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Volume 5

Department of Energy
FY 2026 Congressional Justification

Science

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DEPARTMENT OF ENERGY

Appropriation Summary

FY 2026

(Dollars in Thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 President's Budget	FY 2026 President's Budget vs. FY 2025 Enacted $	FY 2026 President's Budget vs. FY 2025 Enacted %
Department of Energy Budget by Appropriation					
Energy Efficiency and Renewable Energy [1]	3,460,000	3,460,000	888,000	-2,572,000	-74.3%
Electricity	280,000	280,000	193,000	-87,000	-31.1%
Cybersecurity, Energy Security and Emergency Response	200,000	200,000	150,000	-50,000	-25.0%
Strategic Petroleum Reserve	213,390	213,390	206,325	-7,065	-3.3%
Naval Petroleum and Oil Shale Reserves	13,010	13,010	13,000	-10	-0.1%
Strategic Petroleum Reserve Petroleum Account	100	100	100	+0	+0.0%
Northeast Home Heating Oil Reserve	7,150	7,150	3,575	-3,575	-50.0%
Office of Petroleum Reserves	**233,650**	**233,650**	**223,000**	**-10,650**	**-4.56%**
Nuclear Energy (270) [2]	1,525,000	1,525,000	1,210,000	-315,000	-20.7%
Fossil Energy	865,000	865,000	595,000	-270,000	-31.2%
Uranium Enrichment Decontamination and Decommissioning (UED&D)	855,000	855,000	814,380	-40,620	-4.8%
Energy Information Administration	135,000	135,000	135,000	+0	+0.0%
Non-Defense Environmental Cleanup	342,000	342,000	322,371	-19,629	-5.7%
Science	8,240,000	8,240,000	7,092,000	-1,148,000	-13.9%
Office of Technology Commercialization [3]	20,000	20,000	0	-20,000	-100.0%
Office of Clean Energy Demonstrations	50,000	50,000	0	-50,000	-100.0%
Grid Deployment [4]	60,000	60,000	15,000	-45,000	-75.0%
Office of Manufacturing & Energy Supply Chains [5]	0	0	15,000	+15,000	N/A
Advanced Research Projects Agency - Energy	460,000	460,000	200,000	-260,000	-56.5%
Nuclear Waste Disposal Fund	12,040	12,040	12,040	+0	+0.0%
Departmental Administration	286,500	286,500	174,926	-111,574	-38.9%
Indian Energy Policy and Programs	70,000	70,000	50,000	-20,000	-28.6%
Inspector General	86,000	86,000	90,000	+4,000	+4.7%
Title 17 Innovative Technology Loan Guarantee Program	58,719	-121,000	682,588	+803,588	-664.1%
Advanced Technology Vehicles Manufacturing Loan Program	13,000	13,000	9,500	-3,500	-26.9%
Tribal Energy Loan Guarantee Program	6,300	6,300	-12,000	-18,300	-290.5%
Total, Credit Programs	**78,019**	**-101,700**	**680,088**	**781,788**	**-768.72%**
Energy Projects	83,724	0	0	+0	N/A
Critical and Emerging Technologies	0	0	2,000	+2,000	N/A
Total, Energy Programs	**17,341,933**	**17,078,490**	**12,861,805**	**-4,216,685**	**-24.69%**
Weapons Activities [6]	19,108,000	19,293,000	24,856,400	+5,563,400	+28.8%
Defense Nuclear Nonproliferation	2,581,000	2,396,000	2,284,600	-111,400	-4.6%
Naval Reactors [2]	1,946,000	1,946,000	2,346,000	+400,000	+20.6%
Federal Salaries and Expenses	500,000	500,000	555,000	+55,000	+11.0%
Total, National Nuclear Security Administration	**24,135,000**	**24,135,000**	**30,042,000**	**5,907,000**	**+24.47%**
Defense Environmental Cleanup	7,285,000	7,285,000	6,956,000	-329,000	-4.5%
Other Defense Activities	1,080,000	1,107,000	1,182,000	+75,000	+6.8%
Defense Uranium Enrichment D&D	285,000	285,000	278,000	-7,000	-2.5%
Total, Environmental and Other Defense Activities	**8,650,000**	**8,677,000**	**8,416,000**	**-261,000**	**-3.01%**
Nuclear Energy (050)	160,000	160,000	160,000	+0	+0.0%
Total, Atomic Energy Defense Activities	**32,945,000**	**32,972,000**	**38,618,000**	**5,646,000**	**+17.12%**
Southeastern Power Administration	0	0	0	+0	+0.0%
Southwestern Power Administration	11,440	11,440	10,400	-1,040	-9.1%
Western Area Power Administration	99,872	99,872	63,372	-36,500	-36.5%
Falcon and Amistad Operating and Maintenance Fund	228	228	228	+0	+0.0%
Colorado River Basins Power Marketing Fund	0	0	0	+0	+0.0%
Total, Power Marketing Administrations	**111,540**	**111,540**	**74,000**	**-37,540**	**-33.66%**
Total, Energy and Water Development and Related Agencies	**50,398,473**	**50,162,030**	**51,553,805**	**1,391,775**	**+2.77%**
Excess Fees and Recoveries, FERC	-9,000	-9,000	-9,000	+0	+0.0%
Title XVII Loan Guar. Prog Section 1703 Negative Credit Subsidy Receipt	-6,493	-61,106	-65,805	-4,699	+7.7%
UED&D Fund Offset	-285,000	-285,000	-278,000	+7,000	-2.5%
Sale of Northeast Gasoline Supply Reserve	-98,000	0	0	+0	N/A
Sale of Northeast Home Heating Oil Reserve	0	0	-100,000	-100,000	N/A
Total Funding by Appropriation	**49,999,980**	**49,806,924**	**51,101,000**	**+1,294,076**	**+2.6%**
Total Discretionary Funding	***49,999,980***	***49,806,924***	***46,319,000***	***-3,487,924***	***-7.0%***
DOE Budget Function	**49,999,980**	**49,806,924**	**51,101,000**	**+1,294,076**	**+2.6%**
NNSA Defense (050) Total	24,135,000	24,135,000	30,042,000	+5,907,000	+24.5%
Non-NNSA Defense (050) Total	8,810,000	8,837,000	8,576,000	-261,000	-3.0%
Defense (050)	*32,945,000*	*32,972,000*	*38,618,000*	*5,646,000*	*17.12%*
Science (250)	8,240,000	8,240,000	7,092,000	-1,148,000	-13.9%
Energy (270)	8,814,980	8,594,924	5,391,000	-3,203,924	-37.3%
Non-Defense (Non-050)	*17,054,980*	*16,834,924*	*12,483,000*	*-4,351,924*	*-25.85%*

[1] The Office of Energy Efficiency and Renewable Energy funding levels for FY 2024 Enacted and FY 2025 Enacted included the Offices of State and Community Energy Programs, Federal Energy Management Program, and Manufacturing and Energy Supply Chains.

[2] Naval Reactors and Nuclear Energy (050) amounts do not reflect the mandated transfer of $92.8 million in FY 2024 and FY 2025 from Naval Reactors to the Office of Nuclear Energy for operation of the Advanced Test Reactor

[3] The Office of Technology Commercialization, formerly known as the Office of Technology Transitions, is funded in the Departmental Administration appropriation in FY 2026 at $10 million.

[4] Funding for the Grid Deployment account in FY 2026 will support OE programs and projects, with close coordination with CESER, that increase generation and transmission capacity and strengthen grid security.

[5] Funding for the MESC account in FY 2026 will support EERE and FE activities to address supply chain vulnerability areas, to include critical minerals and materials. The Office of Manufacturing and Energy Supply Chains was funded at $19 million in the Energy Efficiency and Renewable Energy appropriation in both FY 2024 Enacted and FY 2025 Enacted.

[6] FY 2026 Requested Funding includes $4.782 billion in mandatory Reconciliation resources for NNSA Weapons Activities.

Office of Science

Science
(dollars in thousands)

FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2024 Enacted
$8,240,000	$8,240,000	$7,092,000	-$1,148,000

Note: The FY 2024 Enacted SC total does not include foreign aid supplement funding.

Proposed Appropriation Language

For Department of Energy expenses including the purchase, construction, and acquisition of plant and capital equipment, and other expenses necessary for science activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, and purchase of not more than [35] *35* passenger motor vehicles [including one ambulance for replacement only], [$8,240,000,000] *$7,092,000,000*, to remain available until expended: *Provided*, That of such amount, [$226,831,000] *$226,831,000* shall be available until September 30, [2026] *2027*, for program direction.

Explanation of Change

Proposed appropriation language updates reflect the funding and replacement of passenger motor vehicle levels.

Public Law Authorization

Science:

- Public Law 87-195, "Foreign Assistance Act of 1961"
- Public Law 95-91, "Department of Energy Organization Act", 1977
- Public Law 102-486, "Energy Policy Act of 1992"
- Public Law 108-153, "21st Century Nanotechnology Research and Development Act 2003"
- Public Law 108-423, "Department of Energy High-End Computing Revitalization Act of 2004"
- Public Law 109-58, "Energy Policy Act of 2005"
- Public Law 110-69, "America COMPETES Act of 2007"
- Public Law 111-358, "America COMPETES Reauthorization Act of 2010"
- Public Law 115-246, "American Super Computing Leadership Act of 2017"
- Public Law 115-246, "Department of Energy Research and Innovation Act", 2018
- Public Law 115-368, "National Quantum Initiative Act", 2018
- Public Law 117-167, "CHIPS and Science Act", 2022
- Public Law 117-169, "Inflation Reduction Act of 2022"

Isotope R&D and Production:

- Public Law 101-101, "1990 Energy and Water Development Appropriations Act", establishing the Isotope Production and Distribution Program Fund
- Public Law 103-316, "1995 Energy and Water Development Appropriations Act", amending the Isotope Production and Distribution Program Fund to provide flexibility in pricing without regard to full-cost recovery

Workforce Development for Teachers and Scientists:

- Public Law 101-510, "DOE Science Education Enhancement Act of 1991"
- Public Law 103-382, "The Albert Einstein Distinguished Educator Fellowship Act of 1994"

Mission

The Office of Science's (SC) mission is to deliver scientific discoveries and major scientific tools to transform our understanding of nature and advance the energy, economic, and national security of the United States (U.S.).

Overview

SC is the Nation's largest Federal sponsor of basic research in the physical sciences and the lead Federal agency supporting fundamental scientific research for our Nation's energy future. SC is an established leader of the U.S. scientific discovery and innovation enterprise. Over the decades, SC investments and accomplishments in basic research and enabling research capabilities continue to provide the foundations for new technologies, businesses, and industries, making significant contributions to our nation's economy, national security, and quality of life. Select scientific accomplishments enabled by the SC programs are described in the program budget narratives. Additional descriptions of recent science discoveries can be found at https://www.energy.gov/science/listings/science-highlights.

SC accomplishes its mission and advances national goals by supporting:

- *Science for energy, economic, and national security*—building a foundation of scientific and technical knowledge to spur discoveries and innovations for advancing the Department's mission. SC supports a wide range of funding modalities from single principal investigators to large team-based activities to engage in fundamental research on energy resource production, conversion, storage, transmission, and use.
- *The frontiers of science*—exploring nature's mysteries from the study of fundamental subatomic particles, atoms, and molecules that are the building blocks of the materials of our universe and everything in it to the DNA, proteins, and cells that are the building blocks of life. Each of the programs in SC supports research probing the most fundamental disciplinary questions.
- *The 21st Century tools of science*—providing the nation's researchers with state-of-the-art national scientific user facilities, the most advanced tools of modern science, propelling the U.S. to the forefront of science, technology development, and deployment through innovation.

The FY 2026 Request for SC is $7,092.0 million, a decrease of 13.9 percent below the FY 2025 Enacted level, to implement the Administration's objectives to advance bold, transformational leaps in U.S. science and technology (S&T) and ensure America remains the global S&T leader for generations to come. The FY 2026 Request supports a portfolio of basic scientific research probing some of the most fundamental questions in areas such as: fusion energy and plasma physics; nuclear and high energy physics; materials sciences and chemistry; biological systems; applied mathematics; next generation high-performance computing and simulation capabilities; artificial intelligence and machine learning; isotope science and production; quantum information sciences; and basic research to advance new accelerator and energy technologies.

The Request increases investments in Administration priorities including basic research on Artificial Intelligence (AI) and Machine Learning (ML), Quantum information Sciences (QIS), fusion energy sciences, and Critical Minerals and Materials (CMM) research initiatives. The SC Request supports ongoing efforts in fusion development in support of the Long Range Plan (LRP). The Request continues support for the National Quantum Information Science (QIS) Research Centers for basic research and early-stage development to accelerate the advancement of QIS through vertical integration between systems, theory, hardware, and software. The Request continues funding for microelectronics, critical minerals and materials, and isotope production and research. These initiatives position SC to advance and address new research opportunities through collaborative, cross-program efforts. SC administers and/or bestows several awards to recognize talented scientists and engineers that advance DOE's missions, including the Presidential Early Career Award for Scientists and Engineers (PECASE), Ernest Orlando Lawrence Award, Enrico Fermi Award, and Distinguished Scientist Fellow opportunity. The Request continues support for these honorary awards.

Science
Funding by Congressional Control

	(dollars in thousands)				
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted ($)	FY 2026 Request vs FY 2025 Enacted (%)
Advanced Scientific Computing Research					
ASCR Research	1,015,000	1,036,235	1,016,000	-20,235	-1.95%
Construction					
24-SC-20 - High Performance Data Facility	1,000	–	–	–	–
Total, Construction	**1,000**	**–**	**–**	**–**	**–**
Total, Advanced Scientific Computing Research	**1,016,000**	**1,036,235**	**1,016,000**	**-20,235**	**-1.95%**
Basic Energy Sciences					
BES Research	2,365,000	2,354,785	2,019,657	-335,128	-14.23%
Construction					
24-SC-10 HFIR Pressure Vessel Replacement (PVR), ORNL	4,000	6,000	–	-6,000	-100.00%
24-SC-12 NSLS-II Experimental Tools - III (NEXT-III), BNL	2,556	5,500	–	-5,500	-100.00%
21-SC-10 Cryomodule Repair & Maintenance Facility (CRMF), SLAC	9,000	20,000	20,000	–	–
19-SC-14 Second Target Station (STS), ORNL	52,000	52,000	52,000	–	–
18-SC-11 Spallation Neutron Source Proton Power Upgrade (PPU), ORNL	15,769	–	–	–	–
18-SC-12 Advanced Light Source Upgrade (ALS-U), LBNL	57,300	50,000	50,000	–	–
18-SC-13 Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC	120,000	100,000	99,343	-657	-0.66%
Total, Construction	**260,625**	**233,500**	**221,343**	**-12,157**	**-5.21%**
Total, Basic Energy Sciences	**2,625,625**	**2,588,285**	**2,241,000**	**-347,285**	**-13.42%**
Biological and Environmental Research					
BER Research	890,000	851,000	384,920	-466,080	-54.77%
Construction					
24-SC-31 Microbial Molecular Phenotyping Capability (M2PC), PNNL	10,000	19,000	10,000	-9,000	-47.37%

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted ($)	FY 2026 Request vs FY 2025 Enacted (%)
Total, Construction	**10,000**	**19,000**	**10,000**	**-9,000**	**-47.37%**
Total, Biological and Environmental Research	**900,000**	**870,000**	**394,920**	**-475,080**	**-54.61%**
Fusion Energy Sciences					
FES Research	540,000	590,000	667,280	+77,280	+13.10%
Construction					
20-SC-61 Matter in Extreme Conditions (MEC) Petawatt Upgrade, SLAC	10,000	–	–	–	–
14-SC-60 U.S. Contributions to ITER	240,000	200,000	77,500	-122,500	-61.25%
Total, Construction	**250,000**	**200,000**	**77,500**	**-122,500**	**-61.25%**
Total, Fusion Energy Sciences	**790,000**	**790,000**	**744,780**	**-45,220**	**-5.72%**
High Energy Physics					
HEP Research	824,000	848,570	747,836	-100,734	-11.87%
Construction					
18-SC-42 Proton Improvement Plan II (PIP-II), FNAL	125,000	125,000	114,000	-11,000	-8.80%
11-SC-40 Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment	251,000	251,000	251,000	–	–
Total, Construction	**376,000**	**376,000**	**365,000**	**-11,000**	**-2.93%**
Total, High Energy Physics	**1,200,000**	**1,224,570**	**1,112,836**	**-111,734**	**-9.12%**
Nuclear Physics					
NP Operation and Maintenance	709,000	715,600	657,860	-57,740	-8.07%
Construction					
20-SC-52 Electron Ion Collider (EIC), BNL	95,000	110,000	110,000	–	–
Total, Construction	**95,000**	**110,000**	**110,000**	**–**	**–**
Total, Nuclear Physics	**804,000**	**825,600**	**767,860**	**-57,740**	**-6.99%**
Isotope R&D and Production					
IRP Research	99,793	116,736	109,430	-7,306	-6.26%
Construction					
20-SC-51 U.S. Stable Isotope Production and Research Center (SIPRC), ORNL	20,900	45,900	45,900	–	–
24-SC-92 Clinical Alpha Radionuclide Producer (CARP), BNL	1,000	–	–	–	–

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted ($)	FY 2026 Request vs FY 2025 Enacted (%)
24-SC-91 Radioisotope Processing Facility, ORNL	8,500	7,000	7,000	–	–
Total, Construction	30,400	52,900	52,900	–	–
Total, Isotope R&D and Production	**130,193**	**169,636**	**162,330**	**-7,306**	**-4.31%**
Accelerator R&D and Production					
ARDAP Research	29,000	27,000	–	-27,000	-100.00%
Total, Accelerator R&D and Production	**29,000**	**27,000**	**–**	**-27,000**	**-100.00%**
Workforce Development for Teachers and Scientists					
WDTS	40,000	31,000	25,000	-6,000	-19.35%
Total, Workforce Development for Teachers and Scientists	**40,000**	**31,000**	**25,000**	**-6,000**	**-19.35%**
Science Laboratories Infrastructure					
PILT	5,004	5,119	5,119	–	–
Oak Ridge Landlord	6,910	7,032	7,032	–	–
SLI F&I	18,530	42,692	42,692	–	–
SLI Laboratory Operations Apprenticeship	3,000	3,000	3,000	–	–
OR Nuclear Operations	46,000	46,000	46,000	–	–
Construction					
21-SC-71 Princeton Plasma Innovation Center (PPIC), PPPL	15,000	30,000	34,600	+4,600	+15.33%
21-SC-72 Critical Infrastructure Recovery & Renewal (CIRR), PPPL	10,000	10,000	9,400	-600	-6.00%
21-SC-73 Ames Infrastructure Modernization (AIM)	8,000	–	–	–	–
20-SC-72 Seismic and Safety Modernization (SSM), LBNL	35,000	23,000	–	-23,000	-100.00%
20-SC-73 CEBAF Renovation and Expansion (CEBAF), TJNAF	11,000	11,000	26,000	+15,000	+136.36%
20-SC-77 Argonne Utilities Upgrade (AU2), ANL	8,007	3,000	1,500	-1,500	-50.00%
20-SC-78 Linear Assets Modernization Project (LAMP), LBNL	18,900	25,000	13,100	-11,900	-47.60%

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted ($)	FY 2026 Request vs FY 2025 Enacted (%)
20-SC-79 Critical Utilities Infrastructure Revitalization (CUIR), SLAC	30,000	20,000	10,000	-10,000	-50.00%
20-SC-80 Utilities Infrastructure Project (UIP), FNAL	35,000	35,000	12,000	-23,000	-65.71%
19-SC-74 - BioEPIC, LBNL	38,000	–	–	–	–
Total, Construction	**208,907**	**157,000**	**106,600**	**-50,400**	**-32.10%**
Total, Science Laboratories Infrastructure	**288,351**	**260,843**	**210,443**	**-50,400**	**-19.32%**
Safeguards and Security					
S&S	190,000	190,000	190,000	–	–
Total, Safeguards and Security	**190,000**	**190,000**	**190,000**	–	–
Program Direction					
PD	226,831	226,831	226,831	–	–
Total, Program Direction	**226,831**	**226,831**	**226,831**	–	–
Total, Office of Science	**8,240,000**	**8,240,000**	**7,092,000**	**-1,148,000**	**-13.93%**

(dollars in thousands)

SBIR/STTR funding:

- FY 2024 Enacted: SBIR $100,156,000 and STTR $14,076,000 (SC only)
- FY 2025 Enacted: SBIR $100,037,000 and STTR $13,938,000 (SC only)
- FY 2026 Request: SBIR $69,326,000 and STTR $9,748,000 (SC only)

Advanced Scientific Computing Research

Overview

The Advanced Scientific Computing Research (ASCR) program's mission is to advance applied mathematics and computer science, including artificial intelligence (AI) and quantum information science (QIS); deliver the most sophisticated computational scientific applications in partnership with disciplinary science; create first-of-a-kind advanced computing and networking capabilities for the Nation; and develop future generations of computing hardware and software tools for science and engineering in partnership with the research community, including U.S. industry. ASCR's research and facilities investments increase the capability, versatility, and efficiency of scientific computing through activities described by four thrusts:

- Breakthrough Tools and Technologies: ASCR enhances software, data processes, and AI for increasingly complex or resource intense modeling and simulation, including enabling the convergence of AI with QIS.
- Deep Understanding of AI and Physical Models: ASCR advances and enables knowledge in core mathematical methods and algorithms that underlie all AI, modelling, and simulation.
- Enabling High-precision Research and Development: ASCR focuses on concurrently advancing applied math and computer science knowledge with disciplinary science in critical areas such as fusion energy and material science.
- Hardware Innovation: ASCR increases the robustness of computing, including underlying communication and energy needs, redefines the art of possible in conventional computing, and leads the development of new emerging technologies.

