising technologies. This has resulted in significant commercial interest, investment, and follow-on funding in for successful technologies, amplifying the impact of the Agency's funding decisions and accelerating progress towards achieving the Agency's mission.

These efforts also support, indirectly, the President's ambitious climate goals, but there is a gap between ARPA-E's existing 'energy technology-focused' authority and what would be needed to support technology innovation to mitigate the causes of, reverse the impact of, adapt to, or increase resilience against climate change. While ARPA-E is authorized to support projects that mitigate the greenhouse gas emissions from energy users and sources, there is a need to also significantly reduce current and future greenhouse gas emissions from all sources to achieve net zero emissions by 2050.

Recommendations from the Climate Innovation Working Group – established by the President and co-chaired by the White House Office of Domestic Climate Policy, Office of Science of Technology and Policy, and Office of Management and Budget – include utilizing an “ARPA-like” model to support development of affordable, game-changing technologies that can help achieve the President’s goal of net zero economy-wide emissions by 2050 and can protect from the impacts of extreme weather events caused by climate change.

The Administration proposes to expand ARPA-E’s scope to include R&D on climate adaptation and resilience innovations. This will enable work beyond the energy technology-focused projects necessary to achieve net zero emissions by 2050, including coordination across agencies, to meet the Administration’s goals to adapt and strengthen resilience from the most devastating impacts of climate change. The Administration looks forward to working with Congress to develop the required legislation to advance these goals. This expanded scope complements ARPA-E’s advanced energy mission and reflects the need to address additional climate change-related initiatives. Funding is requested to support the Administration’s broader climate technology agenda that will drive innovation to tackle the climate crisis while creating good paying jobs, assure the United States remains the world’s leader in climate technologies, and increase societal resilience to climate change impacts. ARPA-E will work with the other Agencies to develop transformative solutions for the climate crisis, including adaptation and resilience, and lay the foundation for future improvements in R&D across the Federal Government.

Highlights and Major Changes in the FY 2023 Budget Request

In FY 2023, ARPA-E plans to release up to 22 new funding opportunity announcements (FOAs) focused on energy and climate adaptation and resiliency (pending authorization expansion). The FOAs will address new areas not represented in the present portfolio and develop new opportunities opened by the outcomes of previous programs. The assessment process for the new programs is now underway.

**Advanced Research Projects Agency - Energy
Funding by Congressional Control (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted	
				\$	%
ARPA-E Projects	392,000	392,000	643,000	+251,000	+64%
Program Direction	35,000	35,000	57,150	+22,150	+63%
Total, Advanced Research Projects Agency - Energy	427,000	427,000	700,150	+273,150	+64%
Federal FTEs	64	64	101	+37	+58%

Future Years Energy Program

	(\$K)				
	FY 2023 Request	FY 2024	FY 2025	FY 2026	FY 2027
Advanced Research Projects Agency - Energy	700,150	716,000	733,000	749,000	767,000

Outyear Priorities and Assumptions

In the FY 2012 Consolidated Appropriations Act (P.L. 112-74), Congress directed the Department to include a future-years energy program (FYEP) in subsequent requests that reflects the proposed appropriations for five years. This FYEP shows outyear funding for each account for FY 2024 - FY 2027. The outyear funding levels use the growth rates from and match the outyear account totals published in the FY 2023 President's Budget for both the 050 and non-050 accounts. Actual future budget request levels will be determined as part of the annual budget process.

Advanced Research Projects Agency - Energy priorities in the outyears include the following: ARPA-E will continue its focus on novel early-stage energy and climate research and development with technology applications that can be meaningfully advanced with a small investment over a defined period of time. Commensurate with the increase in appropriation, ARPA-E will increase the depth and breadth of investment in focused portfolios as well as the Agency's investment in its Open, Seeding Critical Advances for Leading Energy Technologies with Untapped Potential (SCALEUP), Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR), and Supporting Entrepreneurial Energy Discoveries (SEED) programs.