ASCR's program activities steward an innovation pipeline addressing these four thrusts. This pipeline starts with basic research in ASCR Research that comprises of Applied Mathematics Research, Computer Science Research, and Computational Partnerships. It then makes connections to scale-up research and development activities through testbeds and centers in Advanced Computing Technologies (ACT). Finally, it culminates in world-leading, first-of-a-kind computing, networking, and data infrastructure capabilities developed and deployed by High Performance Computing (HPC) and Networking Facilities. Each of these program activities plays a critical role:

- ASCR Research's Applied Math and Computer Science activities focus on long-term research to develop innovative algorithms, software, methods, and workflows underpinning current and future HPC, AI, quantum hardware, and emerging science applications. ASCR Research's Computational Partnerships catalyze joint inquiry and effort between mathematics and computer science researchers and domain science researchers to solve the interwoven challenges.
- ASCR ACT activities anticipates future computing needs and provides testbeds and research centers for the design and development of the newest technologies, including QIS and new microelectronics. ACT focuses on engaging industry and the research community to scale-up research on next-generation technologies for enabling broad research impact, innovation, and initial commercial development.
- ASCR HPC and Networking Facilities activities conceive, build, and operate world-class, open access HPC, networking, and data infrastructure for scientific research. Many thousands of researchers, spanning industry, academia, and government laboratories, rely on the ASCR facilities to advance their research. The expert workforce of the ASCR facilities partners with industry to create and deploy next generation computing and networking technology. ASCR's stewardship of domestic HPC ecosystems, industrial partnerships, and supply chains makes the continued innovation in this strategic technology possible. In addition, ASCR's stewardship of DOE high performance networking connects all DOE national laboratories and major sites to global research networks to advance data-intensive scientific discovery.

The SC crosscutting effort in AI brings together powerful increases in computing power and massive data sets from state-of-the-art facilities to accelerate scientific progress. DOE envisions a future where researchers use foundation models and other AI techniques, combined with physics-based approaches, to analyze complex problems and then use that understanding to make decisions. Especially for high-consequence applications, precision and trustworthiness are critical, and ASCR's request supports leveraging DOE's considerable capabilities to advance scientific AI—that is, AI designed to handle large multi-dimensional data sets and produce the high-precision answers needed for science—to realize its potential in meeting the Nation's technical challenges. At the same time, the cross-cutting nature of QIS increasingly drives scientific frontiers and innovations toward realizing the full potential of quantum-based applications, from computing to sensing, connected through quantum networks. However, there is a need for bold approaches that better couple all elements of the technology innovation chain and combine talents across universities, national labs, and the private sector in concerted efforts to enable the U.S. to lead the world into the quantum future. To meet this need, ASCR continues its full support for the National QIS Research Centers (NQISRCs) and its partnership with DARPA on industry quantum benchmarking.

Highlights of the FY 2026 Request

The ASCR FY 2026 Request of $1,016.0 million is a decrease of $20.2 million below the FY 2025 Enacted level and is well-aligned with Administration and Department priorities to advance AI technology and its integration with critical and emerging technologies such as QIS and microelectronics. It also provides support to enhance U.S. competitiveness through workforce investments, facilitate the adoption of next-generation HPC, and usher in the AI and exascale science era to bolster industrial innovation.

Research

The Request prioritizes delivering on the promise of the exascale and AI enabled science era while leading innovation in next-generation HPC integrated with QIS and AI. This effort includes funding critical basic research in applied mathematics and computer science to merge the power of AI with exascale computing. These investments also include developing tools that facilitate building foundation models useful for basic and applied science, and partnerships that build and use foundation models that support new applications in science, energy, and national security. The Request also emphasizes applied mathematics, computer science, networking, hardware, and microelectronics research to advance and leverage advanced computing including quantum. Increased or shifted efforts in research, advanced computing technologies, and at the facilities will move forward the implementation of DOE's Integrated Research Infrastructure (IRI) to integrate DOE's unique data, user facilities, and computing resources. Strategic partnerships, both within DOE and at the interagency level, expand the impact of the exascale capabilities including software and AI, and accelerate scientific discovery through advanced computing (SciDAC). Underpinning all investments are efforts to grow the necessary competitive workforce through the Computational Sciences Graduate Fellowship (CSGF) and Established Program to Stimulate Competitive Research (EPSCoR).

The Request supports advanced computing technologies innovation through microelectronics and quantum computing, networking, and sensing testbeds and centers. Continued support enables the NQISRCs and ASCR's regional quantum testbeds and user programs to provide U.S. researchers with access to unique and commercial quantum computing and networking resources. It also enables basic research in QIS, in coordination with other relevant Departments and Agencies, to cement national leadership in the field. Through Research and Evaluation Prototypes (REP), partnerships with industry in collaboration with the research community produce computationally efficient advances for scientific AI, HPC, and QIS. The Request also supports Microelectronics Science Research Centers, a network of multiple multidisciplinary teams comprised of researchers from universities, national laboratories, and industry to develop new materials, chemistries, devices, systems, architectures, algorithms, and software in a co-design innovation ecosystem.

Facility Operations

The FY 2026 Request supports full operations and competitive allocation of the Nation's exascale computing systems: Frontier at the Oak Ridge Leadership Computing Facility (OLCF) and Aurora at the Argonne Leadership Computing Facility (ALCF); full operations of the Perlmutter system at the National Energy Research Scientific Computing Center (NERSC); and full operations of the Energy Sciences Network (ESnet). The Request supports user access to advanced computing and AI testbeds, as well as commercial quantum computers at the facilities through competitive, merit reviewed, open access programs. The Request supports the NERSC-10, OLCF-6, and ALCF-4 upgrade projects and the new High Performance Data Facility (HPDF) project (further details below), to strengthen and leverage SC's unparalleled research capabilities. The Request includes support for governance and implementation of DOE's IRI.

Projects

The FY 2026 Request provides no line-item construction funding for the HPDF project. Final design with a phased approach to installation will be completed to determine the next steps for this project, preserving options to meet the urgency of the Department's mission needs in data-intensive research and AI.

Advanced Scientific Computing Research
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Advanced Scientific Computing Research				
Applied Mathematics Research	52,182	68,182	60,994	-7,188
Computer Sciences Research	66,718	76,718	62,431	-14,287
Computational Partnerships	75,182	56,982	35,151	-21,831
Advanced Computing Technologies	108,918	105,118	112,618	+7,500
Energy Earthshot Research Centers	5,000	3,000	–	-3,000
Total, Mathematical, Computational, and Computer Sciences Research	**308,000**	**310,000**	**271,194**	**-38,806**
High Performance Production Computing	142,000	154,500	154,328	-172
Leadership Computing Facilities	474,000	475,195	490,098	+14,903
High Performance Network Facilities and Testbeds	91,000	93,540	97,261	+3,721
Integrated Research Infrastructure	–	3,000	3,119	+119
Total, High Performance Computing and Network Facilities	**707,000**	**726,235**	**744,806**	**+18,571**
Subtotal, Advanced Scientific Computing Research	**1,015,000**	**1,036,235**	**1,016,000**	**-20,235**
Construction				
24-SC-20 - High Performance Data Facility	1,000	–	–	–
Subtotal, Construction	**1,000**	–	–	–
Total, Advanced Scientific Computing Research	**1,016,000**	**1,036,235**	**1,016,000**	**-20,235**

SBIR/STTR funding:
- FY 2024 Enacted: SBIR $10,132,000 and STTR $1,341,000
- FY 2025 Enacted: SBIR $10,627,000 and STTR $1,364,000
- FY 2026 Request: SBIR $8,422,000 and STTR $1,184,000

Advanced Scientific Computing Research
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Mathematical, Computational, and Computer Sciences Research Funding for robust AI research are significantly increased by the Request which will develop tools that facilitate building and understanding foundation models useful for basic and applied science, including expanded partnerships with industry, academia, and other agencies, and enable the convergence of AI, HPC, and QIS. DOE will utilize its computing capabilities, AI testbeds, research efforts, and programs like EPSCoR and CSGF to enhance the competitiveness of the U.S. workforce. Computer Science and Applied Mathematics activities will continue foundational and long-term basic research efforts that: explore and prepare for emerging technologies; develop new scalable computationally efficient algorithms and software; address the challenges of data intensive science and emerging computing technologies, such as QIS; and support the development leading AI technologies. Computational Partnerships supports partnerships in critical areas across DOE and with other agencies to expand the impact of exascale capabilities and software. The ACT activities will support the recompetition/renewal of the NQISRCs, quantum computing and networking testbeds, and the Microelectronics Science Research Centers, in close coordination with the other SC programs. Through REP, partnerships with industry will advance technologies for scientific AI, QIS, and HPC.	-$38,806
High Performance Computing and Network Facilities The Request provides resources for all three ASCR HPC facilities to deliver HPC, storage, visualization, and testbed resources, and for ESnet to deliver high performance network access to all DOE national laboratories and dozens of other DOE sites. OLCF and ALCF will provide full operations and competitive allocation of the nation's first two Exascale computing systems, Frontier and Aurora, and testbed resources focused on novel AI hardware and QIS technologies; NERSC will continue full operations of the NERSC-9 (Perlmutter) system. Funding supports the next generation Leadership Computing Facility upgrade projects (OLCF-6 and ALCF-4) and the NERSC-10 upgrade project at their target profiles. ESnet will continue full operations of the ESnet6 network at or above the designed 99.9% reliability target and deliver site resiliency enhancements. The Request supports development of IRI across ASCR facilities.	+$18,571
Construction The FY 2026 Request provides no line-item construction funding for the HPDF project. Final design with a phased approach to installation will be completed to determine the next steps for this project, preserving options to meet the urgency of the Department's mission needs in data-intensive research and AI.	$ —
Total, Advanced Scientific Computing Research	-$20,235

Basic and Applied R&D Coordination

Coordination across disciplines and programs is a cornerstone of the ASCR program. Partnerships within SC and the National Nuclear Security Administration (NNSA) continue in advanced computing and applications. ASCR also has partnerships in QIS and AI within SC and is collaborating across DOE and with other agencies to expand the AI-enabled Exascale science era. Through the Networking and Information Technology R&D Subcommittee, the Subcommittee on MLAI, the Subcommittee on QIS, and the Subcommittee on the Economic and Security Implications of QIS of the National Science and Technology Council (NSTC) Committees on Science, Technology, and Homeland and National Security, ASCR coordinates with programs across the Federal Government. Future advanced computing technologies, scientific data, large scale networking, high end computing, AI, and QIS are coordinated with other agencies through the NSTC. In FY 2026, cross-agency interactions and collaborations continue in coordination with the Office of Science and Technology Policy.

Program Accomplishments

Exascale Computing Project: Pushing Resilient Computing Forward for Simulation and Artificial Intelligence

One of the fundamental challenges in scaling up accelerated computing to exascale is reliability. When the NVIDIA PathForward project started, the estimated GPU compute nodes required to reach exascale was many tens of thousands. At that time, NVIDIA foresaw that silent data corruption and failures in time would be high enough that the resulting mean-time-to-failure would be inadequate to meet exascale system requirements. The PathForward program funded the development and implementation of a number of enhancements to NVIDIA's engineering methodology and hardware that reduce the failure rate and improve availability by a large factor, while only incurring a small silicon area overhead. This enabled NVIDIA GPUs to meet exascale system requirements and also improved performance for AI—leading to higher speed, larger models, and better training efficiency. Results of the PathForward funding of NVIDIA resilience efforts contributed to several improvements for GPUs that are used in Perlmutter, and many other large GPU systems. NVIDIA continues to see PathForward investments influence its roadmap with new resilience features funded by PathForward in the Blackwell generation.

Industry Partners Leverage ECP to Digitally Customize Materials

Titanium alloys are critical materials for the aerospace industry—stronger and lighter than steel, resistant to rust and corrosion and resilient to high temperatures. Companies such as RTX, formerly Raytheon Technologies, rely on these sturdy alloys to build critical components like jet-engine turbine blades, landing gear, and exhaust ducts. However, manufacturing usable components from titanium alloy typically wastes as much as half the raw metal. Simulations performed on the Summit supercomputer at the Oak Ridge Leadership Computing Facility are saving time and money by helping researchers digitally customize the materials. RTX worked with Oak Ridge National Laboratory (ORNL) researchers to use phase-field modeling, a computationally demanding and time-consuming mathematical technique that rigorously captured the physics of the process. The approach sought to simulate the complicated dynamics of melting and solidifying of various alloys of titanium, copper, and niobium. The computational power of Summit allowed the team to simulate microstructures down to the nanometer—about a millionth of a millimeter—under a wide range of extreme conditions, including various stages of heating and cooling and the evolution of millions of microscopic metal grains. Summit's predictive simulations shrank a decade of physical testing into 2 or 3 years by RTX estimates, which also found that the new alloy could cut in half their annual $273 million production costs of machining titanium components and save as much as 2.5 quadrillion British thermal units of energy by 2050. The results of this work hold promise for improvements across aerospace and energy applications.

Quantum Computing Testbeds: A Critical Hardware Capability for the Nation

Access to the state-of-the-art hardware is critical for enabling rapid scientific progress in the nascent field of quantum computing. Researchers from the quantum computing testbed project QSCOUT at the Sandia National Laboratories have delivered an industry-leading ion trap called Roadrunner. Its main feature is a junction of three electrode zones that makes qubit reordering possible and enables a key quantum operation – called mid-circuit measurement – for future error-corrected quantum computers. In addition to the novel ion trap, the QSCOUT team also built a full stack quantum computer infrastructure around it. It is accessible to researchers nation-wide for remote experimentation. The ion traps built by the QSCOUT team are in high demand by the scientific community and, to date, about 40 ion trap devices have been delivered to many research teams across industry, academia, and the Federal government, including teams affiliated with Duke University, Georgia Tech Research Institute, IonQ, Air Force Research Laboratory, University of Maryland, and the DOE NQISRC Quantum Systems Accelerator (QSA). These traps are being used in applications beyond quantum computing, enabling basic science research in quantum networking and quantum sensing.

Opening a Vast Map of the Universe to Investigate the Mystery of Dark Energy
With support from NERSC, the High Energy Physics program's Dark Energy Spectroscopic Instrument (DESI) is mapping millions of celestial objects to better understand dark energy, the mysterious driver of our universe's accelerating expansion. Objects in DESI's catalog range from nearby stars in our own Milky Way to galaxies billions of light-years away; because of the time it takes light to travel to Earth, looking out in space is akin to looking back in time. The DESI collaboration recently released a vast new collection of data (DESI's Data Release 1), hosted by NERSC, for anyone in the world to investigate. Every night, thousands of celestial images captured by DESI are automatically transferred via ESnet to the Perlmutter supercomputer at NERSC, which conducts automated precision analysis and sends processed data back over ESnet to the DESI researchers – a workflow 40 times faster than previous methods. This integrated approach represents a new, more efficient way of doing research where experimental facilities, HPC, and high performance networking combine to drastically accelerate the pace of science.

Quantum Networking Uses Hyperentanglement
Entanglement is a key resource that enables distributed quantum computing and helps the technology scale. Entanglement generation and distillation between distributed quantum systems is the main challenge in quantum networking. A promising approach is to use the so-called hyperentanglement – the entanglement between different fundamental properties of a single particle – to boost entanglement distillation rates, information capacity, and enhance noise resilience of a quantum network. The team of researchers led by ORNL experimentally demonstrated a two-qubit controlled-NOT gate designed for manipulating polarization-frequency hyperentangled photons, achieving near-perfect operational fidelity. This work represents the first demonstration of a controlled-NOT operation between polarization and frequency within a single photon, enabling advanced quantum communication and networking protocols. This mechanism promises to serve as one of the building blocks for wide-area quantum networks.

Using Supercomputers to Understand the Repair of DNA
Understanding how the body heals and protects itself from DNA damage is vital for treating genetic disorders and life-threatening diseases such as cancer. Despite numerous studies and medical advances, much about the molecular mechanisms of DNA repair remains a mystery. By leveraging the immense capabilities of the Summit supercomputer at ORNL, researchers constructed a molecular-level model of the DNA repair process called nucleotide excision repair, solving a critical puzzle that explains how damaged strands of DNA can be repaired by multiple proteins working together. AlphaFold, an AI machine learning model developed by Google DeepMind, paired with the Nanoscale Molecular Dynamics, or NAMD, high-precision molecular-dynamics simulation application, played a crucial role in predicting the unknown 3D structures and intricate interfaces between proteins involved in DNA repair. This work provides key insights into developing novel treatments and preventing conditions that lead to premature aging and certain types of cancer.

Exascale Advances NASA's Manned Mission to Mars.
NASA has set a goal to send humans to Mars in the 2030s, but major technical challenges need to be resolved to achieve that milestone. Safely landing a vehicle with humans onboard will most likely require retropropulsion, in which rockets are fired downward to slow the vehicle's descent. However, it is impossible to replicate the unique conditions of Mars here on Earth. NASA uses computational fluid dynamics (CFD) simulations to model the aerodynamic forces, heat transfer, and other factors that spacecraft encounter, which informs designs that will make space missions safer and more efficient. The computational demands of these calculations have been out of reach until the NASA team, including experts from Georgia Institute of Technology's Aerospace Systems Design Laboratory, partnered with OLCF. After five years of software efforts and annual campaigns running increasingly sophisticated simulations, in FY 2024 researchers successfully completed a groundbreaking 35-

second autonomous closed-loop test flight simulating the vehicle's final descent from 8 kilometers to about 1 kilometer as the vehicle approached its landing phase. These capabilities are critical for assessing the controllability of future vehicles, bringing humanity one step closer to walking on Mars.

Advanced Scientific Computing Research
Mathematical, Computational, and Computer Sciences Research

Description

The Mathematical, Computational, and Computer Sciences Research subprogram supports research activities to effectively meet the SC AI, QIS, HPC, and computational science mission needs, including both data and computationally intensive science. These sciences coupled with AI are central to progress at the frontiers of science and our most challenging engineering problems, including for next-generation microelectronics and systems exploring the convergence of HPC, AI, and QIS. The Computer Science and Applied Mathematics activities in ASCR provide the foundation for increasing the capability of the national HPC ecosystem and scientific data infrastructure. This goal is accomplished through long-term research focused on developing intelligent software, algorithms, and methods that anticipate future hardware challenges and opportunities, and address evolving science needs. ASCR's partnerships with disciplinary science deliver some of the most advanced scientific computing applications in areas of strategic importance to the Nation and help realize the promise of the exascale and AI-enabled science era. Research efforts anticipate changes in hardware and rapidly developing capabilities such as AI and QIS, as well as science needs over the long term. ASCR's partnerships with industry, including vendors and users, and discipline sciences are essential to these efforts.

Applied Mathematics Research

The FY 2026 Request for the Applied Mathematics activity supports basic research leading to fundamental mathematical advances and computational breakthroughs across DOE and SC missions. Basic research in scalable algorithms and libraries, multiscale and multi-physics modeling, methods that facilitate building and understanding foundational models for leading AI capabilities, and efficient data analysis underpin all of DOE's computational and data-intensive science efforts. More broadly, the Request supports foundational research in problem formulation, multiscale modeling and coupling, mesh discretization, time integration, advanced solvers for large-scale linear and nonlinear systems of equations, methods that use asynchrony or randomness, uncertainty quantification, and optimization. Historically, advances in these methods have contributed as much, if not more, to gains in computational science than hardware improvements alone. The forward-looking efforts of these activities' anticipate DOE mission needs from the closer coupling and integration of advanced computing with scientific modeling, AI, and QIS. The result will enable greater capabilities for scientific discovery, design, and decision-support in complex systems; enable the development of new algorithms to support data analysis at the edge of experiments and instruments; and protect the privacy of sensitive datasets. Industry often uses software developed with Applied Mathematics investments and integrates it with their own software.

Computer Science Research

The FY 2026 Request for the Computer Science activity supports long-term, basic research on the software infrastructure that is essential for the effective use of the most powerful HPC and networking systems in the Nation; the tools and data infrastructure to enable the incorporation of AI techniques and real-time exploration and the understanding of extreme scale; and complex data from both simulations and experiments. Additionally, Computer Science efforts play a key role in understanding gaps and future opportunities for the design of future computing systems, ensuring that the U.S. maintains leadership in high-performance and data-intensive computing, and integrating them with AI and QIS technologies. To advance these goals, this activity includes support for foundational research in data analysis and visualization, data management and storage, distributed systems and resource management, programming models and tools enabling high performance and portability, program verification and testing, operating and runtime systems, advanced networking, hardware/software co-design, computer-science fundamentals, and HPC cybersecurity. Hardware and software vendors often use software developed with ASCR Computer Science investments and integrate it with their own software. In addition, partnerships between mathematicians and computer scientists, jointly supported by this activity and Applied Mathematics, develop computationally efficient algorithms and methods that scale from intelligent sensors to HPC and advance the Department's energy goals.

Computational Partnerships

The FY 2026 Request for the Computational Partnerships activity supports the Scientific Discovery through Advanced Computing, or SciDAC, program, for the employment of HPC for scientific discovery. Established in 2001, SciDAC involves ASCR partnerships with the other SC programs, other DOE program offices, and other federal agencies in strategic areas with a goal to dramatically accelerate progress in scientific computing, including AI, through deep collaborations between discipline scientists, applied mathematicians, and computer scientists. SciDAC does this by providing the intellectual resources in applied mathematics and computer science, expertise in algorithms and methods, and scientific software tools to advance scientific discovery through modeling, simulation, large-scale data analysis, and scientific AI in areas of strategic importance to SC, DOE, and the Nation. These efforts include partnerships with industry, academia, and other agencies to utilize DOE's advanced computing capabilities and AI testbeds to build foundation models that support new applications in science and energy. The FY 2026 Request supports building SciDAC partnerships focused on AI for science with other SC and DOE programs.