ARPA-E Projects

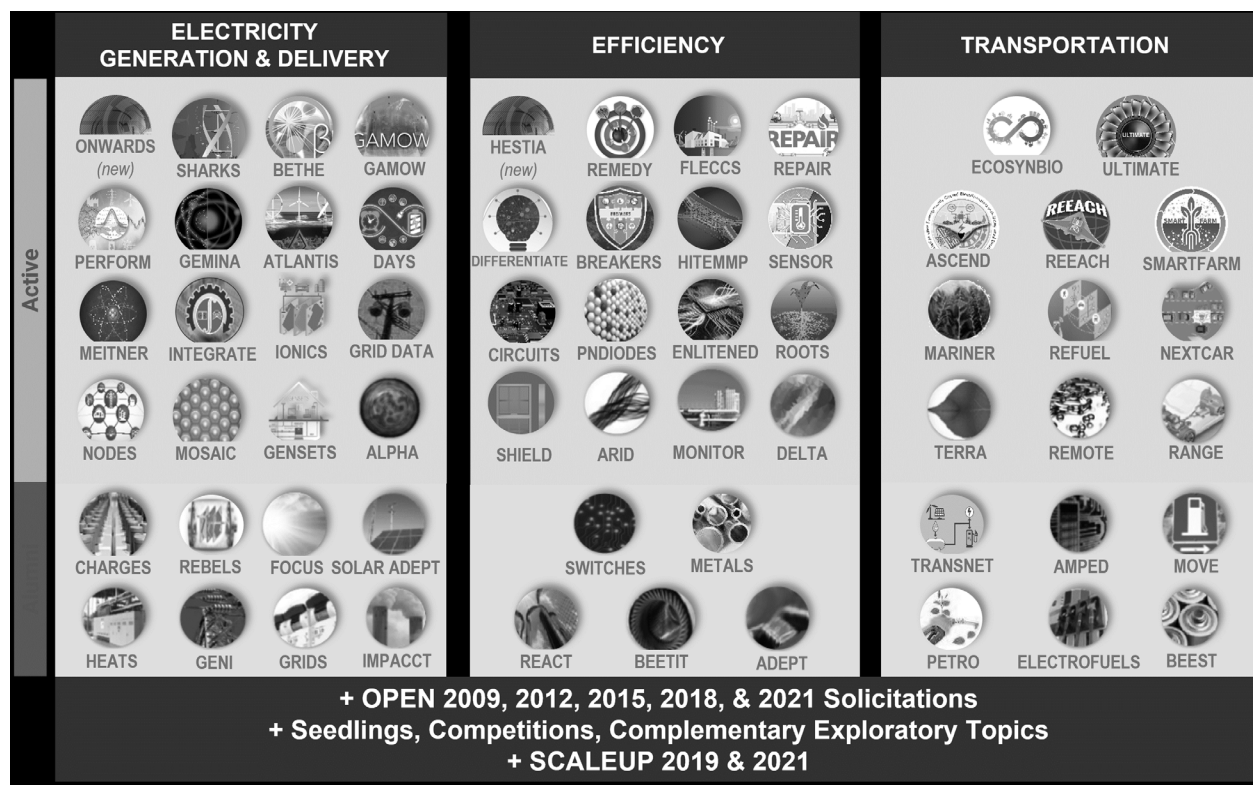
Overview

ARPA-E identifies and supports revolutionary inventions and transformational energy and climate technology advances, which requires constant evolution of its programmatic focus. This is accomplished by establishing dynamic technical programs (each lasting about three years) designed to accelerate innovation in high-potential areas. The breadth of the program portfolio that has developed over ARPA-E's lifetime addresses different parts of the energy technology space from year to year.

ARPA-E has demonstrated the efficacy of its model for accelerating high-potential, novel technical approaches to existing and emerging U.S. energy and climate challenges. Program Directors, recruited for their technical expertise, leadership, and experience in energy issues, are given significant autonomy in identifying potential high-impact areas for R&D investment. ARPA-E's Program Directors work to develop their proposals in the context of both private sector and federally funded work in the technical space, and ultimately propose a program designed to accelerate research and commercial development in the topic area. As a complement to its focused technology programs, ARPA-E also supports OPEN solicitations. OPEN solicitations seek the most innovative new ideas in energy technology across the full spectrum of energy applications, allowing the Agency to support the development of important technologies that otherwise would fall outside the scope of its focused programs. OPEN solicitations were run in 2009, 2012, 2015, 2018, and 2021.

Selection of project awards within each program occurs by a rigorous process of proposal review. Selection criteria include the transformative character of the technology, the potential impact of the technology on ARPA-E's energy missions as defined in its authorizing statute, and the potential for the project to yield commercial applications that benefit U.S. economic and energy security. Within these criteria the most highly rated proposals are selected for award negotiations. The majority of the funded projects involve more than one institution, and the lead institutions are distributed among universities, businesses, federally funded R&D centers (FFRDCs), and non-profit organizations.

The resulting portfolio of alumni and active R&D projects (shown below) broadly covers the U.S. energy technology landscape, from transportation fuels and energy storage, through residential, commercial and manufacturing efficiency to the storage, distribution and generation of electrical power. The programs are designed to deliver value given a targeted investment over a defined period of time. The projects are structured in a portfolio funding approach to 'de-risk' areas of technological opportunity by supporting multiple high-potential approaches to the program goals to the point where their relative value for further applications can be determined. This allows the most effective approaches to emerge based on their technical performance and potential. Under ARPA-E's rigorous project management process, project teams work to quarterly milestones for both technical and commercialization goals.



FOA Acronym	Definition
Electricity Generation and Delivery – Active	
ALPHA	Accelerating Low-Cost Plasma Heating and Assembly
ATLANTIS	Aerodynamic Turbines Lighter and Afloat with Nautical Technologies and Integrated Servo-control
BETHE	Breakthroughs Enabling THERmonuclear-fusion Energy
CHARGES	Cycling Hardware to Analyze and Ready Grid-Scale Electricity Storage
DAYS	Duration Addition to electricity Storage
GAMOW	Galvanizing Advances in Market-Aligned Fusion for an Overabundance of Watts
GEMINA	Generating Electricity Managed by Intelligent Nuclear Assets
GENSETS	Generators for Small Electrical and Thermal Systems
GRID DATA	Generating Realistic Information for the Development of Distribution and Transmission Algorithms
INTEGRATE	Innovative Natural-gas Technologies for Efficiency Gain in Reliable and Affordable Thermochemical Electricity-generation
IONICS	Integration and Optimization of Novel Ion-Conducting Solids
MEITNER	Modeling-Enhanced Innovations Trailblazing Nuclear Energy Reinvigoration
MOSAIC	Micro-scale Optimized Solar-cell Arrays with Integrated Concentration
NODES	Network Optimized Distributed Energy Systems
ONWARDS	Optimizing Nuclear Waste and Advanced Reactor Disposal Systems
PERFORM	Performance-based Energy Resource Feedback, Optimization, and Risk Management
SHARKS	Submarine Hydrokinetic And Riverine Kilo-megawatt Systems
Electricity Generation and Delivery – Alumni	
CHARGES	Cycling Hardware to Analyze and Ready Grid-Scale Electricity Storage
FOCUS	Full-Spectrum Optimized Conversion and Utilization of Sunlight
GENI	Green Electricity Network Integration
GRIDS	Grid-Scale Rampable Intermittent Dispatchable Storage
HEATS	High Energy Advanced Thermal Storage
IMPACCT	Innovative Materials and Processes for Advanced Carbon Capture Technologies