Advanced Computing Technologies

The FY 2026 Request for the Advanced Computing Technologies (ACT) activity supports research focused on the development of emerging computing technologies through REP and center investments, in partnership with the other SC program offices. These technologies include QIS, neuromorphic computing, robotics, automated systems for scientific discovery, and other advanced microelectronics technologies. ACT also strengthens the competitiveness of the U.S. scientific computing workforce through CSGF.

REP has a long history of partnering with U.S. vendors to develop the next generation of computing technologies that advance the state-of-the-art enabling DOE researchers to better understand the challenges and capabilities of emerging technologies. REP partnerships with industry and in collaboration with the research community focused on computationally efficient, leap-ahead technologies for scientific AI, HPC, and robotics will accelerate the development of scalable qubit architectures, first-of-a-kind neuromorphic devices AI applications, and novel AI training methods for robotics.

In close coordination with IRI activities, the Request will support the exploration of critical components of a high-level programming interface that will enable integrated workflows for all major DOE science instruments and user facilities with HPC. The efforts foster a DOE national laboratory ecosystem of automated labs, edge sensors, data resources, and access to commercial cloud capabilities to radically accelerate the pace of innovation and discovery.

This activity also supports ASCR's investments in the NQISRCs, as well as quantum computing and networking testbeds. These investments focus on building game-changing quantum-computing systems that will provide the U.S. scientific community with transformative capabilities to simulate physical systems at scales and levels of fidelity out of reach of classical techniques. To accelerate scientific discovery, AI will be leveraged to optimize and explore new system designs, and combined with quantum computing systems, to enable novel algorithmic innovations. The networking initiatives will build the capability to connect and integrate different quantum technologies by distributing quantum resources, such as entanglement.

Success in fostering and stewarding a highly skilled and competitive workforce is fundamental to SC's mission and key to also sustaining U.S. leadership in HPC and computational science. The high demand across DOE missions and the unique challenges of high-performance computational science and engineering led to the establishment of the CSGF in 1991. This program has delivered leaders across the computational science community. With increasing demand for these highly skilled scientists and engineers, ASCR continues to partner with the NNSA to support the CSGF to increase the availability and breadth of a trained workforce for exascale computing, AI, and QIS.

Additionally, the Request supports ASCR's contribution to the SC Microelectronics Science Research Centers are formed as networks of individual projects, aggregated into three centers, that each address a common challenge. These Centers include researchers from universities, national laboratories, and industry that develop materials, chemistries, devices, systems, architectures, algorithms, and software.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Mathematical, Computational, and Computer Sciences Research	**$310,000**	**$271,194**	**-$38,806**
Applied Mathematics Research	$68,182	$60,994	-$7,188
Investments continue to support innovative research efforts in algorithms, libraries, and methods that underpin high-end scientific simulations, scientific AI techniques, including methods that facilitate building foundation models useful for basic and applied science, and methods that help scientists extract insights from massive scientific datasets with an emphasis on foundational capabilities. Partnerships between mathematicians and computer scientists focus on developing computationally efficient algorithms and methods, and in physics-informed, multiscale algorithms.		The Request will focus on core foundational research efforts in algorithms, libraries, and methods that underpin high-end scientific simulations, scientific AI techniques, building and understanding foundation models, and methods that help scientists extract insights from massive scientific datasets with an emphasis on capabilities for making data AI-ready. The Request will continue partnerships between mathematicians and computer scientists to develop computationally efficient algorithms and methods for hybrid architectures including HPC, quantum, and AI, and in physics-informed, multiscale algorithms.	The decrease represents the consolidation of several efforts to focus on the most promising future directions for increasingly hybrid architectures that integrate HPC, QIS, and AI.
Computer Science Research	$76,718	$62,431	-$14,287
Funding supports innovative investments in software that improves the utility of HPC and advanced networks for science. This includes AI techniques, workflows, tools, data management, analytics and visualizations with strategic increases focused on critical tools to facilitate building and understanding foundation models useful for basic and applied science and to enable an integrated		The Request will focus on foundational research efforts in software that improves the utility of HPC and advanced networks for science. This includes AI techniques, workflows, tools, data management, analytics and visualizations with strategic increases focused on critical tools to facilitate building and understanding foundation models and making massive data	The decrease represents the consolidation of several efforts to focus on the most promising future directions for increasingly hybrid architectures that integrate HPC, QIS, and AI.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
research infrastructure. Funding for this activity continues long-term basic research efforts that explore and prepare for emerging technologies, such as quantum computing and networking, and other specialized and heterogeneous hardware and accelerators. Small investments in cybersecurity continue. In addition, funding supports partnerships between mathematicians and computer scientists to develop computationally efficient scalable algorithms and methods.	sets AI-ready. Funding for this activity will also continue long-term basic research efforts that explore and prepare for emerging technologies and the integration of HPC, QIS, and AI. Small investments in cybersecurity will continue. In addition, funding will support partnerships between mathematicians and computer scientists to develop computationally efficient scalable algorithms and methods.	
Computational Partnerships $56,982	$35,151	-$21,831
Funding supports the SciDAC partnerships with SC and DOE programs. Efforts are focused on enabling widespread use of DOE HPC resources by Federal agencies in support of networks of scientists to work together on multidisciplinary research priorities such as the on-going partnership with the National Cancer Institute.	The Request will continue support for the SciDAC partnerships with other SC and DOE programs to enable AI-driven, high precision science R&D and realize the promise of exascale computing. Support for Advanced Computing will continue.	The decrease will be focused on lower priority research as the program focuses on the transition of some research reaching testbed readiness, including that focused on AI memory technologies, to Advanced Computing Technologies, and other minor adjustments.
Advanced Computing Technologies $105,118	$112,618	+$7,500
Funding supports quantum computing testbed efforts, and regional quantum networking testbeds. The funding allows REP to increase strategic investments in emerging technologies including AI-focused hardware, and continued support for hardening of critical software developed under ECP to enable science in the exascale era. The funding supports the CSGF fellowship, in partnership with NNSA. The NQISRCs will be recompeted, as authorized in the National Quantum Initiative Act. The funding also supports research awards that contribute to the	The Request will continue to support quantum computing testbed efforts, and regional quantum networking testbeds. The Request allows REP to increase strategic investments in hardware, and research that supports the integration of HPC, QIS, and AI, as well as continued support for hardening of critical software developed under ECP to enable science in the exascale era. The Request will continue support for the CSGF fellowship, in partnership with NNSA. The Request will continue support for the NQISRCs, as authorized in the National Quantum Initiative	The Request will support increases for AI-focused hardware investments, and Microelectronics Science Research Centers. New investments include partnerships with industry in collaboration with the research community in computationally efficient, leap-ahead technologies for scientific AI, HPC, and QIS. Also, some research reaching testbed readiness, including that focused on AI memory technologies, will be transferred from Computational Partnerships.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Microelectronics Science Research Centers.	Act. Additionally, the Request will continue support for research awards that contribute to the Microelectronics Science Research Centers.	
Energy Earthshot Research Centers $3,000	$ —	-$3,000
Funding provides limited support for the EERCs established jointly between SC programs (BES, ASCR, and BER) with coordination with the DOE Applied Technology Offices to closeout this activity.	No funding is requested for the EERCs.	The decrease will provide no funding for the EERC initiative.

Note:

- Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.

Advanced Scientific Computing Research
High Performance Computing and Network Facilities

Description

The High Performance Computing (HPC) and Network Facilities subprogram supports the construction and operations of forefront research computing, networking, and data user facilities to meet critical mission needs and advance American dominance of HPC, Artificial Intelligence (AI), and Quantum Information Science (QIS). The HPC activity supports the National Energy Research Scientific Computing Center (NERSC) at Lawrence Berkeley National Laboratory (LBNL), which provides HPC resources and large-scale storage to a broad range of SC researchers, and the High Performance Data Facility (HPDF) that will provide a managed computational and data resource to attack fundamental problems in science and engineering. The Leadership Computing activity supports the two Leadership Computing Facilities (LCFs) at Oak Ridge National Laboratory (ORNL) and Argonne National Laboratory (ANL), which provide leading-edge HPC capabilities to the U.S. research and industrial communities. The High Performance Network Facilities and Testbeds activity supports the high-performance network user facility, ESnet, which connects all DOE national laboratories and many other sites to global research networks and delivers highly reliable data transport capabilities optimized for the requirements of large-scale science. Within the subprogram, facility operations include investments in upgrading projects, software stewardship, and testbeds. The core strength of the facilities is the dedicated staff who work to maximize user productivity and science impact and efficiently operate and maintain world-leading research computing, networking, and data infrastructure, while simultaneously executing major upgrade projects and exploring advanced applications of AI and commercial quantum computing technologies.

The HPC and Network Facilities subprogram investments are informed through formal collection of strategic user requirements for research computing and data management from stakeholders across SC and DOE, including the other SC research programs, SC scientific user facilities, DOE national laboratories, U.S. industry, and other stakeholders. ASCR continues to observe an accelerating pace of innovation in computing technology through and beyond the exascale era. Allocation of HPC resources to users follows the merit review public-access model used by all SC scientific user facilities. The Innovative and Novel Computational Impact on Theory and Experiment (INCITE) allocation program provides access to the LCFs; the ASCR Leadership Computing Challenge (ALCC) allocation program provides a path for critical DOE mission applications to access the LCFs and NERSC, and a mechanism to address urgent national emergencies and priorities.

The FY 2026 Request will continue to support the implementation of DOE's Integrated Research Infrastructure (IRI) so that researchers can seamlessly and securely access DOE's unique data, user facilities, and computing resources to accelerate discovery and innovation. At the dawn of the exascale science era, many researchers and collaborations strive to meld data, simulation, and AI tools in novel ways, some with strict operational demands. Agency and program leaders feel the urgency to bring the best-integrated science and AI approaches to bear on our greatest challenges and highest priorities. All ASCR Facilities and HPDF are collaborating to create an IRI ecosystem that meets these requirements.

<u>High Performance Production Computing</u>

The FY 2026 Request for this activity will continue to support the NERSC user facility at LBNL to deliver high-end production computing resources and data services for the SC research community. NERSC users come from nearly every state in the U.S., with about half based in universities, approximately one-third in DOE laboratories, and other users from government laboratories, non-profits, small businesses, and industry. NERSC aids users entering the HPC arena for the first time, as well as those preparing leading-edge codes that harness the full potential of ASCR's exascale resources.

The FY 2026 Request will continue to support NERSC operation of the 125 pf HPE/AMD/NVIDIA NERSC-9 system (Perlmutter), an AI-enabled GPU-CPU system, which came online in FY 2021. NERSC is consistently oversubscribed, with user requests exceeding capacity by a factor of 3–10 each year. In addition, the variety of data- and compute-intensive research workflows is expanding rapidly. The FY 2026 Request supports NERSC operations and the NERSC-10 upgrade project, which is intended to provide SC with an innovative, flexible HPC platform to serve an even wider range of NERSC users, workflows, and applications. The Request also supports NERSC's exploratory efforts in AI and access to commercial quantum computing technologies to benefit the NERSC user community.

The FY 2026 Request provides funding to complete the design of the High Performance Data Facility (HPDF) with options for phased installation in the future.

<u>Leadership Computing Facilities</u>
The LCFs are national resources featuring first-of-a-kind supercomputing systems that drive innovation in HPC to enable open scientific computational applications, including industry applications, that harness the full potential of extreme-scale leadership computing to accelerate discovery. The success of this effort is built on the gains made in the ECP, REP and ASCR research efforts. The LCFs foster partnerships between domain scientists and computational science experts that extend the power of exascale computing to the Nation's most pressing research challenges. Industrial users of LCFs often prompt their companies to invest in their own HPC resources, which benefit from ASCR's investments that reduce risk for vendors and enable pioneering product lines for the broad consumer markets. The LCFs' experienced staff deploy cutting edge technologies and conduct scaling tests, while providing direct support to users, early science application teams, and HPC tool and library developers.

The FY 2026 Request for this activity supports operation and competitive allocation of the OLCF at ORNL, including the Nation's first exascale computing system, an HPE-Cray/AMD exascale system (Frontier), deployed in 2021. The Request also supports the Quantum Computing User Program, IRI efforts, advanced computing testbeds, and supporting resources.

The FY 2026 Request for this activity also supports operation and competitive allocation of the ALCF at ANL, including the Nation's second exascale and DOE's most AI capable system, an Intel/HPE-Cray system (Aurora) deployed in 2023. The Request also supports the 44 PF HPE/AMD/NVIDIA testbed (Polaris), the AI testbed, IRI efforts, and supporting resources.

The ALCF and OLCF systems are architecturally distinct, consistent with DOE's strategy to manage enterprise risk, foster diverse capabilities that provide the Nation's HPC user community with the most effective resources, and expand U.S. competitiveness. The demand for 2025 INCITE allocations at the LCFs outpaced the available resources by a factor of three, 2024–2025 ALCC demand outpaced resources by a factor of five, and demand continues to increase as industry and interagency partners adopt exascale technologies and as users leverage the LCFs for a wide range of AI applications. The FY 2026 Request for the LCFs will continue implementation of the OLCF-6 and ALCF-4 upgrade projects, cultivate vendor partnerships to spur innovation of strategic value and to drive U.S. competitiveness, continue cutting edge AI testbeds and user access programs for commercial quantum computing platforms, and develop seamless IRI solutions.

<u>High Performance Network Facilities and Testbeds</u>
The FY 2026 Request for this activity supports ESnet, SC's high performance network user facility, providing world-leading wide-area network access for all of DOE. ESnet is widely recognized as a global leader in the research and education network community, with a multi-decade track record of developing innovative network architectures and services, and reliable operations designed for 99.9 percent uptime for connected sites. The ESnet backbone network spans the continental U.S. and the Atlantic Ocean, connecting all 17 DOE National Laboratories and dozens of DOE sites to 200+ research and commercial networks around the world, enabling many tens of thousands of scientists across the country to access data and research resources. ESnet supports the data transport needs of all SC user facilities. The expert staff at ESnet operate the current generation network, ESnet6, leveraging its unique data transport orchestration, automation, and programmability features to advance DOE's data-intensive science and AI goals. In FY 2026, ESnet will continue to invest in site resiliency improvements across the DOE complex and will leverage ESnet6 to develop advanced services to support DOE priority R&D thrusts, IRI, AI, and cybersecurity.

Integrated Research Infrastructure (IRI)

The FY 2026 Request for IRI Operations will support the activities of the IRI Management Council and investments to build core IRI operations services. IRI is a program activity to integrate SC's experimental and observational scientific user facilities, data assets, and advanced computing resources so that researchers can combine these tools in novel ways that make complex data-intensive workflows much faster and more resource-efficient for research teams, enabling new research paradigms. IRI investments are thus foundational to DOE's broader AI research goals and bringing the power of HPC solutions to high-priority research challenges.

Advanced Scientific Computing Research
High Performance Computing and Network Facilities

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
High Performance Computing and Network Facilities	**$726,235**	**$744,806**	**+$18,571**
High Performance Production Computing	$154,500	$154,328	-$172
Funding supports operations at the NERSC user facility, including user support, power, space, system leases, and staff. Funding also supports the NERSC-10 upgrade project and the High Performance Data Facility project. In addition, funding supports early implementation of IRI. NERSC supports sustaining ECP software and technologies critical to HPC operations and users.		The Request will support operations at the NERSC user facility, including user support, power, space, system leases, staff, and the NERSC-10 upgrade project at the CD-2 baseline level. The Request will sustain support for implementation of IRI and ECP software and technologies critical to HPC operations and users.	The increase will support NERSC operations and the NERSC-10 upgrade project at the CD-2 baseline level.
National Energy Research Scientific Computing Center (NERSC)	*$146,500*	*$150,328*	*+$3,828*
Funding supports operations at the NERSC user facility, including user support, power, space, system leases, and staff. Funding supports full implementation of site upgrades and procurements for the NERSC-10 upgrade project, and full operations and allocation of the NERSC-9 Perlmutter system. NERSC will support sustaining ECP software and technologies critical to HPC operations and users. In addition, funding supports the early implementation of IRI and exploratory efforts in AI and quantum computing to benefit the NERSC user community.		The Request will support operations at the NERSC user facility, including user support, power, space, system leases, and staff. The Request will also support the NERSC-10 upgrade project at the CD-2 baseline level, and full operations and allocation of the NERSC-9 Perlmutter system. In addition, funding will support implementation of IRI and ECP software and technologies critical to HPC operations and users. The Request continues support for exploratory efforts in AI and quantum computing to benefit the NERSC user community.	The increase will support NERSC operations, and the NERSC-10 upgrade project at the CD-2 baseline level.
High Performance Data Facility, OPC	*$8,000*	*$4,000*	*-$4,000*
Funding supports conceptual design for the HPDF project in preparation for CD-1.		The Request provides funding to complete the design of HPDF with	Final design with a phased approach to installation will be completed to determine next steps

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
	options for phased installation in the future.	for this project, preserving options to meet the urgency of the Department's mission needs in data-intensive research and AI.
Leadership Computing Facilities $475,195	$490,098	+$14,903
The funding supports operations at the LCF facilities at ANL and ORNL, including user support, power, space, system leases, early access systems and testbeds, and staff. Funding supports operations and allocation of exascale systems at OLCF and ALCF as well as planning and implementation for the major upgrade projects; AI efforts; user access to commercial quantum computing resources; vendor partnerships; and IRI. The LCFs will maintain ECP software and technologies critical to HPC operations and users.	The Request will support operations at LCF facilities at ANL and ORNL, including user support, power, space, system leases, early access systems and testbeds, and staff. The Request will support operations and allocation of exascale systems at OLCF and ALCF. The Request will grow support implementation of major upgrade projects; AI testbeds; user access to commercial quantum systems; vendor partnerships; and IRI. The LCFs will continue support for ECP software and technologies critical to HPC operations and users.	The increase will support LCF operations, the OLCF-6 project at the target baseline, and implementation of the ALCF-4 project.
Leadership Computing Facility at ANL $215,195	*$222,755*	*+$7,560*
Funding supports the start of operations and competitive allocation of the ALCF-3 exascale system, Aurora, which will deploy and maintain ECP software and technologies as well as serve the user community as DOE's most capable AI system. The funding supports continuing operation and competitive allocation of the ALCF systems as well as AI testbeds, planning for the ALCF-4 upgrade project, vendor partnerships, and early implementation of IRI.	The Request will support operations and competitive allocation of the Aurora exascale system and the AI Testbed. The Request will support implementation of the ALCF-4 upgrade project. The Request will continue to support implementation of IRI. ALCF will continue to deploy and maintain ECP software and technologies critical to HPC operations and users.	The increase will support ALCF operations and implementation of the ALCF-4 upgrade project.
Leadership Computing Facility at ORNL $260,000	*$267,343*	*+$7,343*
Funding supports operations at the OLCF facility, including user support, power, space, maintenance, and staff. Funding also supports operation and competitive allocation	The Request will support operations at the OLCF facility, including user support, power, space, maintenance, and staff. The Request will support the OLCF-6	The increase will support OLCF operations and the OLCF-6 upgrade project at the target baseline.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
of the Frontier exascale system and planning and implementation of the OLCF-6 upgrade project, contingent on achievement of CD-2/3. The funding supports user access programs for commercial quantum computing platforms, vendor partnerships, and advanced computing testbeds. OLCF will deploy and maintain ECP software and technologies critical to HPC operations and users. Funding also supports the early implementation of IRI.		upgrade project at the target baseline. The Request will also support operation and competitive allocation of the Frontier exascale system and the user access program for commercial quantum computing platforms. The Request also will support implementation of IRI. OLCF will continue to deploy and maintain ECP software and technologies critical to HPC operations and users.	
High Performance Network Facilities and Testbeds	$93,540	$97,261	+$3,721
Funding supports operations of ESnet at 99.9 percent reliability, including user support, operations and maintenance of equipment, fiber leases, R&D testbed, and staff. Funding also supports site resiliency investments and early implementation of IRI.		The Request will support operations of ESnet at 99.9 percent reliability, including user support, operations and maintenance of equipment, fiber leases, R&D testbed, and staff. Funding also supports site resiliency investments and implementation of IRI.	The increase will support ESnet operations, and implementation of site resiliency improvements.
Integrated Research Infrastructure	$3,000	$3,119	+$119
Funding supports commencement of IRI community governance activities and initial investments to build core IRI operations services.		The Request will support continuation of IRI community governance activities and software engineering for core IRI operations services.	The increase will support limited expansion of software engineering efforts.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Advanced Scientific Computing Research
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	5,000	5,000	5,000	–
Total, Capital Operating Expenses	**N/A**	**N/A**	**5,000**	**5,000**	**5,000**	**–**

Capital Equipment

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Total, Non-MIE Capital Equipment	N/A	N/A	5,000	5,000	5,000	–
Total, Capital Equipment	**N/A**	**N/A**	**5,000**	**5,000**	**5,000**	**–**

Note:
- *The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.*

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
24-SC-20, High Performance Data Facility						
Total Estimated Cost (TEC)	112,000	-	1,000	-	-	-
Other Project Cost (OPC)	10,933	3,860	7,000	-	-	-
Total Project Cost (TPC)	122,933	3,860	8,000	-	-	-
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	1,000	-	-	-
Other Project Cost (OPC)	N/A	N/A	7,000	-	-	-
Total Project Cost (TPC)	N/A	N/A	8,000	-	-	-

Advanced Scientific Computing Research
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type A					
National Energy Research Scientific Computing Center	135,000	135,155	146,500	150,328	+3,828
Number of Users	10,500	–	10,750	11,000	+250
Achieved Operating Hours	–	8,485	–	–	–
Planned Operating Hours	8,585	8,585	8,585	8,585	–
Unscheduled Down Time Hours	–	100	–	–	–
Argonne Leadership Computing Facility	219,000	219,000	215,195	222,755	+7,560
Number of Users	1,650	–	1,700	1,750	+50
Achieved Operating Hours	–	8,742	–	–	–
Planned Operating Hours	7,008	7,008	7,008	7,008	–
Oak Ridge Leadership Computing Facility	255,000	255,045	260,000	267,343	+7,343
Number of Users	1,750	–	1,800	1,800	–
Achieved Operating Hours	–	8,603	–	–	–
Planned Operating Hours	7,008	7,008	7,008	7,008	–
Energy Sciences Network	91,000	90,923	93,540	97,261	+3,721
Achieved Operating Hours	–	8,760	–	–	–
Planned Operating Hours	8,760	8,760	8,760	8,760	–
Total, Facilities	700,000	700,123	715,235	737,687	+22,452
Number of Users	13,900	–	14,250	14,550	+300
Achieved Operating Hours	–	34,590	–	–	–
Planned Operating Hours	31,361	31,361	31,361	31,361	–
Unscheduled Down Time Hours	–	100	–	–	–

Note:
- *Achieved Operating Hours and Unscheduled Downtime Hours will only be reflected in the Congressional budget cycle which provides actuals.*
- *Percent optimal operations defines what is achieved at this funding level. This includes staffing, up-to-date equipment and software, operations and maintenance, and appropriate investments to maintain world leadership.*

Advanced Scientific Computing Research
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	795	811	802	-9
Number of Postdoctoral Associates (FTEs)	335	341	338	-3
Number of Graduate Students (FTEs)	500	510	505	-5
Number of Other Scientific Employment (FTEs)	215	219	217	-2
Total Scientific Employment (FTEs)	**1,845**	**1,881**	**1,862**	**-19**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals and other support staff.*

Basic Energy Sciences

Overview

The Basic Energy Sciences (BES) program's mission is to support fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels, generating knowledge that can enable development of energy technologies critical to the Nation's economic and national security. BES research provides the scientific foundations for innovations that advance technologies for the generation, conversion, transmission, and storage of energy, as well as critical and emerging technologies in quantum information science and microelectronics, thereby supporting the DOE missions in energy and national security. Such advances necessarily require the discovery, design, and control of materials and chemical systems across large scales of time and space. BES accomplishes this through sustained investment in leading-edge scientific research and the stewardship of world-class scientific user facilities that enable cutting-edge research and development.