FOA Acronym	Definition
REBELS	Reliable Electricity Based on Electrochemical Systems
Solar ADEPT	Solar Agile Delivery of Electrical Power Technology
Efficiency – Active	
ARID	Advanced Research In Dry cooling
BREAKERS	Building Reliable Electronics to Achieve Kilovolt Effective Ratings Safely
CIRCUITS	Creating Innovative and Reliable Circuits Using Inventive Topologies and Semiconductors
DELTA	Delivering Efficient Local Thermal Amenities
DIFFERENTIATE	Design Intelligence Fostering Formidable Energy Reduction and Enabling Novel Totally Impactful Advanced Technology Enhancements
ENLITENED	ENergy-efficient Light-wave Integrated Technology Enabling Networks that Enhance Dataprocessing
FLECCS	FLExible Carbon Capture and Storage (FLECCS)
HESTIA	Harnessing Emissions into Structures Taking Inputs from the Atmosphere
HITEMMP	High Intensity Thermal Exchange through Materials, and Manufacturing Processes
MONITOR	Methane Observation Networks with Innovative Technology to Obtain Reductions
PNDIODES	Power Nitride Doping Innovation Offers Devices Enabling SWITCHES
REMEDY	Reducing Emissions of Methane Every Day of the Year
REPAIR	Rapid Encapsulation of Pipelines Avoiding Intensive Replacement
ROOTS	Rhizosphere Observations Optimizing Terrestrial Sequestration
SENSOR	Saving Energy Nationwide in Structures with Occupancy Recognition
SHIELD	Single-Pane Highly Insulating Efficient Lucid Designs
Efficiency – Alumni	
ADEPT	Agile Delivery of Electrical Power Technology
BEETIT	Building Energy Efficiency Through Innovative Thermodevices
METALS	Modern Electro/Thermochemical Advances in Light Metals Systems
REACT	Rare Earth Alternatives in Critical Technologies
SWITCHES	Strategies for Wide Bandgap, Inexpensive Transistors for Controlling High-Efficiency Systems
Transportation – Active	
ASCEND	Aviation-class Synergistically Cooled Electric-motors with iNtegrated Drives
ECOSynBio	Energy and Carbon Optimized Synthesis for the Bioeconomy
MARINER	Macroalgae Research Inspiring Novel Energy Resources
NEXTCAR	Next-Generation Energy Technologies for Connected and Automated On-Road Vehicles
RANGE	Robust Affordable Next Generation Energy Storage Systems
REEACH	Range Extenders for Electric aviation with Low Carbon and High Efficiency
REFUEL	Renewable Energy to Fuels Through Utilization of Energy-Dense Liquids
REMOTE	Reducing Emissions using Methanotrophic Organisms for Transportation Energy
SMARTFARM	Systems for Monitoring and Analytics for Renewable Transportation Fuels from Agricultural Resources and Management
TERRA	Transportation Energy Resources from Renewable Agriculture
ULTIMATE	Ultrahigh Temperature Impervious Materials Advancing Turbine Efficiency
Transportation – Alumni	
AMPED	Advanced Management and Protection of Energy Storage Devices
BEEST	Batteries for Electrical Energy Storage in Transportation
ElectroFuels	Microorganisms for Liquid Transportation Fuel
MOVE	Methane Opportunities for Vehicular Energy
PETRO	Plants Engineered to Replace Oil
TRANSNET	Traveler Response Architecture using Novel Signaling for Network Efficiency in Transportation

One significant component of ARPA-E's mission is accelerating the economic impact of U.S. investments in energy and climate R&D, and advancing the commercialization readiness of successful projects (depth of investment) is essential to

achieving this goal. Developing the pathway to commercial applications is an intrinsic component of all projects, and project teams are required to conduct activities such as develop a detailed techno-economic analysis, market research, intellectual property protection, and engagement with potential customers and investors. As project teams demonstrate success, ARPA-E's Technology-to-Market Advisors and Program Directors work closely with the teams to help identify pathways toward commercial deployment. Many of ARPA-E's alumni projects have been able to obtain follow-on funding from private investors, state agencies and/or federal programs, and ARPA-E's maturing portfolio is offering increasing opportunities for commercialization of ARPA-E funded technologies.

Despite the level of technology 'de-risking' projects from the focused and OPEN solicitations achieved, ARPA-E determined that in some areas, further de-risking was necessary to validate technologies at a scale pertinent to investment. To this end, in FY 2020, ARPA-E instituted a new solicitation called SCALEUP. SCALEUP is designed to fund successful technologies that were previously funded by ARPA-E for which the proof-of-concept R&D challenges have been addressed, and which can progress toward real-world impact through scaling. An enduring challenge to ARPA-E's mission is that even technologies that achieve substantial technical advancement under ARPA-E support are at risk of being stranded in their development path once ARPA-E funding ends. Experience across ARPA-E's diverse energy portfolios, and with a wide range of investors, indicates that pre-commercial "scaling" projects are critical to establishing that performance and cost parameters can be met in practice for these very early stage technologies. Success in these scaling projects would enable industry, investors, and partners to justify substantial commitments of financial resources, personnel, production facilities, and materials to develop promising ARPA-E technologies into early commercial products.

In FY 2023, ARPA-E plans to release up to 22 new FOAs, including additional investment in SCALEUP. The FOAs will address new areas not represented in the present portfolio and develop new opportunities opened by the outcomes of previous programs. The assessment process for the new programs is now underway as described below.

Potential technology areas for up to 22 focused programs in FY 2023:

ARPA-E is developing programs for transformational research across a wide range of energy and climate technologies, and applications including:

- Energy-related topics may include: Grid resilience, reliability, flexibility, and operation; advanced nuclear or fusion technologies; disruptive storage for transportation and/or grid; carbon neutral or negative fuels; and decarbonization and/or greenhouse gas (GHG) capture.
- Climate-related topics may include: Climate sensors and monitoring for dramatically improved GHG detection, climate analysis, and severe event prediction; carbon neutral/negative agricultural production and general land, freshwater, and ocean use; prevention of GHG emissions from land sources; carbon neutral waste and recycling; and resilient infrastructure to protect against climate-related severe events.

ARPA-E plans to release another SCALEUP FOA in FY 2023 in order to continue the push toward commercialization for previous extremely early-stage ARPA-E programs and to continue the focus on ensuring manufacturing in the U.S.

ARPA-E will also continue its stand-alone SBIR/STTR program to provide additional support to small businesses beyond the significant number of awards to small businesses via ARPA-E's standard non-SBIR/STTR solicitations. ARPA-E plans to release SBIR/STTR funding through its annual SEED program, as well as focused FOAs targeted for SBIR/STTR awards.

**ARPA-E Projects
Funding (\$K)**

ARPA-E Projects:

ARPA-E Projects:

Total, ARPA-E Projects

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
392,000	392,000	643,000	+251,000
392,000	392,000	643,000	+251,000

SBIR/STTR

- FY 2021 Enacted: \$14,308 total (SBIR \$12,544 / STTR \$1,764)
- FY 2022 Annualized CR: \$14,308 total (SBIR \$12,544 / STTR \$1,764)
- FY 2023 Request: \$23,470 total (SBIR \$20,576 / STTR \$2,894)

ARPA-E Projects
Explanation of Major Changes (\$K)

	<div>FY 2023 Request vs FY 2021 Enacted</div>
ARPA-E Projects: The FY 2023 Congressional Request proposes an additional \$251 million above the FY 2021 Enacted. At the increased appropriation, ARPA-E will fund up to 22 focused programs, another SCALEUP FOA, its stand-alone SBIR/STTR program, and annual SEED program.	+251,000
Total, ARPA-E Projects	+251,000

**Program Direction – Appropriations Request
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Washington Headquarters				
Salaries and Benefits	11,810	11,810	18,879	+7,069
Travel	400	400	2,000	+1,600
Support Services	16,432	16,432	26,246	+9,814
Other Related Expenses	6,358	6,358	10,025	+3,667
Total, Program Direction	35,000	35,000	57,150	+22,150
Federal FTEs	64	64	101	+37
Support Services				
Technical Support	5,751	5,751	9,186	+3,435
Management Support	10,681	10,681	17,060	+6,379
Total, Support Services	16,432	16,432	26,246	+9,814
Other Related Expenses				
Working Capital Fund	4,123	4,123	6,732	+2,609
Energy Information Technology Services (EITS)	1,588	1,588	2,593	+1,005
Other Services	647	647	700	+53
Total, Other Related Expenses	6,358	6,358	10,025	+3,667

Program Direction

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Program Direction \$35,000,000	\$57,150,000	+ \$22,150,000
Salaries and Benefits		
At the FY 2021 Enacted level, ARPA-E anticipates supporting up to 64 Federal FTEs.	At the FY 2023 Request level, ARPA-E anticipates needing up to 101 Federal FTEs. Salaries and benefits will increase from the FY 2021 Enacted level commensurate with the overall Projects and Program Direction appropriations. Additional Program Directors, Tech to Market, and Operations staff will be added in FY 2023 to support ARPA-E's growing portfolio and expanded climate mission.	+ \$7,069,000: The increase from the FY 2021 Enacted level supports an additional 37 FTEs in support of ARPA-E's expanded climate mission.
Travel		
At the FY 2021 Enacted level, ARPA-E Program Directors and Technology-to-Market advisers will visit performers as part of ARPA-E's hands-on engagement, which is the primary component of ARPA-E travel. The number of site visits will be commensurate with the number of ongoing projects.	At the FY 2023 Request level, ARPA-E Program Directors and Technology-to-Market advisers will visit performers regularly as part of ARPA-E's hands-on engagement. The number of site visits will be commensurate with the number of ongoing projects. FY 2023 Travel is expected to return to pre-COVID levels.	+ \$1,600,000: Travel will increase as new projects initiate and ARPA-E Program Directors and Technology-to-Market advisers visit performers as part of ARPA-E's hands-on engagement. FY 2023 is expected to return to pre-COVID levels and increase four times over the FY 2021 level.
Support Services		
At the FY 2021 Enacted level, ARPA-E anticipates continuing the use of support service contractors to support ARPA-E federal staff in the management and oversight of projects and other required functions. The level of support is commensurate to the number of ongoing and anticipated projects.	At the FY 2023 Request level, ARPA-E anticipates continuing the use of support service contractors to support ARPA-E federal staff in the management and oversight of projects and other required functions. The level of support is commensurate with the number of ongoing and anticipated projects.	+ \$9,814,000: Support services will increase from FY 2021 levels as ARPA-E continues management and oversight of its growing portfolio and expanded climate mission.
Other Related Expenses		
The FY 2021 Enacted level for other related expenses primarily consists of Working Capital Fund and Energy Information Technology support costs, which are commensurate with the level of FTEs and support services requested.	The FY 2023 Request level for other related expenses primarily consists of Working Capital Fund and Information Technology support costs, which are commensurate with the level of FTEs and support services requested.	+ \$3,667,000: IT and WCF costs are expected to increase proportionally with the overall increase in Program Direction budget and costs associated with additional staffing.