The research disciplines that BES supports—condensed matter and materials physics, chemistry, geosciences, and aspects of biosciences—touch virtually every important aspect of efficient energy resource production, conversion, transmission, and storage, providing a knowledge base for achieving a secure, abundant, and affordable energy future. The BES Advisory Committee (BESAC) report, "A Remarkable Return on Investment in Fundamental Research,"[a] provides key examples of major technological, commercial, and national security impacts that are directly traceable to BES-supported basic research. This mission-relevance of BES research results from a long-standing strategic planning process, which encompasses BESAC reports, community workshops and reports, and rigorous program reviews. BES balances its research investments between discovery-oriented transformational basic research and use-inspired basic research.

BES scientific user facilities consist of complementary x-ray sources, neutron sources, and centers for research utilizing nanoscale science. Capabilities at BES facilities can probe materials and chemical systems with ultrahigh spatial, temporal, and energy resolutions to investigate the critical functions of matter—transport, reactivity, excitations, and motion—to answer challenging science questions and to provide insights on the scientific basis for energy technologies. The above-noted BESAC report recounts the central role of user facilities in U.S. scientific and industrial leadership. BES has a long history of delivering major construction projects on time and on budget, and of providing reliable availability and support to users for operating facilities.[b] This record of accomplishment includes rigorous community engagement in planning and in performance assessment for operating facilities and construction.

Key to exploiting scientific discoveries for future energy systems is the ability to create new materials using forefront innovative synthesis and processing techniques to precisely define the atomic arrangements, and to discover, design, and direct chemical processes. These innovations, based on principles revealed by fundamental science and using experimental tools with advanced computational, artificial intelligence, and data science, enable better control of physical and chemical transformations and conversions of energy from one form to another generating useful information for the development and improvement of energy technologies and industrial processes. Working closely with other DOE offices, BES research is informed by practical technology challenges and findings are disseminated to the broader community to translate federal investments to industrial impact and economic prosperity.

BES is focused on enhancing research and user communities across the Nation. The grand challenge and use-inspired scientific research that is necessary to address National priorities requires a sustained and integrated ecosystem of scientists, engineers, and enabling capabilities. Collectively, BES research and facilities provide a significant strategic advantage for the Nation to advance scientific frontiers while laying the foundation for future energy innovations that will sustain American energy dominance.

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[a] https://science.osti.gov/~/media/bes/pdf/BESat40/BES_at_40.pdf

[b] https://www.gao.gov/assets/gao-08-641.pdf

Highlights of the FY 2026 Request

The BES FY 2026 Request of $2,241.0 million is a decrease of $347.3 million below the FY 2025 Enacted level.

Research

Guided by strategic planning, including BESAC and Basic Research Needs workshop reports, the Request underscores continues support for EFRCs, NQISRCs , and BES core scientific research programs. Continued funding for the Established Program to Stimulate Competitive Research (EPSCoR) will maintain support of institutions in U.S. states and territories that do not historically have large federally supported academic research programs, thereby enhancing research and user communities from across the Nation to ensure a strong scientific foundation in the BES ecosystem. The FY 2026 Request:

- Increases funding for Artificial Intelligence and Machine Learning (AI/ML) research to accelerate fundamental discoveries, enhance user facility operations, and advance interpretation of massive data sets. As part of this portfolio, BES will expand efforts focused on AI/ML for science within the Theoretical Condensed Matter Physics and Computational and Theoretical Chemistry programs.
- Increases funding for QIS research, which includes a robust core research portfolio to complement the NQISRCs, which are undergoing recompetition/renewal in FY 2025.
- Increases funding for Critical Minerals and Materials (CMM) research to expand understanding of the role of rare earth elements (REEs), platinum-group elements (PGEs), and other critical elements in determining the functional properties of materials and catalysts across different length scales, discover chemical processes and materials that can enhance recovery and reuse of critical elements, and develop fundamental knowledge of how best to reduce or eliminate the need for critical elements in chemical processes and energy technologies.
- Continues funding for muti-disciplinary microelectronics research in which materials, chemistries, devices, systems, architectures, algorithms, and software are developed in a closely integrated, co-design approach. As part of this portfolio, the Microelectronics Science Research Centers (MSRCs) comprise a network of multiple team awards, with individual awards focused on a dimension related to a common research topic for each center. The multidisciplinary teams include researchers from national laboratories, universities, and industry. The Request will enable support for BES research awards that contribute to these cross-SC Research Centers.
- Continues funding for the highest priority research that provides foundational knowledge for the development of next-generation energy technologies.

Facility Operations

The Request balances support for user access with the need to ensure safe operations of five BES-supported x-ray light sources, two neutron sources, and five Nanoscale Science Research Centers (NSRCs). Preconceptual planning continues for beamline MIE projects.

Projects

Support continues for the Linac Coherent Light Source-II High Energy (LCLS-II-HE), Second Target Station (STS), and Cryomodule Repair and Maintenance Facility (CRMF) line-item projects. Funding is requested for the Advanced Light Source Upgrade (ALS-U) line-item project consistent with a new project baseline budget to be established in FY 2026. Funding for the NSLS-II Experimental Tools (NEXT)–III and High Flux Isotope Reactor (HFIR) Pressure Vessel Replacement (PVR) projects is deferred.

Basic Energy Sciences
Funding

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Basic Energy Sciences				
Scattering and Instrumentation Sciences Research	114,646	81,396	25,497	-55,899
Condensed Matter and Materials Physics Research	198,714	205,714	144,022	-61,692
Materials Discovery, Design, and Synthesis Research	91,297	87,297	48,698	-38,599
Established Program To Stimulate Competitive Research EPSCoR	25,000	25,000	25,000	–
Energy Frontier Research Centers - Materials	65,000	65,000	58,000	-7,000
Energy Earthshot Research Centers - Materials	3,500	3,500	–	-3,500
Energy Innovation Hubs - Materials	25,913	25,913	25,913	–
Computational Materials Sciences	13,492	13,492	4,000	-9,492
Total, Materials Sciences and Engineering	**537,562**	**507,312**	**331,130**	**-176,182**
Fundamental Interactions Research	133,593	140,593	101,315	-39,278
Chemical Transformations Research	118,658	114,658	61,858	-52,800
Photochemistry and Biochemistry Research	131,460	99,710	45,107	-54,603
Energy Frontier Research Centers - Chemical	65,000	65,000	60,000	-5,000
Energy Earthshot Research Centers - Chemical	3,500	3,500	–	-3,500
Energy Innovation Hubs - Chemical	20,758	20,758	20,758	–
General Plant Projects - Chemical	1,000	1,000	1,000	–
Computational Chemical Sciences	13,492	13,492	4,000	-9,492
Total, Chemical Sciences, Geosciences, and Biosciences	**487,461**	**458,711**	**294,038**	**-164,673**
X-Ray Light Sources	709,134	778,865	805,106	+26,241
High-Flux Neutron Sources	375,163	373,367	385,146	+11,779
Nanoscale Science Research Centers	150,880	159,230	165,770	+6,540
Other Project Costs	14,000	9,500	5,000	-4,500
Major Items of Equipment	25,000	–	–	–
Scientific User Facilities, Research	65,800	67,800	33,467	-34,333
Total, Scientific User Facilities (SUF)	**1,339,977**	**1,388,762**	**1,394,489**	**+5,727**
Subtotal, Basic Energy Sciences	**2,365,000**	**2,354,785**	**2,019,657**	**-335,128**

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Construction				
24-SC-10 HFIR Pressure Vessel Replacement (PVR), ORNL	4,000	6,000	–	-6,000
24-SC-12 NSLS-II Experimental Tools - III (NEXT-III), BNL	2,556	5,500	–	-5,500
21-SC-10 Cryomodule Repair & Maintenance Facility (CRMF), SLAC	9,000	20,000	20,000	–
19-SC-14 Second Target Station (STS), ORNL	52,000	52,000	52,000	–
18-SC-11 Spallation Neutron Source Proton Power Upgrade (PPU), ORNL	15,769	–	–	–
18-SC-12 Advanced Light Source Upgrade (ALS-U), LBNL	57,300	50,000	50,000	–
18-SC-13 Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC	120,000	100,000	99,343	-657
Subtotal, Construction	260,625	233,500	221,343	-12,157
Total, Basic Energy Sciences	2,625,625	2,588,285	2,241,000	-347,285

SBIR/STTR funding:

- FY 2024 Enacted: SBIR $35,002,000 and STTR $4,922,000
- FY 2025 Enacted: SBIR $33,354,000 and STTR $4,691,000
- FY 2026 Request: SBIR $21,204,000 and STTR $2,982,000

Basic Energy Sciences
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Materials Sciences and Engineering Research will continue to support fundamental scientific opportunities for materials innovations. Research priorities include energy technologies (e.g., nuclear, energy storage, and grid), microelectronics research (including the MSRCs), AI/ML, critical materials, and QIS. The Request also includes funding for continued support of the EFRCs, the Batteries and Energy Storage Energy Innovation Hub, the NQISRCs (recompetition/renewal in FY 2025), and EPSCoR.	-$176,182
Chemical Sciences, Geosciences, and Biosciences Research will continue to support fundamental scientific opportunities for innovations in chemistry, geosciences, and biosciences. Research priorities include energy (e.g., geothermal, fuels and high commodity chemicals), AI/ML, QIS, microelectronics (including the MSRCs), and critical materials. The Request also includes funding for continued support of the EFRCs, the NQISRCs (recompetition/renewal in FY 2025), and the Fuels from Sunlight Hub (renewal in FY 2025).	-$164,673
Scientific User Facilities (SUF) The 12 BES user facilities will be supported in a manner balancing safe operation and user access. Continued facilities research priorities include accelerator and detector R&D and expansion of AI/ML. The Request also provides Other Project Costs (OPC) to support the LCLS-II-HE project.	+$5,727
Construction The Request provides continuing support for the LCLS-II-HE, STS, CRMF, and ALS-U projects.	-$12,157
Total, Basic Energy Sciences	-$347,285

Basic and Applied R&D Coordination

As a program that supports fundamental scientific research relevant to many DOE mission areas, BES strives to build and maintain close connections with other DOE program offices. BES coordinates with DOE R&D programs through a variety of Departmental activities, including workshops, strategic planning activities, solicitation development, and program review, as elaborated below. BES also coordinates with DOE technology offices in the Small Business Innovation Research (SBIR) and Small-Business Technology Transfer Research (STTR) program, including topical area planning, solicitations, reviews, and award recommendations.

BES has robust interactions with DOE technology offices through formal and informal coordination activities. Historically, co-siting of research by BES and other DOE programs at the same institutions has facilitated close integration of basic and applied research. The DOE national laboratory system plays a crucial role in achieving this integration of basic and applied research.

BES program managers also participate in intra-DOE information exchange and coordination on solicitations and in program reviews and project selections. These activities facilitate cooperation and coordination between BES and other parts of DOE, notably the energy technology offices.

Program Accomplishments

- In FY 2024, over 13,700 unique users accessed BES user facilities,[c] approximately 27 percent taking advantage of remote access.
- The APS-U project completed installation of the upgraded storage ring and achieved first light, delivering x-rays to the resonant inelastic x-ray scattering beamline, one of multiple beamlines upgraded as part of the project. Following this milestone, APS has resumed its user program, with more than three dozen beamlines available to the scientific community.
- Researchers from one of the DOE's NQISRCs developed a new technique for characterizing the sources of energy loss in superconducting qubits. Through a comparison of devices made using different combinations of superconducting material and substrate preparation, the research team discovered that tantalum-based qubits on annealed sapphire showed dramatically reduced losses. This finding may enable qubit designs with improved coherent times, of interest to many industrial quantum computing companies.
- An EFRC demonstrated, for the first time, the concept of "edge of chaos", or semi-stability, in an artificial system. The phenomenon, observed in nature as the self-amplification of electrical signals passing through axons in the brain, allows an electrical signal to pass through a metallic conductor without requiring amplifiers to address signal loss due to resistance. The result has the potential to revolutionize chip design and performance by making them simpler and more efficient.
- Led by an EFRC, a multi-institutional group from several DOE laboratories and universities in the U.S. and Germany combined experiments and theory to capture the first image of electron motion decoupled from nuclear motion, revealing the immediate electronic response to ionizing radiation. Leveraging the availability of attosecond pump/probe x-ray pulses at the LCLS, the team developed an entirely new technique for this work–all x-ray attosecond transient absorption spectroscopy in liquids—opening new directions for attosecond science.
- A team of researchers from multiple U.S. universities developed a recyclable macrocyclic chelator capable of selectively separating the rare earth elements neodymium and dysprosium in aqueous solutions. This new chelator offers a promising new approach to the separation of complex electronic waste containing these and other valuable materials used in a wide range of energy and information technologies.
- A collaboration between users and staff from a nanoscience research center developed a new class of supramolecular organo-ionic electrolytes that can be utilized in solid-state batteries (SSBs) to enable direct cathode recycling under more modest conditions. The new electrolytes, which are viscoelastic solids, offer benefits to solid-state battery fabrication, and show excellent performance in both new and refurbished SSBs.

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[c] Note that the number of users was less than prior fiscal years due to the APS outage for facility upgrades.

- An international team from the U.S., Germany, and Japan demonstrated that a 2D device made of three atomic layers of tungsten diselenide could perform all-optical processing of information using only a small number of photons. This approach, which leverages the world-unique Quantum Press at Brookhaven National Laboratory, shows promise for improving the speed and energy efficiency of telecommunications and for secure quantum communication.
- Researchers created 3D-printable semiconductor “inks” made from the more earth-abundant hafnium and zirconium that show very high photoluminescence for blue and green emission. The class of materials, ionic halide perovskites, can be synthesized with high-purity at low temperatures and offer significant benefits for applications in electronics and energy.
- A collaboration between DOE scientific user facilities led to the development of a software toolkit for AI-driven autonomous high-resolution scanning microscopy that demonstrates a greater than 70 percent reduction in the data and dose required to yield a representative scanning x-ray microscopy image. The new toolkit, which incorporates AI and edge computing at the beamline, gives users the ability to make smarter scans focused on areas of interest in a sample, mitigating some of the challenges that are expected due to forthcoming upgrades at DOE user facilities.
- An international team of researchers demonstrated the impact of the microenvironment within zeolite pores on the dehydration of cyclohexanol, a common biomass chemical. The work offers insight into how microenvironments in porous systems like zeolites can be tailored at the atomic level to promote the conversion of biomass or other starting materials into high value industrial chemicals.
- The DOE EPSCoR program, designed to enhance geographic balance through support for research institutions in states that have traditionally received less federal R&D funding, provided $37 million in grants from SC’s six major research programs as well as DOE technology offices for research at academic institutions in 19 EPSCoR jurisdictions.
- A team of DOE laboratory researchers discovered a new approach to reducing dinitrogen to other nitrogen containing compounds under ambient conditions. The team designed new compounds that link common rare-earth or d-block metals using simple organic linkers to create cavities dinitrogen can diffuse into to bind the metals and become activated for further reactions. The results will guide potential strategies for reducing the energy intensity of ammonia production.

Basic Energy Sciences
Materials Sciences and Engineering

Description
Materials are critical to nearly every aspect of energy generation, storage, transmission, and end-use, as well as numerous other critical technologies, including in the areas of quantum information science (QIS) and microelectronics. Materials limitations are often a significant barrier to longer lifetimes of infrastructure and devices, the introduction of new energy technologies, or improved energy efficiencies. The Materials Sciences and Engineering (MSE) subprogram supports research to provide the fundamental understanding and control of materials synthesis, properties, and functionality that will enable solutions to challenges in energy generation, storage, and use. The research explores the origin of macroscopic material behaviors; their fundamental connections to atomic, molecular, and electronic structures; and their evolution as materials move from nanoscale building blocks to mesoscale systems. At the core of the subprogram is experimental, theoretical, computational, and instrumentation research that will enable the predictive discovery, design, and characterization of new materials with novel structures, properties, and functions. To accomplish these goals, the portfolio includes three integrated research activities:

- Scattering and Instrumentation Sciences Research
- Condensed Matter and Materials Physics Research
- Materials Discovery, Design, and Synthesis Research

The Request continues the highest-priority fundamental research that supports the DOE mission and establishes the foundational knowledge necessary to accelerate innovation to advance energy technologies, critical emerging technologies, and other national priorities. The portfolio emphasizes understanding of how to direct and control energy flow in materials systems over multiple time and length scales, and translation of this understanding to prediction of material behavior, transformations, and processes in challenging real-world systems. This will establish a foundational knowledge base for future advanced energy and information technologies, as well as industrial processes. The research supported explores a broad spectrum of materials science, including new frontiers of emergent materials behavior; utilization of nanoscale control; and metastable or far from equilibrium materials systems that enable novel materials design and advanced manufacturing.

Research activities in quantum materials emphasize the development of systems that realize unique properties required for QIS technologies. Materials science for microelectronics provides the advances needed for future computing, sensors, detectors, and communication critical for energy and for leadership in advanced research. An increasingly important aspect of materials research is the use of artificial intelligence/machine learning (AI/ML) and data science techniques to enhance the utility of both theoretical and experimental data for predictive design and discovery of materials. The MSE subprogram supports the development of advanced characterization tools, instruments, and techniques that can assess a wide range of space and time scales, especially in combination and under operando conditions to analyze non-equilibrium materials, conditions, and excited-state phenomena. In addition to a multifaceted portfolio of single-investigator and small-group research projects, the MSE subprogram supports multi-investigator, multi-disciplinary team-science research modalities, including Energy Frontier and Microelectronics Science Research Centers, Energy Innovation Hubs, Computational Materials Sciences, and the National QIS Research Centers (NQISRCs). This subprogram also includes the DOE Established Program to Stimulate Competitive Research (EPSCoR) program to broaden investments in foundational science and early-stage energy research for U.S. states and territories that do not historically have large federally supported academic research programs.

Scattering and Instrumentation Sciences Research
This activity supports innovative techniques and instrumentation development for advanced materials science research with scattering, spectroscopy, and imaging using electrons, neutrons, and x-rays, including development of science to understand ultrafast dynamics. These techniques provide precise and complementary information about the relationship among structure, dynamics, and properties, and are critical in advancing understanding and discovery of novel quantum materials, including materials for next-generation

systems to advance microelectronics and QIS. The tools and capabilities developed in this activity are broadly applicable to other fields, including chemistry, biology, and geoscience. The unique interactions of electrons, neutrons, and x-rays with matter enable a range of complementary tools with different sensitivities and resolution for the characterization of systems at length- and time-scales spanning many orders of magnitude. Included is the use of cryogenic environments to evaluate properties only occurring at low temperatures and to learn about processes and interfaces in materials damaged by the probes used to characterize them. In parallel with the development of advanced instrumentation, application of novel data science approaches, including those leveraging AI/ML, to improve the collection, processing, and analysis of very large data sets is critical to ensuring optimal use of such instruments.

Condensed Matter and Materials Physics Research
This activity supports fundamental experimental and theoretical research to discover, understand, and control novel phenomena in solid materials. These electronic, magnetic, optical, thermal, and structural materials make up the infrastructure for innovative energy advances, accelerator and detector technologies for SC facilities, and microelectronics and QIS. This activity supports research to understand the role of critical materials in determining material properties and functionality, so that they can be reduced or eliminated from key energy technology supply chains.

Experimental research in this activity emphasizes discovery and characterization of materials' properties that have the potential to be exploited for new technological functionalities. Complementary theoretical research aims to explain such properties across a broad range of length- and time-scales. Theoretical research also includes development and integration of predictive theory and modeling for discovery of materials with targeted properties. Advanced computational and data science techniques, including AI/ML, are enabling knowledge to be extracted from large materials databases of theoretical calculations and experimental measurements. This activity supports the development of such databases, the computational tools that can take advantage of them, and innovative physics-guided AI approaches to accelerate discovery. This activity continues to emphasize understanding and control of quantum materials. The research advances the fundamental understanding of electronic, magnetic, thermal, and optical properties relevant to energy-efficient microelectronics and QIS. Specifically, the MSE subprogram's dedicated QIS portfolio supports fundamental research with potentially transformative impact on the development and characterization of qubit platforms for future quantum computing, sensing, and communication systems. Activities also emphasize research to understand how materials respond to temperature, light, radiation, corrosive chemicals, and other environmental conditions.