**Advanced Research Projects Agency - Energy
Research and Development (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
Basic	0	0	0	0
Applied	213,500	213,500	350,075	+136,575
Development	213,500	213,500	350,075	+136,575
Subtotal, R&D	427,000	427,000	700,150	+273,150
Equipment	0	0	0	0
Construction	0	0	0	0
Total, R&D	427,000	427,000	700,150	+273,150

**Advanced Research Projects Agency - Energy
Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request
ARPA-E Projects			
SBIR	12,544	12,544	20,576
STTR	1,764	1,764	2,894
Total, SBIR/STTR	14,308	14,308	23,470

- FY 2021 Enacted: \$14,308 total (SBIR \$12,544 / STTR \$1,764)
- FY 2022 Annualized CR: \$14,308 total (SBIR \$12,544 / STTR \$1,764)
- FY 2023 Request: \$23,470 total (SBIR \$20,576 / STTR \$2,894)

DEPARTMENT OF ENERGY
Funding by Site Detail
Advanced Research Projects Agency - Energy FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Washington Headquarters			
ARPA-E Projects	392,000	392,000	643,000
Program Direction - ARPA-E	35,000	35,000	57,150
Total Washington Headquarters	427,000	427,000	700,150
Total Funding by Site for TAS_0337 - Advanced Research Projects Agency - Energy	427,000	427,000	700,150

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Energy Information Administration

Energy Information Administration

**U.S. Energy Information Administration
Proposed Appropriation Language**

For necessary expenses in carrying out the activities of the U.S. Energy Information Administration, \$144,480,000 to remain available until expended.

Explanation of Change

Public Law (P.L.) Authorizations

P.L. 83-703, Atomic Energy Act (1954)
P.L. 93-275, 15 U.S.C. 761, Federal Energy Administration Act (1974)
P.L. 93-319, Energy Supply and Environmental Coordination Act (1974)
P.L. 94-163, Energy Policy and Conservation Act (1975)
P.L. 94-385, 15 U.S.C. 790, Energy Conservation and Production Act (1976)
P.L. 95-91, 42 U.S.C. 7135, Department of Energy Organization Act (1977)
P.L. 95-619, 42 U.S.C. 7141 National Energy Conservation Policy Act (1978)
P.L. 95-620, 42 U.S.C. 8301, Power Plant and Industrial Fuel Use Act (1978)
P.L. 95-621, Natural Gas Policy Act (1978)
P.L. 96-294, Energy Security Act (1980)
P.L. 97-229, 42 U.S.C. 6245, Energy Emergency Preparedness Act (1982)
P.L. 97-415, Nuclear Regulatory Commission Authorization Act (1983)
P.L. 99-58, National Coal Imports Reporting Act (1985)
P.L. 99-58, 42 U.S.C. 6201, Energy Policy and Conservation Act Amendments of 1985
P.L. 99-509, 42 U.S.C. 7135, Omnibus Budget Reconciliation Act of 1986
P.L. 100-42, 42 U.S.C. 8312, Power Plant and Industrial Fuel Use Act Amendments of 1987
P.L. 102-486, 42 U.S.C. 13385, Energy Policy Act (1992)
P.L. 107-347, Title V of E-Government Act of 2002, Confidential Information Protection and Statistical Efficiency Act of 2002
P.L. 109-58, 42 U.S.C. 15801, Energy Policy Act of 2005
P.L. 110-140, Energy Independence and Security Act (2007)
P.L. 112-81, National Defense Authorization Act for Fiscal Year 2012
P.L. 112-158, Iran Threat Reduction and Syria Human Rights Act of 2012
P.L. 113-125, Reliable Home Heating Act of 2014
P.L. 114-11, Energy Efficiency Improvement Act of 2015
P.L. 117-58, Infrastructure Investment and Jobs Act (2021)

U.S. Energy Information Administration
Congressional Control: National Energy Information System (NEIS)
Funding (\$K)

FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted
\$126,800	\$126,800	\$144,480	+\$17,680

Overview

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

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

Highlights of the FY 2023 Budget Request

In addition to delivering the critical data, analysis, forecasts, and long-term energy outlooks on which EIA's stakeholders rely, the FY 2023 Budget Request of \$144,480,000 will enable EIA to advance its program on multiple fronts to address key emerging energy issues, including information needs identified in the Bipartisan Infrastructure Law (BIL). In each of these areas, EIA will actively engage other federal, state, and local entities as appropriate to harmonize data collection efforts and leverage data-sharing agreements and third-party information to efficiently expand program coverage where feasible.

- Expand the *Residential Energy Consumption Survey* (RECS) to collect and publish household energy use for Puerto Rico and the other populated U.S. territories. The work would begin with a pilot study testing potential collection methodologies, which would then be used to inform the design and execution of official collection efforts to provide representative statistics for each individual territory and could be used in conjunction with the statistics for the U.S. mainland. EIA would also explore the feasibility of collecting and publishing new *Commercial Buildings Energy Consumption Survey* (CBECS) data for the populated U.S. territories.
- Begin modernizing the *National Energy Modeling System* (NEMS) to more fully address the transitional nature of the energy sector, such as the increasing penetration of renewables and the ability to model deep decarbonization scenarios. EIA would also improve technology representation in the *Annual Energy Outlook* (AEO) to more fully account for dynamic market and industry developments in the AEO's long-term projections.
- Collect and publish new and highly relevant electricity information in response to stakeholder needs. For example, EIA would release regional hourly data on wind and solar generation, collect new data on the hybrid operation of solar and battery projects installed and operated for mutual efficiency, and collect new data on sales of electricity to power electric vehicles. This initiative would also enable EIA to publish wholesale electricity price data on a near real-time basis and provide regional estimates of emissions related to electricity generation. EIA would also explore the feasibility of collecting and publishing new data on electric vehicle infrastructure and city-level data on electricity-related emissions.
- Provide near real-time information to support the federal response to unforeseen energy disruptions and natural disasters. This effort would enable rapid emergency data collection and expansion of third party data and analysis. EIA would be able to collect and analyze regional data in the event of severe supply disruptions to report supply conditions and constraints, expanding EIA's short-term market analysis to provide context that supports more informed stakeholder decision making during and after severe disruptions.

The FY 2023 funding will also enable EIA to maintain and enhance cybersecurity capabilities in response to new threats and evolving DOE and federal requirements to support an expanding cloud presence.

Energy Data Program

EIA's comprehensive energy data program conducts surveys of energy suppliers and consumers and then processes the data to produce a full range of publicly available reports. EIA provides this high-quality, relevant, and timely data in a range of formats and structures to serve the various analytical needs of its customers. Where appropriate, EIA uses administrative and third-party data to cost-effectively close energy information gaps and minimize respondent burden. The energy data program also provides the basis for EIA's energy analysis and forecasting activities, including key inputs for its short- and long-term energy models. EIA regularly reviews its energy data program to ensure the agency remains current with evolving market trends.

Energy Supply Surveys

The energy supply survey program represents EIA's data foundation and largest operational area. Information from these surveys is published in more than 300 reports each year across weekly, monthly, quarterly, and annual product lines. EIA also collects and disseminates hourly electricity demand data from the nation's balancing authorities, which provides timely insights into grid operations. The energy supply survey program collects comprehensive data that illustrate the complex flows of energy production, conversion, distribution, and end uses across the nation, including oil and natural gas, coal, refined products, nuclear power, renewables, biofuels, and electric power. The program is staffed with a broad range of technical expertise to ensure the quality of EIA's data and the integrity of its underlying statistical processes. Producers, consumers, investors, traders, and analysts use EIA energy statistics in their day-to-day activities. For example, the *Weekly Petroleum Status Report* and *Weekly Natural Gas Storage Report* typically spur price formation activity to balance energy markets.

Energy Consumption and Efficiency Surveys

EIA collects and publishes national, end-use consumption data for commercial buildings, residential buildings, and manufacturing through three large-scale, multi-year surveys. CBECS provides the only comprehensive, statistically reliable source of information on energy consumption, expenditures, and end uses in U.S. commercial buildings. RECS collects information from a national sample of housing units, including data on energy characteristics of homes, usage patterns, and household demographics. The *Manufacturing Energy Consumption Survey* (MECS), which is linked to production and employment data from Census Bureau economic surveys, provides information on energy throughput and economic and operational characteristics of U.S. manufacturers. These surveys are critical to understanding changes in U.S. energy use and are the basis for developing projections of future U.S. energy scenarios. Because of the scale and complexity of these surveys, EIA continues to explore innovative methods for collecting valid, timely data at lower costs.

Energy Analysis Program

EIA conducts a robust energy analysis program to help explain the complex and changing energy marketplace. The program maintains and operates NEMS, the nation's leading tool for developing long-term projections of U.S. energy production, consumption, prices, and technology usage; the *World Energy Projection System Plus* (WEPS+), used for developing long-term projections of international energy markets; and the *Short-Term Integrated Forecasting System* (STIFS), used to develop short-term domestic energy market forecasts. EIA's energy models support the production of its flagship publications: the AEO, the *Short-Term Energy Outlook* (STEO), and the *International Energy Outlook* (IEO), as well as other special and periodic topical analyses.

EIA also produces many recurring reports that provide context for dynamic energy markets, such as *Today in Energy*, a concise, highly accessible overview of a topical energy issue each day on EIA's website. The *Drilling Productivity Report*, *This Week in Petroleum*, and *Natural Gas Weekly Update* are additional examples of relevant analysis products that serve EIA's broad stakeholder community. In addition, EIA provides periodic reports and ad hoc analyses of important emerging energy issues, including, for example, battery storage for the U.S. electric grid and the potential impact of carbon fees on energy-related emissions. The program is staffed with experts in all areas of the energy sector, including oil, gas, coal, nuclear, renewables, electricity, transportation, emissions, and energy consumption and efficiency.

EIA also provides context and analysis for international energy issues and their impact on U.S. energy markets. For example, EIA analyzed the implications of removing restrictions on U.S. crude oil and natural gas exports—which included modeling of prices, production, and trade effects. EIA also publishes updated reports that focus on the energy sectors in specific countries and regions, as well as country-level international energy statistics and rankings for major fuels and activities. EIA also responds to official government requests for international energy analysis, coordinating its responses with other DOE programs while maintaining its mission-mandated independence and impartiality.

Resources and Technology Management

This function provides overall business management, analysis, and mission support to EIA and responds to requests from other DOE offices and programs. Activities include workforce development and administration, financial and budget management, acquisition of support services, project management, program evaluation, and communications activities. The program also manages EIA's information technology (IT) enterprise to ensure a stable, operable IT infrastructure that meets data confidentiality and cybersecurity requirements.

EIA maintains a dynamic stakeholder outreach and communications program that interacts with a diverse external customer base and manages the public website (www.eia.gov), press and media relations, marketing and outreach services, and the employee intranet. EIA's website features state-of-the-art tools such as customizable data browsers; interactive state, national, and North American energy infrastructure maps; open data initiatives such as Application Programming Interfaces (APIs); and highly visited online resources such as *Energy Kids* and *Energy Explained* that have increased information accessibility to EIA's customers.

Cybersecurity

EIA will allocate funding for cybersecurity, while continuing to modernize its IT infrastructure. EIA's cybersecurity program identifies vulnerabilities and develops strategies to minimize potential vulnerabilities.

Information Technology Modernization

EIA is modernizing the technological platforms that support its comprehensive energy information program. For example, EIA has undertaken a multi-year project to migrate its energy supply surveys to a more modern and efficient IT processing platform. EIA is also assessing its energy modeling capabilities to ensure the ongoing ability to provide timely, relevant forecasts and projections of domestic and global energy markets.

Using Administrative Data for Statistical Purposes

EIA will continue to engage with other federal agencies in sharing and using administrative data sets for statistical purposes where appropriate. Using administrative and third-party data sets is a key strategy for EIA to close energy information gaps while minimizing the costs and respondent burden of survey data collection. EIA currently uses more than 60 administrative data sets and has negotiated successfully to obtain movements of commodities (crude oil, ethanol, coal) by rail using data from the Surface Transportation Board; and weekly petroleum export data from the U.S. Department of Homeland Security's Customs and Border Protection. EIA maintains strict measures to safeguard the privacy and confidentiality of the businesses, individuals, and institutions providing the data.