In FY 2026, BES will continue to partner with other SC programs in the NQISRC program. NQISRC research supported by the MSE subprogram includes theory of materials for quantum applications in computing, communication, and sensing; device science for next-generation QIS systems; and synthesis, fabrication, and characterization of quantum materials. BES will also continue to partner with other SC programs on activities to support multi-disciplinary basic research to accelerate the advancement of microelectronic technologies in a co-design innovation ecosystem, where the design of materials, devices, architectures, and algorithms are integrated as part of a single R&D pipeline.[d] BES contributes to the SC Microelectronics Science Research Centers (MSRCs) program, a portfolio of awards that support research in energy efficiency for microelectronics or their operation in extreme environments. Materials, chemistries, devices, systems, architectures, algorithms, and software are being developed in tandem .

Materials Discovery, Design, and Synthesis Research
This activity supports the predictive design, discovery, and development of new materials with desired properties, which is the engine that drives science frontiers and technology innovations. It aims to grow and maintain U.S. leadership in materials discovery by investing in advanced synthesis capabilities and by coupling these with state-of-the-art user facilities and advanced computational capabilities at DOE laboratories, generating scientific knowledge that is foundational to the BES mission.

[d] https://science.osti.gov/-/media/bes/pdf/reports/2019/BRN_Microelectronics_rpt.pdf

The FY 2026 Request continues support of materials discovery and synthesis research to understand the unique properties of critical materials, with the goal of reducing their use. Understanding the science of synthesis will enable design of new systems that are easier to efficiently convert into similar products with comparable or enhanced complexity, functionality, and value. The activity also supports fundamental research in solid-state chemistry to enable discovery of new functional materials and the development of new crystal growth methods and thin film deposition techniques to create complex materials with targeted structure and properties. In addition to research on chemical and physical synthesis processes, the portfolio includes research to understand how to use bio-mimetic and biology-inspired approaches to design and synthesize novel materials with some of the unique properties found in nature. The activity supports the development of new AI/ML-based approaches aimed at accelerating materials discovery and enabling scalable, automated synthesis with real-time adaptive control.

Established Program to Stimulate Competitive Research (EPSCoR)
The DOE EPSCoR program funds fundamental and early-stage research that supports DOE's science and energy mission in states and territories with historically lower levels of federal academic research funding. The program emphasizes research that will improve the capability of designated states and territories to conduct nationally competitive fundamental and early-stage energy-related research; jumpstart research capabilities through workforce development in energy-related areas; and build beneficial relationships between scientists and engineers in the designated jurisdictions and DOE laboratories. Managed by BES, funding for the EPSCoR program is distributed among the six major research programs within SC.[e] Annual EPSCoR funding opportunities alternate between research performed in collaboration with the DOE laboratories and larger-team implementation awards. The FY 2026 program is planned to focus on EPSCoR State-National Laboratory Partnership awards promoting single-investigator and small-group interactions with the unique capabilities of the DOE national laboratory system. The technical scope will focus on the research topics supported by SC program offices and early-stage energy research broadly. The program will continue to support other SC programs, including the Early Career Research Program.

Energy Frontier Research Centers
The EFRC research modality brings together the skills and talents of teams of investigators to combine discovery science and energy-relevant basic research whose scope and complexity is beyond what is possible from single-investigator or small-group awards. These multi-investigator, multi-disciplinary centers aim to accelerate basic research to enable transformative scientific advances and uncover new and innovative solutions to the most difficult problems in materials sciences. EFRCs supported in this subprogram focus on the design, discovery, synthesis, characterization, and understanding of novel, solid-state materials that generate and convert energy; the understanding of materials and processes foundational for electrical energy storage; quantum materials and QIS; microelectronics; and materials for future nuclear energy. The FY 2026 Request continues support for EFRC awards made in FY 2024 and supports plans to recompete EFRC awards made in FY 2022 along with new priority topics.

Energy Innovation Hubs
The Batteries and Energy Storage Energy Innovation Hub program will continue to tackle forefront, basic scientific challenges for next-generation electrochemical energy storage. Hubs focus on collaborative research to overcome key scientific barriers for major energy challenges that require large, multidisciplinary teams to provide the required science foundations and innovations. The Request will continue to support the Hub awards initiated in prior years.

Computational Materials Sciences
This program has focused on research leading to computational codes and associated experimental/computational databases for the design of materials with advanced functionalities. This included development of new ab initio theory, contributing the generated data to databases; advanced characterization and controlled synthesis to provide the data to validate computational predictions; and design of computational codes to take advantage of DOE's world-leading exascale high-performance computers.

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[e] Per direction in the explanatory statement accompanying the FY 2023 Consolidated Appropriations Act

In FY 2026, the program will focus on development of novel AI/ML-based tools and techniques for accelerated scientific discovery. Support for the maintenance and further development of high value, widely used software previously developed under the program may be considered based on program priorities.

Basic Energy Sciences
Materials Sciences and Engineering

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Materials Sciences and Engineering	**$507,312**	**$331,130**	**-$176,182**
Scattering and Instrumentation Sciences Research	$86,396	$30,497	-$55,899
Funding continues to focus on the development and use of advanced characterization tools, including the use of multiscale, multimodal, and cryogenic techniques to extract information on multiple length and time scales. Advanced instrumentation research can be applied to diverse national priorities, including QIS, advanced industrial processes, and preparedness for biological threats (cryogenic microscopy).		The Request will continue to focus on the development and use of advanced characterization tools to extract information on multiple length and time scales. Advanced instrumentation research will be applied to a breadth of national priorities, including QIS, microelectronics, critical minerals, energy science, and advanced industrial processes.	Reductions will be based on programmatic priorities.
Condensed Matter and Materials Physics Research	$200,714	$139,022	-$61,692
Funding continues to emphasize the understanding and control of the fundamental properties of materials, including critical materials, that are central to their functionality in a wide range of energy-relevant technologies. Exploration of quantum materials remains a high priority, and particularly the role that these materials play in microelectronics, accelerators, and QIS. The program will partner with other SC program offices in the recompetition of the NQISRCs as the original awards complete five years of research. Investments continue to support awards as part of the Microelectronics Science Research Centers.		The Request will continue to emphasize the understanding and control of the fundamental properties of materials that are central to their functionality in a wide range of clean energy-relevant technologies. Exploration of quantum materials remains a high priority, specifically the role they play in microelectronics, accelerators, and QIS. The program will partner with other SC program offices in the NQISRCs and the MSRCs. Additional investments will expand support for research to leverage AI/ML to accelerate materials discovery and characterization.	Expanded investments will include additional support for AI/ML. Reductions in other areas of core research will be based on programmatic priorities.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Materials Discovery, Design, and Synthesis Research $87,297	$48,698	-$38,599
Funding continues to support design, discovery, and synthesis of novel forms of matter with desired properties and functionalities with an emphasis on advancing the fundamental science relevant to future low-carbon industrial processes and energy technologies. Research on bio-mimetic and biology-inspired materials is relevant to energy technologies as well as other national priorities such as preparedness for and response to biological threats.	The Request will continue support for the design, discovery, and synthesis of novel forms of matter with desired properties and functionalities with an emphasis on advancing the fundamental science relevant to future industrial processes and energy technologies, as well as developing and implementing novel AI-based techniques to accelerate synthesis and characterization. Research on bio-mimetic and biology-inspired materials is relevant to energy technologies as well as other national priorities such as critical minerals and materials.	Reductions will be based on programmatic priorities.
Established Program to Stimulate Competitive Research (EPSCoR) $25,000	$25,000	$ —
Funding continues to support early-stage R&D, including research that underpins DOE energy technology programs and the SC Energy Earthshots initiative Following the previous year's focus on State-Lab partnership awards, FY 2025 continues to emphasize implementation awards, larger multiple investigator teams that develop research capabilities, including investment in instrumentation, in EPSCoR jurisdictions. Investments continue in early career research faculty from EPSCoR-designated jurisdictions.	The Request will continue to support fundamental science and early-stage R&D, including research that underpins DOE energy technology programs. FY 2026 will support State-National Laboratory Partnership awards. Investment will continue in early career research faculty from EPSCoR-designated jurisdictions and in co-investment with other initiatives.	Funding will focus on State-National Laboratory Partnership awards promoting interactions between EPSCoR institutions and the DOE national laboratory system.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Energy Frontier Research Centers	$65,000	$58,000	-$7,000
Funding provides the fourth year of support for four-year EFRC awards that were made in FY 2022 and the second year of funding for awards made in FY 2024 in a broad range of topics relevant to national priorities on energy technologies.		The Request will provide the third year of support for four-year EFRC awards that were made in FY 2024. In addition, BES will recompete awards made in FY 2022, with emphasis on a broad range of topics relevant to energy and other national priorities.	Technical emphasis for the EFRC program will broaden to include new research directions that cut across BES programmatic efforts, as well as those identified in recent strategic planning activities related to energy, QIS, microelectronics, and other national priorities.
Energy Earthshot Research Centers	$3,500	$ —	-$3,500
Funding provides support for the EERCs that were initiated in prior fiscal years.		The EERC activity will sunset in FY 2025.	No funding is requested.
Energy Innovation Hubs	$25,913	$25,913	$ —
Funding supports the third year of funding for new Batteries and Energy Storage Hub awards initiated in prior years through an open competition.		The Request will support the fourth year of funding for Batteries and Energy Storage Hub awards initiated in prior years through an open competition.	No change.
Computational Materials Sciences	$13,492	$4,000	-$9,492
Funding supports the third year of funding for awards made in FY 2023 and the second year of funding for awards planned for FY 2024. The Request continues to support research aimed at the development of open source, validated software that takes advantage of DOE's leadership computing facilities.		The CMS activity will develop AI-based tools and techniques for materials discovery and characterization. Support for the maintenance and further development of high value, widely used software previously developed under the program may be considered based on program priorities.	Fundamental research will target AI for accelerated scientific discovery.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

Development of innovative energy technologies relies on understanding and ultimately controlling transformations of energy among forms and conversions of matter across multiple scales starting at the atomic level. The Chemical Sciences, Geosciences, and Biosciences subprogram supports research to discover fundamental knowledge of chemical reactivity and energy conversion foundational to energy-relevant chemical processes, such as catalysis, synthesis, separations, and light-driven chemical transformations. The research addresses how physical and chemical phenomena at the scales of electrons, atoms, and molecules—including quantum phenomena—control complex and collective behavior of macroscopic-scale energy and matter conversion systems. Fundamental knowledge developed through this subprogram can enable science to tailor chemical transformations with atomic and molecular precision and achieve predictive understanding of complex chemical, geochemical, and biochemical systems.

To address these challenges, the portfolio includes coordinated research activities in three areas:

- Fundamental Interactions Research
- Chemical Transformations Research
- Photochemistry and Biochemistry Research.

The Request continues the highest-priority fundamental research that supports the DOE mission and provides foundational knowledge that can advance affordable, reliable, and secure energy technologies. Research will discover and develop chemical processes that are energy and atom efficient and increase understanding of the phenomena relevant to QIS. This fundamental science can lead to new approaches for industrial processes, innovations in microelectronics, and reduced dependence on critical materials and minerals. Fundamental biochemistry will discover principles that could enable biomimetic and biohybrid energy systems and guide development of new biotechnologies. Integration of artificial intelligence/machine learning (AI/ML), data science, and computational chemistry will provide tools and infrastructure needed for shared data repositories and accelerated discovery and characterization of complex chemical systems.

The CSGB subprogram supports a multifaceted portfolio of single-investigator and small-group research projects as well as multi-investigator, multi-disciplinary team-science research including Energy Frontier and Microelectronics Science Research Centers, Energy Innovation Hubs, Computational Chemical Sciences, and the National QIS Research Centers (NQISRCs).

Fundamental Interactions Research

This activity emphasizes structural and dynamical studies of atoms, molecules, and nanostructures to understand their interactions in full quantum detail. Research is conducted at the boundary of chemistry and physics to understand reactive chemistry in the gas phase, in condensed phases, and at interfaces. This activity provides leadership for ultrafast chemistry and advances ultrafast tools and approaches to probe and control chemical processes. It supports theory and computation for accurate descriptions of molecular reactions and chemical dynamics, optimal use of exascale computing facilities, and potential application of future quantum computers to computational quantum chemistry. In support of SC's broader AI/ML Initiative, this activity supports AI/ML efforts that can advance use of exascale or quantum computing hardware to simulate chemical systems and processes for fundamental discovery as well as methods to accelerate the analysis of complex experimental data. It also supports a program of QIS research at the intersection of chemistry, quantum physics, and information theories that can advance foundational understanding of quantum information control in complex molecular systems. This fundamental research can lay the foundation for the chemical design principles needed to realize next-generation quantum technologies in computing, sensing, and communication.

In FY 2026, BES will continue as a partner in the NQISRC program, which is undergoing a recompetition/renewal in FY 2025. The research in this portfolio will advance state-of-the-art science and technology to realize the full potential of quantum-based applications and pave the path to quantum computing in the longer term. BES will also continue to partner on microelectronics research to unravel complex mechanisms of chemical reactions at interfaces to inform design and synthesis of new materials and chemical processes.[f] As part of this portfolio, the Microelectronics Science Research Centers (MSRCs) comprise a network of multiple team awards, with individual awards focused on a dimension related to one of two common research topics for each Center— energy efficiency or extreme environments. The multidisciplinary teams include researchers from universities, national laboratories, and industry and are developing chemistries, materials, devices, systems, architectures, algorithms, and software in a co-design innovation ecosystem.

Chemical Transformations Research
This activity seeks fundamental knowledge of chemical reactivity, matter and charge transport, and chemical separation and stabilization processes foundational to development of affordable and reliable energy technologies. Fundamental research in this activity spans catalysis science, separation science, heavy element chemistry, and geosciences to advance mechanistic understanding of charge transport and reactivity, catalytic efficiency and selectivity, critical materials recovery, conversion of energy resources, and chemistry in subsurface and aqueous systems important in chemical processes.

In the FY 2026 Request, this activity will continue to investigate transformative approaches for energy. Research will focus on discovery and design of catalytic and separation processes and provide fundamental knowledge of subsurface processes such as mineralization, crack propagation, and rock fracture to foster innovation in the use of the subsurface for energy generation and storage. Research will also address critical minerals and materials with a focus on approaches for resource identification and extraction, selective separation, and substitution of critical elements. Research will also examine quantum phenomena enabled by rare earth elements and actinides. AI/ML approaches will be emphasized to accelerate the generation of scientific knowledge foundational to the BES mission.

Photochemistry and Biochemistry Research
This activity supports research on the molecular mechanisms of light energy capture and its conversion into chemical and electrical energy in both natural and man-made systems. It integrates research at the interface of chemistry, physics, and biology and plays a leadership role for basic research on natural photosynthesis and photochemistry. This research can inspire new strategies for energy conversions and inform development of innovative energy technologies. To understand energy capture and conversion across spatial and temporal scales, research explores charge transport and reactivity and redox interconversion of atoms and small molecules important in production of commodity and specialty chemicals and fuels. Research also examines ionizing radiation effects on chemical reactions that can provide insights for nuclear reactor design, remediation, and fuel-cycle separation as well as other chemical transformations.

In the FY 2026 Request, the activity will continue to focus on molecular-level understanding of biochemical, biophysical, and photochemical processes. Research will aim to discover and design chemical processes, complex structures, and bio-inspired and biohybrid systems to advance affordable energy technologies, including microelectronics. This activity supports research to understand quantum phenomena such as coherence in natural and artificial systems, providing insights for enhancing energy conversion and potentially inspiring materials development for QIS. It also supports development of AI/ML-based methods to accelerate discovery of chemistries and new materials for energy conversion and to identify and characterize biochemical and biophysical processes based on large, complex datasets. Research will include studies to better harness light energy for chemical conversions and to reduce use of critical and rare earth elements in catalysts and light absorbers.

Energy Frontier Research Centers
The EFRC research modality brings together the skills and talents of teams of investigators to combine discovery science and energy-relevant, basic research whose scope and complexity are beyond what is possible from single-investigator or small-group awards. These multi-investigator, multi-disciplinary centers aim to accelerate

[f] https://science.osti.gov/-/media/bes/pdf/reports/2019/BRN_Microelectronics_rpt.pdf

basic research to enable transformative scientific advances and uncover new and innovative solutions to the most difficult problems in chemical sciences, geosciences, and biosciences. EFRCs supported in this subprogram focus on the design, discovery, characterization, and control of chemical, biochemical, and geological processes for improved electrochemical conversion; the understanding of catalytic chemistry and biochemistry that is foundational for production of fuels and chemicals and for separations; QIS; nuclear energy and the chemistry of waste processing; and the advanced characterization of the Earth's subsurface. The FY 2026 Request continues support for EFRC awards made in FY 2024 and supports plans to recompete awards made in FY 2022.

Energy Innovation Hubs
Energy Innovation Hubs focus on collaborative research to overcome key scientific barriers for major energy challenges that require large, multidisciplinary efforts. The Fuels from Sunlight Hub program addresses both new directions and long-standing challenges in solar fuels generation identified in the report from the Liquid Solar Fuels Roundtable.[g]

The two Fuels from Sunlight Hub awards conduct fundamental research on key scientific challenges for fuels production that uses light energy, water, and carbon dioxide as the only inputs. These awards received the final year of funding in FY 2024 for their initial five-year award term. Both projects were evaluated via peer review on an annual basis since initiation. Given the latest review results, the progress of both projects, and the distinct role of the awards in the BES portfolio, the Department is considering both awards for renewal in FY 2025 and will make renewal determinations based on the outcome of external peer review. Renewals would allow the projects to capitalize on their achievements during the initial funding period and to further advance research addressing critical needs in solar fuels development. FY 2026 funding will continue to support the Fuels from Sunlight Hub program consistent with outcomes of the FY 2025 renewal decisions.

Computational Chemical Sciences
This program has supported basic research to develop validated, open-source codes and associated experimental/ computational databases for modeling and simulation of complex chemical processes and phenomena and that can take advantage of today's exascale high-performance computers. Research has supported establishment of a publicly accessible website[h] of open source, robust, validated, user-friendly software that captures the essential physics and chemistry of relevant chemical systems. The broader research community and industry are using these codes/data to accelerate U.S. chemical research.

In FY 2026, the program will focus on development of novel AI/ML-based tools and techniques for accelerated scientific discovery. Support for the maintenance and further development of high value, widely used software previously developed under the program may be considered based on program priorities.

General Plant Projects
General Plant Projects funding provides for minor new construction, other capital alterations and additions, and improvements to land, buildings, and utility systems to maintain the productivity and usefulness of DOE-owned facilities and to meet requirements for safe and reliable facilities operation.