Key Program Accomplishments

EIA delivers timely, relevant information that increases public understanding of a dynamic energy landscape.

Noteworthy recent accomplishments include:

- Delivered monthly forecasts and ongoing analysis that assessed the ongoing effects of the COVID-19 pandemic and geopolitical events on U.S. and global energy markets.
- Released 30-year projections of U.S. energy markets and trends in the AEO2022.
- Published expanded data and analysis of battery storage and the U.S. electric grid.
- Launched the *U.S. Energy Atlas*, a comprehensive reference for data and interactive maps of U.S. energy resources and infrastructure.
- Began publishing regular data updates on the U.S. renewable fuels sector.
- Tracked and reported on energy disruptions caused by extreme weather and cyberattack.
- Released new data showing characteristics of U.S. commercial buildings, including prevalence of electric vehicle charging infrastructure.
- Published new data on the manufacturing sector's energy consumption, fuel-switching capability, and price of energy inputs at establishments.
- Released new analysis about how carbon fees could reduce energy-related carbon dioxide emissions.
- Published projections for global energy through 2050 in the IEO2021.

Congressional Control: National Energy Information System (NEIS)
Explanation of Major Changes (\$K)

FY 2023 Request vs FY 2021 Enacted

Salaries and Benefits:

Projected increase for cost of living adjustment of 4.6% and 7 additional FTEs.	+\$5,499
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Support Services:

Increase in Energy Supply Surveys +\$2,341	+\$12,181
Increase in Energy Consumption and Efficiency Surveys +\$4,788	
Increase in Energy Modeling and Analysis +\$773	
Increase in Resources and Technology Management +\$4,279	

Total, Program Direction	+\$17,680
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**Outyear Funding Request
(\$K)**

	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
U.S. Energy Information Administration	144,480	147,803	151,055	154,378	157,774

Outyear funding levels will enable EIA to continue and successfully conclude multi-year projects that are essential to meeting critical stakeholder needs, such as those identified in the BIL. For example, EIA will complete a NEMS modernization initiative to enable the ability to model a range of energy policy scenarios, including deep decarbonization, and re-tool the energy consumption program to provide more timely, granular information on energy usage and efficiency in the residential, commercial buildings, and manufacturing sectors.

**Program Direction
Funding (\$K)**

	FY 2021 Enacted	FY 2022 Annualized CR	FY 2023 Request	FY 2023 Request vs FY 2021 Enacted (\$)	FY 2023 Request vs FY 2021 Enacted (%)
Salaries and Benefits	\$55,255	\$58,082	\$60,754	\$5,499	10%
Travel	\$306	\$306	\$306	\$0	0%
Support Services	\$50,741	\$47,914	\$62,922	\$12,181	24%
Other Related Expenses	\$20,498	\$20,498	\$20,498	\$0	0%
Total, Program Direction	\$126,800	\$126,800	\$144,480	\$17,680	14%
Federal FTEs	359	366	366	7	2%
Support Services					
Technical Support					
Administrative Support Services	\$9	\$9	\$9	\$0	0%
Human Resources Support Services	\$4	\$4	\$4	\$0	0%
E-Government Support Services	\$1	\$1	\$1	\$0	0%
Scientific/Technical and IT Training	\$40	\$40	\$40	\$0	0%
Data Center (Application Hosting/Housing)	\$180	\$180	\$180	\$0	0%
IT Management Services	\$5,508	\$5,508	\$5,508	\$0	0%
Other Advisory and Assistance Services	\$43,569	\$40,742	\$55,750	\$12,181	28%
Total, Technical Support	\$49,311	\$46,484	\$61,492	\$12,181	25%
Management Support					
Program Management	\$1,430	\$1,430	\$1,430	\$0	0%
Total, Management Support	\$1,430	\$1,430	\$1,430	\$0	0%
Total, Support Services	\$50,741	\$47,914	\$62,922	\$12,181	24%
Other Related Expenses					
Communications, utilities, and misc. charges	\$4,257	\$4,257	\$4,257	\$0	0%
Training	\$466	\$466	\$466	\$0	0%
Other goods and services from Federal sources	\$345	\$345	\$345	\$0	0%
Working Capital Fund	\$9,694	\$9,694	\$9,694	\$0	0%
O&M of IT systems or equipment	\$1,144	\$1,144	\$1,144	\$0	0%
Printing, supplies and materials	\$1,300	\$1,300	\$1,300	\$0	0%
Equipment	\$2,967	\$2,967	\$2,967	\$0	0%
Grants, subsidies, and contributions	\$325	\$325	\$325	\$0	0%
Total, Other Related Expenses	\$20,498	\$20,498	\$20,498	\$0	0%

**Program Direction
Funding**

Activities and Explanation of Changes

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Salaries and Benefits \$55,255,000 Provide salaries and benefits for 359 FTEs.	Salaries and Benefits \$60,754,000 Provide salaries and benefits for 366 FTEs	+\$5,499,000 Increase for cost of living adjustment of 4.6% and 7 additional FTEs to enhance energy modeling and analysis capabilities.
Travel \$306,000 Provide essential travel for EIA stakeholder engagement—for representing EIA in public forums and engaging with industry experts.	Travel \$306,000 Provide essential travel for EIA stakeholder engagement—for representing EIA in public forums and engaging with industry experts.	\$0 Maintain travel costs at FY 2021 level.
Support Services \$50,741,000 <i>Energy Supply Surveys \$15,965,000</i> Continue to operate the core energy supply data collection program. Includes efforts to standardize the processes, systems, and methods used to efficiently collect and process survey data.	Support Services \$62,922,000 <i>Energy Supply Surveys \$18,306,000</i> Continue to operate the core energy supply data collection program. Includes efforts to standardize the processes, systems, and methods used to efficiently collect and process survey data.	+\$12,181,000 <i>Energy Supply Surveys +\$2,341,000</i> Collect and publish new and highly relevant electricity information; and provide near real-time information to support the federal response to unforeseen energy disruptions and natural disasters.
<i>Energy Consumption and Efficiency Surveys \$13,321,000</i> Conduct commercial, residential, and manufacturing energy consumption surveys.	<i>Energy Consumption and Efficiency Surveys \$18,109,000</i> Conduct commercial, residential, and manufacturing energy consumption surveys.	<i>Energy Consumption and Efficiency Surveys +\$4,788,000</i> Expand the Residential Energy Consumption Survey (RECS) to collect and publish household energy use for Puerto Rico and the other populated U.S. territories.
<i>Energy Modeling and Analysis \$9,121,000</i> Deliver core analysis, forecasts, and projections (for example, AEO, IEO, and STEO).	<i>Energy Modeling and Analysis \$9,894,000</i> Deliver core analysis, forecasts, and projections (for example, AEO, IEO, and STEO).	<i>Energy Modeling and Analysis +\$773,000</i> Begin modernizing the National Energy Modeling System (NEMS) to more fully address the transitional nature of the energy sector, such as the increasing penetration of renewables and the ability to model deep decarbonization scenarios.
<i>Resources and Technology Management \$12,334,000</i> Continue providing business management, IT and network services, and administrative support to EIA staff. Maintain communication activities and invest in flexible web platforms to enhance data delivery. Maintain scope of energy mapping system and continue to integrate mapping with relevant EIA data.	<i>Resources and Technology Management \$16,613,000</i> Continue providing business management, IT and network services, and administrative support to EIA staff. Maintain communication activities and invest in flexible web platforms to enhance data delivery. Maintain scope of energy mapping system and continue to integrate mapping with relevant EIA data.	<i>Resources and Technology Management +\$4,279,000</i> Maintain and enhance cybersecurity capabilities in response to new threats and evolving DOE and federal requirements to support an expanding cloud presence. Leverage more robust IT tools to support new and expanded EIA information products, for example, items enumerated in the BIL.

FY 2021 Enacted	FY 2023 Request	Explanation of Changes FY 2023 Request vs FY 2021 Enacted
Other Related Expenses \$20,498,000	Other Related Expenses \$20,498,000	\$0
Pay rent and shared services through the DOE Working Capital Fund and provide IT equipment and licenses, subscriptions and data purchases, and employee training among other activities.	Pay rent and shared services through the DOE Working Capital Fund and provide IT equipment and licenses, subscriptions and data purchases, and employee training among other activities.	Continue Other Related Expenses activities.

DEPARTMENT OF ENERGY
Funding by Site Detail
Energy Information Administration FY 2023
(Dollars in Thousands)

FY 2021 Enacted Requested Total	FY 2022 Annualized CR Requested Total	FY 2023 Request Detail Requested Total
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Washington Headquarters

Energy Information Administration (EIA)	126,800	126,800	144,480
Total Washington Headquarters	126,800	126,800	144,480
 Total Funding by Site - Energy Information Administration	 126,800	 126,800	 144,480

GENERAL PROVISIONS—DEPARTMENT OF ENERGY

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) 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.

(e) 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.

(f)

(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.

(g) The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. 302. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 3094) during fiscal year 2023 until the enactment of the Intelligence Authorization Act for fiscal year 2023.

SEC. 303. None of the funds made available in this title shall be used for the construction of facilities classified as high-hazard nuclear facilities under 10 CFR Part 830 unless independent oversight is conducted by the Office of Enterprise Assessments to ensure the project is in compliance with nuclear safety requirements.

SEC. 304. None of the funds made available in this title may be used to approve critical decision–2 or critical decision–3 under Department of Energy Order 413.3B, or any successive departmental guidance, for construction projects where the total project cost exceeds \$100,000,000, until a separate independent cost estimate has been developed for the project for that critical decision.

SEC. 305. Notwithstanding section 161 of the Energy Policy and Conservation Act (42 U.S.C. 6241), upon a determination by the President in this fiscal year that a regional supply shortage of refined petroleum product of significant scope and duration exists, that a severe increase in the price of refined petroleum product will likely result from such shortage, and that a draw down and sale of refined petroleum product would assist directly and significantly in reducing the adverse impact of such shortage, the Secretary of Energy may draw down and sell refined petroleum product from the Strategic Petroleum Reserve. Proceeds from a sale under this section shall be deposited into the SPR Petroleum Account established in section 167 of the Energy Policy and Conservation Act (42 U.S.C. 6247), and such amounts shall be available for obligation, without fiscal year limitation, consistent with that section.

SEC. 306. Subparagraphs (B) and (C) of section 40401(a)(2) of Public Law 117–58, paragraph (3) of section 16512(r) of title 42, United States Code, and section (I) of section 17013 of title 42, United States Code, shall not apply for fiscal year 2023.

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TITLE V—GENERAL PROVISIONS
(INCLUDING TRANSFER OF FUNDS)

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

SEC. 502. None of the funds made available by this Act may be used in contravention of Executive Order No. 12898 of February 11, 1994 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

SEC. 503. (a) None of the funds made available in this Act may be used to maintain or establish a computer network unless such network blocks the viewing, downloading, and exchanging of pornography. (b) Nothing in subsection (a) shall limit the use of funds necessary for any Federal, State, Tribal, or local law enforcement agency or any other entity carrying out criminal investigations, prosecution, or adjudication activities.

SEC. 504. Of the unavailable collections currently in the United States Enrichment Corporation Fund, \$405,421,000 shall be transferred to and merged with the Uranium Enrichment Decontamination and Decommissioning Fund and shall be available only to the extent provided in advance in appropriations Acts.