[g] https://science.osti.gov/-/media/bes/pdf/reports/2020/Liquid_Solar_Fuels_Report.pdf
[h] https://ccs-psi.org/

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Chemical Sciences, Geosciences, and Biosciences	**$458,711**	**$294,038**	**-$164,673**
Fundamental Interactions Research	$135,593	$96,315	-$39,278
Funding continues to develop innovative ultrafast approaches, with emphasis on use of x-ray free electron lasers; determine how reactive intermediates affect reaction pathways; and characterize quantum phenomena underlying QIS. Research also targets the understanding and control of interfacial chemical conversion mechanisms and quantum phenomena to advance clean energy technologies for improved energy capture and conversion, AI/ML, and microelectronics. This activity generates and uses advanced theoretical and computational approaches that can take advantage of exascale computing capabilities and data science methods for knowledge discovery. The program partners with other SC program offices in the recompetition/renewal of the NQISRCs as the original awards complete five years of research. Continued investments supports awards as part of the Microelectronics Science Research Centers.		The Request will continue to develop innovative ultrafast approaches, with emphasis on use of x-ray free electron lasers; determine how reactive intermediates affect reaction pathways; and characterize quantum phenomena underlying QIS. Research will also target the understanding and control of interfacial chemical conversion mechanisms and quantum phenomena to advance novel energy technologies for improved energy capture and conversion and microelectronics. The program will partner with other SC program offices for the NQISRCs and the MSRCs. Additional investments will expand support for research to leverage AI/ML to accelerate discovery and characterization.	Expanded investments will include additional support for AI/ML. Reductions in other areas will be based on programmatic priorities.
Chemical Transformations Research	$114,658	$61,858	-$52,800
Funding continues fundamental research to understand catalytic mechanisms for thermo- and electro-chemical conversions and		The Request will continue fundamental research to understand catalytic mechanisms for thermo- and electro-chemical	Reductions will be based on programmatic priorities.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
to develop atomically precise synthesis of catalysts important for reliable energy. Research in separation science continues to focus on innovative mechanisms for high-efficiency chemical separations and processes. Heavy element research continues to advance understanding of actinide speciation and reactivity and f-electron systems. Geosciences research continues to reveal subsurface phenomena, such as mineralization and rock fracture propagation, that can be foundational to new energy technologies. Research continues to advance the separations and extraction of rare earth elements from complex and dilute mixtures and the development of alternative approaches to reduce use of critical elements.	conversions and to develop atomically precise synthesis of catalysts important for affordable and reliable energy. Research in separation science will continue to focus on innovative mechanisms for high-efficiency chemical separations and processes. Heavy element research will continue to advance understanding of actinide speciation and reactivity and f-electron systems. Geosciences research will continue to reveal subsurface phenomena that can be foundational to new energy technologies. Research will continue to advance the separations and extraction of rare earth elements from complex and dilute mixtures and the development of alternative approaches to reduce use of critical elements. AI/ML and data science approaches will be leveraged across the activity to accelerate discovery and characterization.	
Photochemistry and Biochemistry Research $104,710	$50,107	-$54,603
Funding continues research on physical, chemical, biophysical, and biochemical processes of light energy capture and conversion which could inspire innovations for reliable energy. Biochemical studies can provide insights for bio-inspired and biohybrid systems with desired functions and properties, as well as for new strategies for artificial photosynthesis, carbon dioxide removal, and biotechnology. Solar fuels research addresses molecular mechanisms of photon capture, charge transport, product selectivity, and reduced critical element use in photoabsorbers and catalysts. Biological and chemical studies	The Request will continue research on physical, chemical, biophysical, and biochemical processes of light energy capture and conversion which could inspire technology innovations for affordable and reliable energy. Biological and chemical studies will examine the role of quantum phenomena in energy conversion. Biochemical studies can provide insights for bio-inspired and biohybrid systems with desired functions and properties and new strategies for artificial photosynthesis, energy conversions, and biotechnology. Solar fuels research will address molecular mechanisms of photon capture, charge transport, product selectivity, and reduced critical	Reductions will be based on programmatic priorities.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
examine the role of quantum phenomena in energy conversion.	element use in photoabsorbers and catalysts. AI/ML and data science methods will continue to be integrated across the activity to accelerate discovery and characterization.	
Energy Frontier Research Centers $65,000	$60,000	-$5,000
Funding provides the fourth year of support for four-year EFRC awards that were made in FY 2022 and the second year of funding for awards made in FY 2024 in a broad range of topics relevant to energy and other national priorities.	The Request will provide the third year of support for the four-year EFRC awards that were made in FY 2024. In addition, BES will recompete awards made in FY 2022, with emphasis on a broad range of topics relevant to energy and other national priorities.	Technical emphasis for the EFRC program will broaden to include new research directions that cut across BES programmatic efforts, as well as those identified in recent strategic planning activities related to energy, QIS, microelectronics, and other national priorities.
Energy Earthshot Research Centers $3,500	$ —	-$3,500
Funding provides support for the EERCs that were initiated in prior fiscal years.	The EERC activity will be sunset in FY 2026.	No funding is requested.
Energy Innovation Hubs $20,758	$20,758	$ —
The two Hub awards are being considered for renewal of up to five years. Renewal allows each project to capitalize on its achievements during the initial funding period and to further advance research efforts on solar fuels generation for energy. The renewal decisions are based on research progress, external peer review, and programmatic priorities.	The Request will continue support for the Hub awards made in FY 2025 to further advance research efforts on solar fuels generation for affordable and secure energy.	Fundamental research will continue to target innovative artificial photosynthesis approaches for fuels generation using only sunlight, carbon dioxide, and water as inputs.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Computational Chemical Sciences $13,492	$4,000	-$9,492
Funding continues the development of public, validated, open-source software that takes advantage of DOE's leadership computing facilities. BES is recompeting awards made in FY 2021 and 2022. BES is prioritizing transitioning ECP researchers and software utilization into these research efforts.	The CCS activity will develop AI-based tools and techniques for discovery and characterization in the chemical sciences. Support for the maintenance and further development of high value, widely used software previously developed under the program may be considered based on program priorities.	Fundamental research will target AI for accelerated scientific discovery.
General Plant Projects $1,000	$1,000	$ —
Funding supports minor facility improvements at Ames National Laboratory.	The Request will support minor facility improvements at Ames National Laboratory.	No change.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Basic Energy Sciences
Scientific User Facilities (SUF)

Description

The Scientific User Facilities subprogram supports the operation of a geographically and technically diverse suite of major research facilities that provide unique tools to thousands of researchers from universities, industry, and government laboratories to advance a broad range of scientific domains and technology areas that are critical to DOE's mission and to many other National priorities. The BES user facilities portfolio consists of a complementary set of intense x-ray sources, neutron scattering facilities, and research centers for nanoscale science. These facilities allow researchers to probe materials in space, time, and energy with the resolution to interrogate the inner workings of matter to help understand the fundamental aspects of the natural world. Operated on an open access, competitive, merit review basis, scientists from every state can utilize the facilities' capabilities and sophisticated instrumentation. The 12 BES scientific user facilities collectively contribute to important scientific results across basic and applied research in chemistry, physics, geology, materials science, environmental science, biology, and biomedical science that can lead to the discovery and design of advanced materials and novel chemical processes with broad societal impacts. In FY 2024, more than 13,000 scientists and engineers in many fields of science and technology used BES scientific facilities.

User facilities conduct hundreds of experiments simultaneously around the clock, generating vast quantities of raw experimental data that must be stored and analyzed to translate the data into information to yield answers to important scientific questions. The data challenges continue to grow as new capabilities and advanced detector technologies come online. Data science and AI/ML methods coupled with advanced computing hardware are required to address these challenges and get the highest value data from user experiments. There are also AI/ML opportunities to improve the efficiency and reliability of accelerator and instrument operations. The Request increases support for the research needed to realize these opportunities in AI/ML.

Maintaining world-leading capabilities is crucial for international competitiveness as advances in tools and instruments often drive scientific discovery. Major upgrades to BES facilities are supported through line-item construction and Major Items of Equipment (MIEs), including support for new and upgraded x-ray and neutron experimental stations and forefront nanoscience instrumentation. The subprogram also supports research in accelerator and detector development to explore technology options for the next generations of x-ray and neutron sources that will keep BES accelerator-based facilities at the forefront.

The FY 2026 Request supports user facilities' operational budget requirements determined by the user facilities. Base requirements for operations continue to increase due to the steady rise in the cost of staff, utilities, maintenance, and materials; evolution of remote use; increased data and computational costs; and the transition of new capabilities from facility upgrades to operations. Funding will require a careful balance to meet costs to ensure safe operations and user access.

X-Ray Light Sources

X-rays are an essential tool for studying the structure of matter and have long been used to see things that visible light cannot resolve. X-rays are critical tools for assessing dynamics as materials, chemistries, and biological systems evolve. Large-scale light source facilities have vastly enhanced the utility of existing x-ray techniques and have given rise to entirely new ways to do experiments that are not otherwise feasible with conventional x-ray machines. Owing to their broadly tunable wavelengths, coherence, ultrafast pulses, and polarization control, light source facilities are incisive probes for advanced research.

BES operates five light sources, including a free electron laser, the Linac Coherent Light Source (LCLS) at SLAC, and four storage ring-based sources—the Advanced Light Source (ALS) at LBNL, the Advanced Photon Source (APS) at ANL, the Stanford Synchrotron Radiation Light Source (SSRL) at SLAC, and the National Synchrotron Light Source (NSLS)-II at BNL. BES provides funding to support facility operations, technical support, computational tools for data analysis, and user program administration, which are made available to all researchers with access determined via peer review of user proposals. All facilities are multidisciplinary and have extensive outreach efforts to ensure that researchers have fair and equitable access regardless of their research focus, geographical location, or institutional size. Upgrade projects are underway for the APS, ALS, and LCLS to ensure ongoing world leadership for these facilities. The initial suite of seven beamlines at NSLS-II in FY 2015 has expanded to 29 beamlines with three under construction and room for about 30 more. To adopt the most up-to-date technologies and provide the most advanced capabilities, BES has a phased approach to new beamlines at NSLS-II, as was done for other BES facilities. The NSLS-II Experimental Tools-II (NEXT-II) MIE project, started in FY 2020, provides three best-in-class beamlines to support the needs of the U.S. research community. In FY 2024, planning and conceptual design funds were provided for NEXT-III, a line-item construction project to deliver the next cadre of beamlines. The Request supports continued preliminary planning for future beamline MIEs.

High-Flux Neutron Sources

BES supports two neutron sources at ORNL, the High Flux Isotope Reactor (HFIR) and the Spallation Neutron Source (SNS). Neutron sources are used to understand the factors that determine the properties and functions of matter and provide foundational insights for development of new materials and molecules with desired functionality. Thermal and cold neutrons are unique tools for the study of atomic-scale structure and dynamics. The wavelength and energy of neutrons are similar to interatomic distances and elementary excitations in materials, allowing atomic-resolution studies of structure and an investigation of material dynamics. As they carry no charge, neutrons can assess bulk properties. Critically, neutrons can discriminate different isotopes of the same element, making them a unique probe to resolve, for example, the location of hydrogen atoms in organic and biological materials via isotope substitution of deuterium for hydrogen. In addition, their magnetic moments allow investigation of magnetism, important for electronic technologies and systems.

HFIR generates neutrons via fission. It operates at 85 megawatts and provides state-of-the-art facilities for neutron scattering, isotope production, materials irradiation, and neutron activation analysis. It is the world's leading production source of elements heavier than plutonium for medical, industrial, and research applications. There are 12 neutron scattering beamlines in the user program at HFIR, which include state-of-the-art instruments for spectroscopy, diffraction, imaging, and small angle scattering. Operations funding in the FY 2026 Request will continue to support efforts to replace the beryllium reflector at HFIR.

SNS produces neutron beams using an accelerator to generate proton pulses that strike a mercury target. As a result of impacts, cascades of neutrons are produced in a process known as spallation. It is the world's brightest pulsed neutron facility and presently offers 19 beamlines. This is a world-leading suite of instruments for very high-resolution spectroscopy and diffraction, reflectometry, spin echo, and small angle spectrometers. Demand is strong for SNS instruments (3.6x oversubscribed) across a very broad range of scientific disciplines and technology areas. Current construction projects at SNS focus on maintaining world-leadership for neutron scattering.

At both HFIR and SNS, investments will advance data science, AI/ML, and computing hardware to support experiment planning, data analysis, and operational efficiency of the accelerator, reactor, and beamlines.

Nanoscale Science Research Centers

Developments at the nanoscale are foundational for delivery of remarkable scientific discoveries that transform our understanding of energy and matter. The Nanoscale Science Research Centers (NSRCs) provide the tools and capabilities for experimental and computational research that lead to technological innovations, new experimental tools, and new computational and modelling capabilities. NSRCs comprise a suite of unique tools and platforms, as well as expert scientific staff that enable and advance probing, manipulating, and assembling single atoms, clusters of atoms, and molecular structures for transformative science providing the foundation for the development of next-generation technologies.

The five NSRCs are the Center for Nanoscale Materials (CNM) at ANL, the Center for Functional Nanomaterials (CFN) at BNL, the Molecular Foundry (MF) at LBNL, the Center for Nanophase Materials Sciences (CNMS) at ORNL, and the Center for Integrated Nanotechnologies (CINT) at SNL and LANL. Each center has complementary expertise and capabilities for synthesis and assembly; theory, modeling, and simulation; imaging and spectroscopy; and nanostructure fabrication and integration. Selected thematic areas include quantum materials, next generation semiconductors, nanoscale photonics, catalysis, and soft/biological materials. These facilities include clean rooms, nanofabrication resources, one-of-a-kind signature tools, custom advanced instrumentation laboratories, and unique AI/ML and data science analytical capabilities. Each NSRC is co-located with other scientific user facilities and/or complementary capabilities, enabling users to more easily take advantage of these additional world-leading experimental and computational resources. Operating funds ensure cutting-edge research capabilities, technical support, and administration of the user program, which serves academic, government, and industry researchers.

Going forward, the NSRCs will continue to spearhead the development of flexible infrastructure and enabling capabilities for materials synthesis, device fabrication, metrology, modeling, and simulation. Investments will focus on evolving these capabilities to address the most pressing national needs, including QIS and next-generation microelectronics. Coordination across the NSRCs will grow to support development of cross-cutting, mutually beneficial techniques and facilitate access to complementary instrumentation.

<u>Other Project Costs</u>
Total project cost (TPC) is comprised of total estimated cost (TEC) and other projects costs (OPC). TEC includes post-Critical Decision (CD)-1 costs for engineering; the acquisition of equipment; and construction/fabrication. OPC represents all other costs incurred during the initiation and definition phase for planning, conceptual design, research, and development, and during the execution phase for startup and commissioning. OPC is always funded via operating funds.

<u>Major Items of Equipment</u>
BES supports MIE projects to ensure continual development and upgrade of scientific facility capabilities, by fabricating upgraded and new stand-alone instruments and capabilities at X-Ray Light Sources, High-Flux Neutron Sources, and NSRCs.

<u>Research</u>
This activity supports research from conceptual studies of accelerator physics and instrumentation to their translation into components or techniques that improve BES user facilities and maintain international competitiveness. Production of beams with increased average flux/brightness and detection tools responsive to high beam intensities are required components for the advancement of light and neutron sources. Research on superconducting undulators will focus on increasing magnetic fields and eliminating liquid helium use. Higher beam availability is needed to respond to the increasing number of facility users, requiring research on techniques to support multiple beamlines simultaneously. Detectors require higher computational capabilities per pixel, improved readout rates, radiation hardness, and better energy and temporal resolutions. Higher neutron-flux capabilities at the SNS demand tight control of beam losses and detectors designed for advanced neutron imaging. BES coordinates with the SC Offices of High Energy Physics and Nuclear Physics on crosscutting accelerator research and technology areas. BES accelerator R&D research is informed by recent workshops.[i] Investments will continue to support development of data science methods and AI/ML-enabled tools to address data and information challenges.

[i] https://science.osti.gov/-/media/bes/pdf/brochures/2024/24-G00737-BRN-ABI-brochure-Final.pdf

Basic Energy Sciences
Scientific User Facilities (SUF)

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities (SUF)	**$1,388,762**	**$1,394,489**	**+$5,727**
X-Ray Light Sources	$778,865	$805,106	+$26,241
Funding supports operations at five BES light sources (LCLS, APS, ALS, NSLS-II, and SSRL). Development of capabilities for biopreparedness, computational techniques, and data will continue.		The Request will support operations at five BES light sources (LCLS, APS, ALS, NSLS-II, and SSRL). Development of AI/ML-enabled capabilities for computational techniques, and data analysis methods will continue.	Funding will support LCLS, APS, ALS, NSLS-II and SSRL operations, accounting for inflation, supply chain costs, staffing support, remote operations, and costs for operation of new/upgraded capabilities.
High-Flux Neutron Sources	$373,367	$385,146	+$11,779
Funding supports operations at SNS and HFIR (including ongoing funding for maintenance of HFIR with the beryllium reflector replacement). Development of capabilities for biopreparedness, computational techniques, and data continues.		The Request will support operations at SNS and HFIR (including ongoing funding for maintenance of HFIR with the beryllium reflector replacement). Development of AI/ML-enabled capabilities for computational techniques, and data analysis methods will continue.	Funding will support operations for SNS and HFIR, accounting for inflation, supply chain costs, staffing support, remote operations, and costs for operation of new/upgraded SNS capabilities.
Nanoscale Science Research Centers	$159,230	$165,770	+$6,540
Funding supports five NSRCs (CFN, CNM, CNMS, MF, and CINT). The NSRCs continue to develop infrastructure and capabilities to maintain world-leading synthesis, device fabrication, characterization, modeling, and simulation.		The Request will provide funding for five NSRCs (CFN, CNM, CNMS, MF, and CINT). The NSRCs will continue to develop infrastructure and capabilities to maintain world-leading synthesis, device fabrication, characterization, modeling, and simulation.	Funding will support operations for the five NSRCs, accounting for inflation, supply chain costs, staffing support, remote operations, and other costs.
Other Project Costs	$9,500	$5,000	-$4,500
Funding supports OPC for the HFIR-PVR project at ORNL and the NEXT-III project at BNL.		The Request will support OPC for the LCLS-II-HE project at SLAC.	OPC will support conceptual design and planning for the LCLS-II-HE project at SLAC.
Research	$67,800	$33,467	-$34,333
Funding supports high-priority research activities for accelerators, detectors, and applications of data science techniques to accelerator		The Request will support high-priority research activities for accelerators, detectors, and applications of AI/ML and other data	Funding will support investment in future accelerator and detector technologies to continue to provide the world's most

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
optimization, control, prognostics, and data analysis. Research emphasizes transformative advances in accelerator science and technology that lead to significant improvements in very high brightness and high current electron sources and in high intensity proton sources. In addition, research expands to include enabling capabilities for data science/AI/ML and continues for response to biological threats and to increase the diversity of the research performers.	science techniques to accelerator optimization, control, prognostics, and data analysis. Research will emphasize transformative advances in accelerator science and technology that lead to significant improvements in very high brightness and high current electron sources and in high intensity proton sources.	comprehensive and advanced accelerator-based facilities for scientific research. Funding will expand investments in data science and AI/ML methods and tools to address data and information challenges at the BES user facilities, including accelerator control and experiment automation with real time data analysis.

Note:

- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Basic Energy Sciences
Construction

Description

Accelerator-based x-ray light sources, accelerator-based pulsed neutron sources, reactor-based neutron sources, and nanoscale science research centers are essential user facilities that enable critical DOE mission-driven science, including research in support of next-generation energy technologies and other critical and emerging technologies (e.g., in quantum information science, microelectronics, and critical minerals) vital to U.S. economic and national security. These user facilities provide the academic, laboratory, and industrial research communities with the tools to fabricate, characterize, and develop new materials and chemical processes to advance basic and applied research across multiple scientific disciplines. Funding for the construction of new user facilities and upgrades to existing user facilities are essential to maintaining U.S. scientific leadership.

21-SC-10, Cryomodule Repair & Maintenance Facility (CRMF), SLAC

The CRMF project will provide a much-needed capability to maintain, repair, and test superconducting radiofrequency (SRF) accelerator components. These components include but are not limited to superconducting RF cavities and cryomodules that make up the new superconducting accelerator being constructed by the now complete LCLS-II project and ongoing LCLS-II-HE project, high brightness electron injectors, and superconducting undulators. The facility will provide for the full disassembly and repair of the SRF cryomodule; the ability to disassemble, clean, and reassemble the SRF cavities and cavity string; testing capabilities for the full cryomodule; and separate testing capabilities for individual SRF cavities. To accomplish this, the project requires a building of up to 21,000 gross square feet to contain the necessary equipment, tools, and fixtures, as well as a control room, clean rooms, and liquid helium distribution system. The project received CD-1, Approve Alternative Selection and Cost Range, on October 11, 2023, with a current TPC range of $70,000,000–$98,000,000. A combined CD-2/3, Approve Performance Baseline and Approve Start of Construction, is expected in 1Q FY 2026.

19-SC-14, Second Target Station (STS), ORNL

The STS project will expand SNS capabilities for neutron scattering research by exploiting 0.7 MW of the 2.8 MW SNS accelerator proton beam power enabled by the Proton Power Upgrade (PPU) project. The STS will provide high brightness, cold neutrons complementary to the first target station (FTS). Instruments will feature advanced neutron optics, optimized geometry, and high resolution, advanced detectors, enabling new research opportunities in quantum materials, materials science and engineering, chemistry and catalysis, soft matter and polymers, and biological systems. The project received CD-1, Approve Alternative Selection and Cost Range, on November 23, 2020, establishing the approved TPC range of $1,800,000,000–$3,000,000,000. CD-3A, Approve Long Lead Procurements, is expected in 3Q FY 2025.

18-SC-13, Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC

The LCLS-II-HE project will expand the capabilities of the LCLS to maintain U.S. leadership in ultrafast and ultrabright x-ray science. The project will increase the energy of the superconducting linac from 4 GeV to 8 GeV and thereby expand the high repetition rate operation (1 million pulses per second) into the hard x-ray regime (5-12 keV). This will transform the community's ability to interrogate and advance understanding of complex matter at the atomic scale on ultrafast time scales with elemental specificity relevant to real world systems, including quantum materials, functional materials, catalysts, and biological molecules. The project received CD-3C, Approve Long Lead Procurements and Early Limited Construction, on July 2, 2024. The project established an original TPC range of $290,000,000–$480,000,000, but due to maturing design efforts that identified additional costs across the project scope and increases in the project's contingency to address several future risks, the TPC estimate has increased to $716,000,000. The project received a combined CD-2/3, Approve Performance Baseline and Approve Start of Construction, on September 19, 2024. CD-4, Approve Start of Operations, is expected 2Q FY 2030.

18-SC-12, Advanced Light Source Upgrade ALS-U, LBNL
The ALS-U project will upgrade the existing ALS facility by replacing the existing electron storage ring with a new electron storage ring based on a multi-bend achromat lattice design, which will provide a soft x-ray source that is up to 1000 times brighter and with a significantly higher coherent flux fraction. ALS-U will leverage two decades of investments in scientific tools at the ALS by making use of the existing beamlines and infrastructure. ALS-U will ensure that the ALS facility remains a world leader in soft x-ray science. The project received CD-3, Approve Start of Construction, on November 10, 2022, with an original Total Project Cost (TPC) of $590,000,000. The ALS-U project is currently working towards rebaselining, which will establish a new TPC and schedule in 1Q FY 2026. CD-4, Approve Project Completion, is currently 4Q of FY 2029.

24-SC-10, HFIR Pressure Vessel Replacement (PVR), ORNL
The HFIR PVR project will replace the aging HFIR pressure vessel to extend facility lifetime for decades, enable resumption of 100 MW operations, and enhance isotope production and scattering research. These upgrades will maintain a domestic high-flux, steady-state neutron source for varied and critical missions. For example, in addition to the hundreds of neutron scattering users, isotope production at HFIR supports research, clinical trials and medical interventions, and federal and industrial applications, including nuclear reactor startup, homeland security, and NASA deep space missions. The project received CD-0, Approve Mission Need, on October 28, 2020, with a current preliminary Total Project Cost (TPC) range of $300,000,000–$740,000,000, updated by preliminary planning for the project. A combined CD-1, Approve Alternative Selection and Cost Range, and CD-3A, Approve Long Lead Procurements, is expected in 2Q FY 2027.

24-SC-12, NSLS-II Experimental Tools - III (NEXT-III), BNL
The NEXT-III project will provide a pathway for the construction of an additional suite of up to 12 beamlines that will be optimized to enhance the capability of NSLS-II. These beamlines will enable cutting-edge research for next-generation energy technologies, manufacturing, automated structure analysis of biological macromolecules, drug discovery, bio-preparedness, quantum materials, and quantum information science, as well as developing novel instrumentation and tools required to maintain the global competitiveness of the U.S. light sources. NEXT-III beamlines will also enable multimodal research that can facilitate growth of industrial research and provide new avenues to introduce more users to synchrotron research. The project received CD-0, Approve Mission Need, on September 30, 2022, with a preliminary TPC range of $350,000,000–$500,000,000, and CD-1, Approve Alternative Selection and Cost Range, on September 15, 2024. A combined CD-2/3, Approve Performance Baseline and Approve Start of Construction, is expected 2Q FY 2026.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$233,500**	**$221,343**	**-$12,157**
24-SC-10, HFIR Pressure Vessel Replacement (PVR), ORNL	$6,000	$ —	-$6,000
Funding continues planning, design, R&D, analysis, engineering, and prototyping to advance design toward readiness for a combined CD-1/3A in 4Q FY 2026.		No funding is requested for the HFIR-PVR project in FY 2026.	No funding is requested.
24-SC-12, NSLS-II Experimental Tools - III (NEXT-III), BNL	$5,500	$ —	-$5,500
Funding supports activities to secure CD-3A approval, expected in 3Q FY 2025, to start long lead procurements of the first group of beamlines and continue with design of the second group of beamlines.		No funding is requested for the NEXT-III project in FY 2026.	No funding is requested.
21-SC-10, Cryomodule Repair & Maintenance Facility (CRMF), SLAC	$20,000	$20,000	$ —
Funding supports the continuation of activities required to secure a combined CD-2/3 approval and initiation of construction contracts, expected in 1Q FY 2026.		The Request will support the continuation of activities required to secure a combined CD-2/3 approval and initiation of construction contracts, expected in 1Q FY 2026.	Funding will advance progress on the CRMF project.
19-SC-14, Second Target Station (STS), ORNL	$52,000	$52,000	$ —
Funding continues planning, R&D, design, engineering, prototyping, and testing to advance the highest-priority activities. Funding also initiates a potential long lead procurement for civil construction site preparation upon associated CD approvals.		The Request will continue activities, focusing on the highest priority accelerator and target designs in parallel with advancing long lead procurement activity for civil construction site preparation upon associated CD approvals.	Funding will advance progress on the STS project.
18-SC-13, Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC	$100,000	$99,343	-$657
Funding supports production of the cryomodules, continues long lead		Funding will continue the construction and installation	Funding will advance progress on the LCLS-II-HE project.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
procurements, and begins remaining scope design efforts and initiates installation/construction contracts. Other tasks as required..	contracts, complete the pre-staging activities, and start installation activities during the year-long LCLS Dark Time in FY 2026.	
18-SC-12, Advanced Light Source Upgrade ALS-U, LBNL $50,000	$50,000	$ —
Funding supports the remaining procurements for the Accumulator and Storage Rings, installation of the Accumulator ring in the tunnel, and assembly of the Storage Ring in preparation of dark time.	The request will advance installation of the Accumulator ring in the tunnel and the beamline front end engineering and system engineering as well as begin preparation activities for the dark time Storage Ring installation.	Funding will advance progress on the ALS-U project.

Basic Energy Sciences
Capital Summary

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	57,394	29,590	47,693	+18,103
Minor Construction Activities						
General Plant Projects	N/A	N/A	22,040	10,900	46,361	+35,461
Accelerator Improvement Projects	N/A	N/A	81,169	19,605	60,427	+40,822
Total, Capital Operating Expenses	**N/A**	**N/A**	**160,603**	**60,095**	**154,481**	**+94,386**

Capital Equipment

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Major Items of Equipment						
Scientific User Facilities (SUF)						
NSLS-II Experimental Tools-II (NEXT-II), BNL	92,283	72,283	20,000	–	–	–
NSRC Recapitalization	79,150	74,150	5,000	–	–	–
Total, MIEs	N/A	N/A	25,000	–	–	–
Total, Non-MIE Capital Equipment	N/A	N/A	32,394	29,590	47,693	+18,103
Total, Capital Equipment	**N/A**	**N/A**	**57,394**	**29,590**	**47,693**	**+18,103**

Note:
- *The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.*

Minor Construction Activities

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
General Plant Projects (GPP)						
GPPs (greater than $5M and $34M or less)						
Spallation Neutron Source Sample Environmental Building	8,594	–	–	–	8,594	+8,594
HFIR Guide Hall Extension	19,900	1,400	18,500	–	–	–
HFIR Fabrication, Alignment & Manufacturing (FAM) Bldg., ORNL	1,540	–	1,540	–	–	–
Technical and Storage Space	9,528	–	–	–	9,528	+9,528
SLAC, SSRL, B120 Expansion for Beamline Upgrade	1,700	–	–	–	1,700	+1,700
SLAC, LCLS, Far Experimental Hall	25,000	–	–	–	25,000	+25,000
HFIR Helium Recovery System	539	–	–	–	539	+539
Total GPPs (greater than $5M and $34M or less)	N/A	N/A	20,040	–	45,361	+45,361
Total GPPs $5M or less	N/A	N/A	2,000	10,900	1,000	-9,900
Total, General Plant Projects (GPP)	**N/A**	**N/A**	**22,040**	**10,900**	**46,361**	**+35,461**
Accelerator Improvement Projects (AIP)						
AIPs (greater than $5M and $34M or less)						
3rd Harmonic Cavity, National Synchrotron Light Source-II	10,020	–	4,720	–	5,300	+5,300
Spallation Neutron Source Cold Box-Engineering	10,500	–	10,500	–	–	–
Cold Source Helium Refrigerator System	21,939	9,339	12,600	–	–	–
160kW Solid State Amplifier Hardware and Utilities - Phase 2 (APS)	5,967	–	5,967	–	–	–
Flexon 2nd Endstation, LBNL	8,500	–	8,500	–	–	–
New SAX/WAX Beamline, LBNL	27,140	1,890	17,750	–	7,500	+7,500
ALS Beamline Readiness	6,000	–	–	–	6,000	+6,000
ALS Front End Readiness	6,000	–	–	–	6,000	+6,000
HFIR HBRR MANTA	753	–	–	–	753	+753
HFIR HBRR MARS	1,282	–	–	–	1,282	+1,282
Total AIPs (greater than $5M and $34M or less)	N/A	N/A	60,037	–	26,835	+26,835
Total AIPs $5M or less	N/A	N/A	21,132	19,605	33,592	+13,987

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Total, Accelerator Improvement Projects (AIP)	N/A	N/A	81,169	19,605	60,427	+40,822
Total, Minor Construction Activities	N/A	N/A	103,209	30,505	106,788	+76,283

Notes:

- *GPP activities $5M and less include design and construction for additions and/or improvements to land, buildings, replacements or addition to roads, and general area improvements. AIP activities $5M and less include minor construction at an existing accelerator facility.*
- *The Total funding for the HFIR Guide Hall Extension GPP project is approximately $19,900,000. This project, originally requested in FY 2021, has been delayed. Design efforts were fully funded in FY 2023 and the remaining funds were requested in FY 2024.*
- *The Total funding for the Cold Source Helium Refrigerator System (AIP) project is $12,600,000. This project, originally requested in FY 2021, was deferred until FY 2024.*
- *The Total funding for the SNS Cold Box-Engineering (AIP) project is $10,500,000. This project, originally requested in FY 2023, was deferred until FY 2024.*
- *The Total funding for the 3rd Harmonic Cavity (AIP) project is $5,300,000. This project, originally requested in FY 2024, has been deferred until FY 2026.*
- *The Total funding for the SAX/WAX Beamline (AIP) project is $9,000,000. This project, originally requested in FY 2024, has been deferred with revised scope until FY 2026.*
- *The Total funding for the NSLS-II Technical and Storage Space (GPP) project is $9,528,000. This project, originally requested in FY 2025, has been deferred until FY 2026.*
- *The SLAC B120 Expansion for Beamline Upgrade (GPP) project originally requested in FY 2025 has been delayed. Design efforts are requested in FY 2026.*
- *The Total funding for the Far Experimental Hall (GPP) project is $28,400,000. This project, originally requested in FY 2025, has been deferred until FY 2026.*
- *The Total funding for the HFIR Helium Recovery System (GPP) project is $7,440,000. Design efforts are requested in FY 2026.*
- *The Total funding for the ALS Beamline Readiness (AIP) project is $7,500,000. Design efforts will be fully funded in FY 2025 and the remaining funds are requested in FY 2026.*
- *The Total funding for the ALS Front End Readiness (AIP) project is $7,500,000. Design efforts will be fully funded in FY 2025 and the remaining funds are requested in FY 2026.*
- *The Total funding for the HFIR HBRR MANTA (AIP) project is $8,525,000. Design efforts are requested in FY 2026.*
- *The Total funding for the HFIR HBRR MARS (AIP) project is $14,855,000. Design efforts are requested in FY 2026.*

Basic Energy Sciences
Construction Projects Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
24-SC-10, HFIR Pressure Vessel Replacement (PVR), ORNL						
Total Estimated Cost (TEC)	679,000	-	4,000	6,000	-	-6,000
Other Project Cost (OPC)	50,000	3,000	9,000	5,000	-	-5,000
Total Project Cost (TPC)	**729,000**	**3,000**	**13,000**	**11,000**	**-**	**-11,000**
24-SC-12, NSLS-II Experimental Tools - III (NEXT-III), BNL						
Total Estimated Cost (TEC)	480,000	-	2,556	5,500	-	-5,500
Other Project Cost (OPC)	20,000	1,500	4,000	4,500	-	-4,500
Total Project Cost (TPC)	**500,000**	**1,500**	**6,556**	**10,000**	**-**	**-10,000**
21-SC-10, Cryomodule Repair & Maintenance Facility (CRMF), SLAC						
Total Estimated Cost (TEC)	88,800	32,000	9,000	20,000	20,000	-
Other Project Cost (OPC)	5,700	4,700	1,000	-	-	-
Total Project Cost (TPC)	**94,500**	**36,700**	**10,000**	**20,000**	**20,000**	**-**
19-SC-14, Second Target Station (STS), ORNL						
Total Estimated Cost (TEC)	1,923,920	156,700	52,000	52,000	52,000	-
Other Project Cost (OPC)	76,080	52,845	-	-	-	-
Total Project Cost (TPC)	**2,000,000**	**209,545**	**52,000**	**52,000**	**52,000**	**-**
18-SC-11, Spallation Neutron Source Proton Power Upgrade (PPU), ORNL						
Total Estimated Cost (TEC)	257,769	242,000	15,769	-	-	-
Other Project Cost (OPC)	13,798	13,798	-	-	-	-
Total Project Cost (TPC)	**271,567**	**255,798**	**15,769**	**-**	**-**	**-**
18-SC-12, Advanced Light Source Upgrade (ALS-U), LBNL						
Total Estimated Cost (TEC)	TBD	TBD	57,300	57,000	50,000	-7,000
Other Project Cost (OPC)	28,000	28,000	-	-	-	-
Total Project Cost (TPC)	**TBD**	**TBD**	**57,300**	**57,000**	**50,000**	**-7,000**
18-SC-13, Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC						
Total Estimated Cost (TEC)	684,000	358,657	120,000	100,000	99,343	-657
Other Project Cost (OPC)	32,000	27,000	-	-	5,000	+5,000
Total Project Cost (TPC)	**716,000**	**385,657**	**120,000**	**100,000**	**104,343**	**+4,343**

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	260,625	233,500	221,343	-12,157
Other Project Cost (OPC)	N/A	N/A	14,000	9,500	5,000	-4,500
Total Project Cost (TPC)	N/A	N/A	274,625	243,000	226,343	-16,657

Note:

- *The current estimated TPC for the ALS-U project is $590,000. The project is currently working on a new cost and schedule analysis that will inform a new baseline TPC in FY 2026.*

Basic Energy Sciences
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type A					
Advanced Light Source	**106,443**	**108,443**	**118,439**	**122,111**	**+3,672**
Number of Users	1,566	1,597	1,550	750	-800
Achieved Operating Hours	–	2,845	–	–	–
Planned Operating Hours	3,051	–	2,768	1,795	-973
Advanced Photon Source	**176,091**	**178,591**	**201,758**	**208,744**	**+6,986**
Number of Users	1,835	38	2,736	4,320	+1,584
Achieved Operating Hours	–	492	–	–	–
Planned Operating Hours	2,099	–	4,774	3,930	-844
National Synchrotron Light Source II	**148,198**	**148,198**	**158,134**	**163,652**	**+5,518**
Number of Users	1,651	2,340	2,500	1,770	-730
Achieved Operating Hours	–	4,699	–	–	–
Planned Operating Hours	4,585	–	4,900	3,850	-1,050
Stanford Synchrotron Radiation Light Source	**68,002**	**68,002**	**69,000**	**78,399**	**+9,399**
Number of Users	1,848	1,796	1,900	1,525	-375
Achieved Operating Hours	–	4,253	–	–	–
Planned Operating Hours	4,639	–	5,116	4,090	-1,026
Linac Coherent Light Source	**210,400**	**217,000**	**231,534**	**232,200**	**+666**
Number of Users	916	920	1,000	830	-170
Achieved Operating Hours	–	4,005	–	–	–
Planned Operating Hours	5,947	–	7,500	4,535	-2,965
Spallation Neutron Source	**179,147**	**210,500**	**230,741**	**237,307**	**+6,566**
Number of Users	246	476	1,082	740	-342
Achieved Operating Hours	–	1,457	–	–	–
Planned Operating Hours	1,359	–	4,329	3,935	-394
High Flux Isotope Reactor	**196,016**	**165,163**	**142,626**	**147,839**	**+5,213**
Number of Users	452	612	403	415	+12
Achieved Operating Hours	–	3,511	–	–	–
Planned Operating Hours	3,733	–	2,250	2,745	+495

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type B					
Center for Nanoscale Materials	29,612	30,900	32,445	33,794	+1,349
Number of Users	668	842	885	780	-105
Center for Functional Nanomaterials	26,540	26,846	27,663	28,793	+1,130
Number of Users	635	719	750	660	-90
Molecular Foundry	37,491	37,403	39,273	40,906	+1,633
Number of Users	1,173	1,128	1,150	1,050	-100
Center for Nanophase Materials Sciences	29,504	29,279	30,743	32,012	+1,269
Number of Users	707	890	850	645	-205
Center for Integrated Nanotechnologies	27,733	28,720	29,106	30,265	+1,159
Number of Users	851	1,020	1,100	895	-205
Total, Facilities	1,235,177	1,249,045	1,311,462	1,356,022	+44,560
Number of Users	12,548	12,378	15,906	14,380	-1,526
Achieved Operating Hours	–	21,262	–	–	–
Planned Operating Hours	25,413	–	31,637	24,880	-6,757

Note:
- *Percent optimal operations defines what is achieved at this funding level. This includes staffing, up-to-date equipment and software, operations and maintenance, and appropriate investments to maintain world leadership.*

Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	5,930	5,530	4,060	-1,470
Number of Postdoctoral Associates (FTEs)	1,640	1,510	970	-540
Number of Graduate Students (FTEs)	2,570	2,340	1,470	-870
Number of Other Scientific Employment (FTEs)	3,710	3,520	2,860	-660
Total Scientific Employment (FTEs)	**13,850**	**12,900**	**9,360**	**-3,540**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals and other support staff.*

21-SC-10, Cryomodule Repair & Maintenance Facility (CRMF), SLAC
SLAC National Accelerator Laboratory, SLAC
Project is for Design and Construction

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

Summary

The Cryomodule Repair and Maintenance Facility (CRMF) project will provide a much-needed capability to maintain, repair, and test superconducting radiofrequency (SRF) accelerator components. The FY 2026 Request for the CRMF project at SLAC National Accelerator Laboratory is $20,000,000 of Total Estimated Cost (TEC) funding. This project has a preliminary Total Project Cost (TPC) range of $70,000,000 to $98,000,000. This cost range encompasses the most feasible preliminary alternatives at this time. As the design of this project has matured, the current preliminary TPC estimate for this project is $94,500,000.

Significant Changes

CRMF was initiated in FY 2021. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on October 11, 2023.

FY 2024 funding supported continued building infrastructure design and advancing the technical systems design guidelines and specifications, including the SRF, controls, and cryogenics capabilities. The FY 2025 Enacted will support completion of the design of the building and conventional infrastructure and prepare the technical and procurement specifications for the building construction Request for Proposal (RFP). The cryogenic systems and procurement specifications will also be completed. The FY 2026 Request will support baselining and starting procurements, initiating the conventional facility infrastructure construction contracts. The funding will also support procurements for cryogenic system.

A Federal Project Director, certified to Level II, has been assigned to this project.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	12/6/19	8/24/23	10/11/23	1Q FY 2026	1Q FY 2026	1Q FY 2026	1Q FY 2030

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	16,400	72,400	88,800	5,700	5,700	94,500
FY 2026	20,700	68,100	88,800	5,700	5,700	94,500

Note:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*

2. Project Scope and Justification

<u>Scope</u>
The preliminary scope of the CRMF project is to construct a building equipped with clean rooms, handling tools, and fixtures to support the repair, maintenance, and testing of superconducting radiofrequency (SRF) linear accelerator (linac) components. These components may include, but are not limited to, SRF cavities and cryomodules, future capabilities for high brightness electron injectors, and superconducting undulators. The requirements will be refined as the project matures.

<u>Justification</u>
Through two BES construction projects at SLAC, LCLS-II (completed) and LCLS-II-HE, SC is making over a $1,800,000,000 capital investment in those projects with improved SRF linac performance to support researchers advancing the scientific discovery and technology development missions of DOE. The LCLS-II project provided a 4 GeV SRF-based linear accelerator containing 35 SRF cryomodules (CMs) to accelerate the electrons. The LCLS-II-HE project will increase the energy of the superconducting linac to 8 GeV by providing an additional 23 SRF CMs of a similar design to those installed by the LCLS-II project but operating at a higher accelerating gradient. SLAC has partnered with Fermi National Accelerator Laboratory (FNAL) and the Thomas Jefferson National Accelerator Facility (TJNAF) to provide the accelerating CMs. The specialized CM fabrication, assembly, and test capabilities are currently available at FNAL and TJNAF, but not at SLAC. Therefore, to make any repairs, SLAC must send the CMs cross country back to either FNAL or TJNAF at an increased risk of damage, cost, and schedule delays. This situation also requires that either FNAL or TJNAF have the maintenance facility capacity and trained personnel available when needed. Historically, these facilities are actively working on CMs for other SC projects, and maintenance or repairs typically require scheduling 6 to 12 months in advance.

The CRMF is designed to meet these challenges by providing SLAC with the capability to repair, maintain, and test the cryomodules and components that make up the upgraded LCLS superconducting linac.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

<u>Key Performance Parameters (KPPs)</u>
The KPPs are preliminary and may change as the project continues towards CD-2. At CD-2 approval, the KPPs will be part of the approved performance baseline. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Capability	Threshold	Objective
Disassembly, repair, and re-assembly of a 1.3 gigahertz (GHz) cryomodule	Install CM assembly tooling and ISO 4 Cleanroom	Same as threshold
1.3 GHz cavity qualification tests in CM	One 7 kilowatt (kW) Solid State Amplifier (SSA) installed with controls and safety systems operational	Eight 7kW SSA installed
High-pressure-rinsing (HPR) of 1.3 GHz cavity	Installation of High-Pressure Rinse and ultrapure water systems	Same as threshold
Cryogenic cooling	Delivery of sufficient 4.5 kelvin (K) liquid Helium (LHe) to sustain 100W of heat load at 2 K for 8 hours	Delivery of sufficient 4.5 Kelvin LHe to sustain 250W of heat load at 2 K for 8 hours
Infrastructure	18,000 GSF building	21,750 GSF building
Infrastructure for testing of 1.3 GHz cavity & cryomodule	Shielded enclosure and 880 GSF dedicated area for vertical test stand equipment and construction of two vertical pits	Same as threshold
Area for SRF-related equipment	Space for ISO 4 cleanroom and CM assembly workstations	Additional space for future SRF shielded enclosure

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	3,600	3,600	—	—
Prior Years - IRA Supp.	300	300	—	—
FY 2024	7,800	7,800	—	5,953
FY 2025	4,700	4,700	4,400	3,347
FY 2026	4,300	4,300	7,000	—
Total, Design (TEC)	**20,700**	**20,700**	**11,400**	**9,300**
Construction (TEC)				
Prior Years	8,400	8,400	—	—
Prior Years - IRA Supp.	19,700	19,700	—	—
FY 2024	1,200	1,200	—	—
FY 2025	15,300	15,300	200	—
FY 2026	15,700	15,700	19,300	10,700
Outyears	7,800	7,800	37,900	—
Total, Construction (TEC)	**68,100**	**68,100**	**57,400**	**10,700**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Total Estimated Cost (TEC)				
Prior Years	12,000	12,000	—	—
Prior Years - IRA Supp.	20,000	20,000	—	—
FY 2024	9,000	9,000	—	5,953
FY 2025	20,000	20,000	4,600	3,347
FY 2026	20,000	20,000	26,300	10,700
Outyears	7,800	7,800	37,900	—
Total, Total Estimated Cost (TEC)	**88,800**	**88,800**	**68,800**	**20,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	4,000	4,000	2,961	700
Prior Years - IRA Supp.	700	700	–	–
FY 2024	1,000	1,000	128	–
Outyears	–	–	1,911	–
Total, Other Project Cost (OPC)	**5,700**	**5,700**	**5,000**	**700**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	16,000	16,000	2,961	700
Prior Years - IRA Supp.	20,700	20,700	–	–
FY 2024	10,000	10,000	128	5,953
FY 2025	20,000	20,000	4,600	3,347
FY 2026	20,000	20,000	26,300	10,700
Outyears	7,800	7,800	39,811	–
Total, TPC	**94,500**	**94,500**	**73,800**	**20,700**

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	17,000	12,500	N/A
Design - Contingency	3,700	3,900	N/A
Total, Design (TEC)	**20,700**	**16,400**	N/A
Construction	31,700	31,700	N/A
Equipment	22,600	24,200	N/A
Construction - Contingency	13,800	16,500	N/A
Total, Construction (TEC)	**68,100**	**72,400**	N/A
Total, TEC	**88,800**	**88,800**	N/A
Contingency, TEC	*17,500*	*20,400*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	500	500	N/A
Conceptual Design	2,800	2,800	N/A
Start-up	1,200	1,200	N/A
OPC - Contingency	1,200	1,200	N/A
Total, Except D&D (OPC)	**5,700**	**5,700**	N/A
Total, OPC	**5,700**	**5,700**	N/A
Contingency, OPC	*1,200*	*1,200*	*N/A*
Total, TPC	**94,500**	**94,500**	N/A
Total, Contingency (TEC+OPC)	*18,700*	*21,600*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	32,000	9,000	20,000	—	27,800	88,800
	OPC	4,700	1,000	—	—	—	5,700
	TPC	36,700	10,000	20,000	—	27,800	94,500
FY 2026	TEC	32,000	9,000	20,000	20,000	7,800	88,800
	OPC	4,700	1,000	—	—	—	5,700
	TPC	36,700	10,000	20,000	20,000	7,800	94,500

Note:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2030
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	1Q FY 2055

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations, Maintenance and Repair	5,500	5,500	137,500	137,500

7. D&D Information

At this stage of project planning and development, SC is planning to construct a new building up to 21,750 gross square feet as part of this project.

	Square Feet
New area being constructed by this project at SLAC	21,750
Area of D&D in this project at SLAC	—
Area at SLAC to be transferred, sold, and/or D&D outside the project, including area previously "banked"	21,750
Area of D&D in this project at other sites	—
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	—
Total area eliminated	—

8. Acquisition Approach

The CRMF Project will be sited at SLAC and is being acquired under the existing DOE M&O contract with Stanford University. SLAC has delivered several large construction projects and research facilities and has the requisite expertise to successfully deliver CRMF. SLAC, with support from partner laboratory expert staff, will complete the design of the technical systems. The acquisition of the CRMF building will be based on the design-bid-build methodology. Selected subcontracted vendors, pre-qualified with the necessary capabilities, will fabricate the technical equipment. SLAC will competitively bid and award all contracts based on best value to the government.

SC and the M&O will draw from the lessons learned from other SC projects and other similar facilities in planning and executing the CRMF project. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

19-SC-14, Second Target Station (STS), ORNL
Oak Ridge National Laboratory, ORNL
Project is for Design and Construction

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

<u>Summary</u>

The STS project will design and build a new, very high brightness cold[j] neutron scattering capability to maintain U.S. competitiveness in providing world-leading neutron scattering user facilities. STS will offer unique beamlines to advance our understanding of the fundamental aspects of the natural world. The FY 2026 Request for the STS project is $52,000,000 of Total Estimated Cost (TEC) funding. This project has a preliminary Total Project Cost (TPC) range of $1,800,000,000 to $3,000,000,000. This cost range encompasses the most feasible preliminary alternatives. The current preliminary TPC estimate is $2,000,000,000 based on the most current revised scope, notional funding profile, and schedule.

<u>Significant Changes</u>

STS was initiated in FY 2019. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on November 23, 2020. CD-3A, Approve Long Lead Procurements (LLPs), is expected in 3Q FY 2025. The project continues to face schedule and cost challenges due to increasing construction costs in the local market and has worked diligently to mitigate the overall cost and schedule risk impacts by value engineering and addressing the Key Performance Parameter (KPP) and scope optimization required by the mission need. The preliminary notional TPC point estimate is $2,000,000,000, assumes a more favorable funding profile than presented at a June 2024 peer review, and is subject to change with adjustments in the annual funding levels.

FY 2024 funding enabled the project to optimize planning around a TPC and funding profile that prioritized the design of the accelerator optics, target assembly, moderator reflector assembly, and conventional facilities. The FY 2025 Enacted will support continued planning, R&D, design, engineering, prototyping, and testing to advance the highest priority activities with emphasis on key project scope for the target vessel, shielding, moderator, and conventional facilities. The science case will be more fully developed to specify the currently inaccessible grand challenges that the new capabilities can address, and the instrument suite will be redefined to support the refined science case. Civil construction site preparation is planned to start in 3Q FY 2025. The FY 2026 Request will progress toward the scientific instrument selection and advance the efforts initiated in FY 2025, including but not limited to planning, R&D, design, engineering, prototyping, and testing to advance the highest priority activities and completing the target monolith, accelerator, and bunker designs in preparation for a combined CD-2/3. The technical scope will advance in parallel with the remaining civil construction site preparation.

A Federal Project Director, certified to level III, has been assigned to this project.

[j] Neutrons can be described based on their wavelength and energy. Cold neutrons have lower energy (below 25 meV) and longer wavelengths (>0.2 nm) than thermal neutrons. Cold neutrons are best for characterizing materials with large atomic/molecular structures, such as polymers, biological materials, and magnetic materials. The wavelength of cold neutrons is similar to the activation energies for many solid-state excitations, molecular relaxations, and dynamic processes.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	1/7/09	4/30/21	11/23/20	1Q FY 2027	4Q FY 2029	1Q FY 2027	4Q FY 2039

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	1Q FY 2027	3Q FY 2025

CD-3A – Approve Long-Lead Procurements for the Construction Management/General Contractor (CM/GC) to perform site preparation for conventional civil construction.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	290,700	1,854,300	2,145,000	97,000	97,000	2,242,000
FY 2026	263,520	1,660,400	1,923,920	76,080	76,080	2,000,000

Note:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*

2. Project Scope and Justification

Scope

The STS project will design and build the new cold neutron scattering facility that comprises four primary elements: the neutron target and moderators; the accelerator systems; the instruments; and the conventional facilities. Costs for acceptance testing, integrated testing, and initial commissioning to demonstrate achievement of the KPPs are included in the STS scope. STS will be located in unoccupied space east of the existing SNS First Target Station (FTS). The project requires approximately 220,000 square feet of new buildings, making conventional facility construction a major contributor to project costs. The conventional facilities have been consolidated and the footprint reduced to lower the construction cost and shorten the schedule.

Justification

BES supports a diverse portfolio of large-scale user facilities including two neutron scattering facilities, the HFIR and the SNS, with the SNS FTS providing the world's brightest pulsed neutron scattering capability for thermal neutrons.[k] Currently, the U.S. lacks domestic capacity for research with lower energy, longer wavelength cold

[k] Thermal neutrons have higher energy (at and above 25 meV) and shorter wavelengths (<0.2 nm) than cold neutrons. The wavelength of thermal neutrons is similar to the interatomic distances in materials, making them ideal for engineering materials, imaging, and determination of crystal structures.

neutrons. Filling this gap is critical to maintaining U.S. competitiveness in world-leading neutron scattering research. The STS project will design and build a new, very high brightness, cold neutron source. The STS will provide unique beamlines with unmatched capabilities that will address major scientific challenges currently difficult or impossible to conduct at existing facilities. This includes unlocking breakthroughs in quantum materials, biomaterials, soft matter and polymers, materials under extreme condition and in non-equilibrium environments, advancing the development of materials into devices, and enhancing manufacturing, all of which are enabling for U.S. energy dominance.

STS will have a very high-density proton beam produced by the SNS proton linac directed to strike a solid tungsten target. The produced neutron beam illuminates compact moderators that will feed experimental beamlines. The neutron moderator system is geometrically optimized to deliver higher peak brightness of cold neutrons. The STS project will exploit 0.7 MW of the 2.8 MW accelerator proton beam power enabled by the PPU project. STS is designed to operate at 15 pulses/second simultaneously with FTS by using one out of every four proton pulses to produce cold neutron beams. FTS will operate at 45 pulses/second. An initial set of world-class instruments to support the refined science case will feature advanced neutron optics, optimized geometry, and high resolution, advanced detectors, enabling new research opportunities and unprecedented levels of performance.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

Key Performance Parameters (KPPs)
The KPPs are preliminary and may change as the project continues towards CD-2. At CD-2 approval, the KPPs will be baselined. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Demonstrate independent control of the proton beam on the two target stations	Operate beam to FTS at 45 pulses/s, with no beam to STS. Operate beam to STS at 15 pulses/s, with no beam to FTS. Operate with beam to both target stations 45 pulses/s at FTS and 15 pulses/s at STS.	Operate beam to FTS at 45 pulses/s, with no beam to STS. Operate beam to STS at 15 pulses/s, with no beam to FTS. Operate with beam to both target stations 45 pulses/s at FTS and 15 pulses/s at STS.
Demonstrate proton beam power on STS at 15 Hz with FTS at 2MW at 45 pulses/s	100 kW beam power	700 kW beam power
Measure STS neutron brightness	peak brightness of 2 x 10^{13}n/cm^{2}/sr/Å/s at 5 Å	peak brightness of 2 x 10^{14}n/cm^{2}/sr/Å/s at 5 Å
Beamlines transitioned to operations	3 beamlines successfully passed the integrated functional testing per the transition to operations parameters acceptance criteria.	≥ 3 beamlines successfully passed the integrated functional testing per the transition to operations parameters acceptance criteria.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	114,000	114,000	50,442	31,728
Prior Years - IRA Supp.	42,700	42,700	—	—
FY 2024	37,000	37,000	34,032	10,972
FY 2025	17,000	17,000	64,165	—
FY 2026	26,000	26,000	33,678	—
Outyears	26,820	26,820	38,503	—
Total, Design (TEC)	**263,520**	**263,520**	**220,820**	**42,700**
Construction (TEC)				
FY 2024	15,000	15,000	—	—
FY 2025	35,000	35,000	8,665	—
FY 2026	26,000	26,000	40,000	—
Outyears	1,584,400	1,584,400	1,611,735	—
Total, Construction (TEC)	**1,660,400**	**1,660,400**	**1,660,400**	—
Total Estimated Cost (TEC)				
Prior Years	114,000	114,000	50,442	31,728
Prior Years - IRA Supp.	42,700	42,700	—	—
FY 2024	52,000	52,000	34,032	10,972
FY 2025	52,000	52,000	72,830	—
FY 2026	52,000	52,000	73,678	—
Outyears	1,611,220	1,611,220	1,650,238	—
Total, Total Estimated Cost (TEC)	**1,923,920**	**1,923,920**	**1,881,220**	**42,700**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	52,845	52,845	47,272
FY 2024	–	–	3,141
FY 2025	–	–	2,432
FY 2026	–	–	3,000
Outyears	23,235	23,235	20,235

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Total, Other Project Cost (OPC)	76,080	76,080	76,080

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	166,845	166,845	97,714	31,728
Prior Years - IRA Supp.	42,700	42,700	–	–
FY 2024	52,000	52,000	37,173	10,972
FY 2025	52,000	52,000	75,262	–
FY 2026	52,000	52,000	76,678	–
Outyears	1,634,455	1,634,455	1,670,473	–
Total, TPC	2,000,000	2,000,000	1,957,300	42,700

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	248,220	250,700	N/A
Design - Contingency	28,300	40,000	N/A
Total, Design (TEC)	276,520	290,700	N/A
Construction	1,128,120	1,299,300	N/A
Construction - Contingency	519,280	555,000	N/A
Total, Construction (TEC)	1,647,400	1,854,300	N/A
Total, TEC	1,923,920	2,145,000	N/A
Contingency, TEC	*547,580*	*595,000*	*N/A*
Other Project Cost (OPC)			
R&D	5,632	20,000	N/A
Conceptual Design	36,644	26,000	N/A
Start-up	18,588	32,000	N/A
OPC - Contingency	15,216	19,000	N/A
Total, Except D&D (OPC)	76,080	97,000	N/A
Total, OPC	76,080	97,000	N/A
Contingency, OPC	*15,216*	*19,000*	*N/A*

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total, TPC	2,000,000	2,242,000	N/A
Total, Contingency (TEC+OPC)	*562,796*	*614,000*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	156,700	52,000	52,000	—	1,884,300	2,145,000
	OPC	52,845	—	—	—	44,155	97,000
	TPC	209,545	52,000	52,000	—	1,928,455	2,242,000
FY 2026	TEC	156,700	52,000	52,000	52,000	1,611,220	1,923,920
	OPC	52,845	—	—	—	23,235	76,080
	TPC	209,545	52,000	52,000	52,000	1,634,455	2,000,000

Note:

- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2039
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	4Q FY 2064

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations, Maintenance and Repair	59,000	59,000	1,475,000	1,475,000

The numbers presented are the incremental operations and maintenance costs above the existing SNS facility without escalation. The estimate will be updated and additional details will be provided after CD-2, Approve Performance Baseline.

7. D&D Information

The new area being constructed in this project will not replace existing facilities.

	Square Feet
New area being constructed by this project at ORNL	~170,000
Area of D&D in this project at ORNL	—
Area at ORNL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	~170,000
Area of D&D in this project at other sites	—
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	—
Total area eliminated	—

8. Acquisition Approach

Based on the DOE determination at CD-1, ORNL is acquiring the STS project under the existing DOE M&O contract.

The M&O contractor prepared a Conceptual Design Report for the STS project and identified key design activities, requirements, and high-risk subsystem components to reduce cost and schedule risk to the project and expedite the startup. The necessary project management systems are fully up to date, operating, and are maintained as an ORNL-wide resource.

ORNL will design and procure the key technical subsystem components. Some technical system designs will require research and development activities. Preliminary cost estimates for most of these systems are based on SNS operating experience and vendor estimates, while some first-of-a-kind systems are based on expert judgement. Vendors and/or partner labs with the necessary capabilities will fabricate the technical equipment. ORNL will competitively bid and award all subcontracts based on best value to the government. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the STS project.

18-SC-13, Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC
SLAC National Accelerator Laboratory, SLAC
Project is for Design and Construction

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

Summary

The LCLS-II-HE project will expand the capabilities of the LCLS to maintain U.S. leadership in ultrafast and ultrabright x-ray science. The project will increase the energy of the superconducting linac from 4 GeV to 8 GeV and thereby expand the high repetition rate operation (one million pulses per second) into the hard x-ray regime (5-12 keV). The FY 2026 Request for the LCLS-II-HE project is $99,343,000 of Total Estimated Cost (TEC) funding and $5,000,000 of Other Project Cost (OPC) funding. The Total Project Cost established at the combined CD-2/3 is $716,000,000.

Significant Changes

The LCLS-II-HE project was initiated in FY 2019. The most recent DOE Order 413.3B approved Critical Decision (CD) is a combined CD-2/3, Approve Performance Baseline/Approve Start of Construction, which was approved on September 19, 2024. The phased long-lead procurements were enabled by the investment of the Inflation Reduction Act (IRA) funds. CD-4 is projected for 2Q FY 2030.

FY 2024 funding supported continued engineering, R&D, and injector gun prototyping; and initiated CD-3C long-lead procurements of cryogenic system components and early construction of vertical transfer line penetration through the linac structure for delivery of cryogens, and cryogenic distribution system and controls instruments required for installation during the year-long down time. The FY 2025 Enacted will continue engineering, R&D, and prototyping and support continued R&D for the superconducting radiofrequency electron gun; cryomodule and solid state amplifier production and delivery; continued CD-3C procurements advancing the cryogenic systems, and the low-emittance injector beamline and related infrastructure; and construction/installation contracts. The FY 2026 Request will continue the construction and installation contracts, including the infrastructure systems for cryogenic transfer lines, water, mechanical and electrical; complete the experimental hutch design; complete the pre-staging activities; and start installation activities during the year-long LCLS downtime.

A Federal Project Director, certified to Level IV, has been assigned to this project.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	12/15/16	3/23/18	9/21/18	09/19/24	1Q FY 2026	09/19/24	2Q FY 2030

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B	CD-3C
FY 2026	09/19/24	5/12/20	1/27/23	7/2/24

CD-3A – Approve Long-Lead Procurements for cryomodule associated parts and equipment.
CD-3B – Approve Long-Lead Procurements for SRF Injector cryogenic systems, Cryo Distribution Box, Optics for Experimental Systems, Controls Systems.
CD-3C – Approve Long-Lead Procurements of cryogenic system distribution and controls, beamline optics, and Early Limited Construction including drilling vertical penetration into the accelerator housing for delivery of cryogens into the tunnel.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	59,000	619,000	678,000	32,000	32,000	710,000
FY 2026	68,000	616,000	684,000	32,000	32,000	716,000

2. Project Scope and Justification

Scope
The LCLS-II-HE project's scope increases the superconducting linac energy from 4 GeV to 8 GeV by installing additional cryomodules in the first kilometer of the existing linac tunnel. The electron beam, generated by a superconducting electron source, will be transported to the existing undulator hall to extend the x-ray energy to 12 keV and beyond. The project will also modify or upgrade existing infrastructure (process cooling water, power, electrical) in the last sector of the linac tunnel and the x-ray transport, optics, and diagnostics system. It will provide new or upgraded instrumentation to augment existing and planned capabilities.

Justification
International developments in X-ray facilities will challenge LCLS's world leadership position. The Shanghai Advanced Research Institute XFEL in Shanghai, China, called SHINE, will match the high pulse rate for continuous operation and have double the electron energy enabled by the LCLS-II project, which allows production of shorter (i.e., harder) x-ray wavelength pulses compared to LCLS. The European X-ray Free Electron Laser (XFEL) at DESY in Hamburg, Germany has a higher electron energy than LCLS, and recent plans could extend the European XFEL from a pulsed operation mode to continuous operation. The continuous operation improves the stability of the electron beam and provides uniformly spaced pulses of x-rays or, if desired, the ability to customize the sequence of x-ray pulses provided to experiments to optimize the measurements being made. The European XFEL began operations in 2017, and SHINE is expected to begin in 2025. Both of these facilities will create a profound capability gap compared to LCLS.

In the face of this challenge to U.S. scientific leadership, extending the energy reach of x-rays beyond the upper limit of the current LCLS superconducting linac (5 keV) is a high priority. This expanded range to 12 keV will allow U.S. researchers to access x-ray wavelengths as short as one Ångstrom and probe earth-abundant elements for novel catalysts used for electricity, fuel, and chemical production. It also allows the study of strong spin-orbit coupling that underpins many aspects of quantum materials, and it reaches the biologically important selenium k-edge, used for protein crystallography.

The ability to observe and understand the structural dynamics of complex matter at the atomic scale, at ultrafast time scales, and in operational environments is critical to the nation's R&D enterprise and ability to develop the new advanced materials for new energy technologies. To achieve this objective, DOE needs a hard x-ray source capable of producing high energy ultrafast bursts with full spatial and temporal coherence at high repetition rates. This capability cannot be provided by any existing or planned light source.

The LCLS-II project was completed successfully in October 2023 and began operation in November 2023. The LCLS-II project was the first step to address the capability gap described above. With this upgrade, LCLS is currently the premier XFEL facility in the world at photon energies ranging from 200 eV up to approximately 5 keV. The cryomodule technology is a major advancement from prior designs that will allow continuous operation up to 1 MHz.

The cryomodule design for the LCLS-II project has consistently performed beyond expectations, providing the technical basis to double the electron beam energy. The LCLS-II-HE project adds the additional acceleration capacity necessary to double the electron beam energy from 4 GeV to 8 GeV. Calculations have indicated that an 8 GeV linac will deliver a hard x-ray photon beam with peak energy of ~12.8 keV, which will meet the mission need.

The LCLS-II-HE upgrade will provide world leading experimental capabilities for the U.S. research community by extending the x-ray energy from 5 keV to 12 keV and beyond.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

Key Performance Parameters (KPPs)
The threshold KPPs approved at CD-2 represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Superconducting linac electron beam energy	7 GeV	$\geq$ 8 GeV
Electron bunch repetition rate	93 kHz	929 kHz
Superconducting linac charge per bunch	0.02 nC	0.1 nC
Photon beam energy range	250 to 8,000 eV	250 to 12,800 eV
High repetition rate capable, hard X-ray end stations	$\geq$ 1	$\geq$ 2
FEL photon quantity (10^{-3} BW)	$5x10^8$ @ 8 keV (10x spontaneous)	10^{10} @ 12.8 keV (20 mJ)

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	52,000	52,000	39,691	—
FY 2024	16,000	16,000	24,800	—
FY 2025	—	—	3,509	—

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Total, Design (TEC)	**68,000**	**68,000**	**68,000**	**—**
Construction (TEC)				
Prior Years	216,657	216,657	142,590	11,171
Prior Years - IRA Supp.	90,000	90,000	—	—
FY 2024	104,000	104,000	39,475	41,564
FY 2025	100,000	100,000	118,401	37,265
FY 2026	99,343	99,343	155,000	—
Outyears	6,000	6,000	70,534	—
Total, Construction (TEC)	**616,000**	**616,000**	**526,000**	**90,000**
Total Estimated Cost (TEC)				
Prior Years	268,657	268,657	182,281	11,171
Prior Years - IRA Supp.	90,000	90,000	—	—
FY 2024	120,000	120,000	64,275	41,564
FY 2025	100,000	100,000	121,910	37,265
FY 2026	99,343	99,343	155,000	—
Outyears	6,000	6,000	70,534	—
Total, Total Estimated Cost (TEC)	**684,000**	**684,000**	**594,000**	**90,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	21,000	21,000	16,104	–
Prior Years - IRA Supp.	6,000	6,000	–	–
FY 2024	–	–	88	2,200
FY 2025	–	–	600	900
FY 2026	5,000	5,000	5,742	2,900
Outyears	–	–	3,466	–
Total, Other Project Cost (OPC)	**32,000**	**32,000**	**26,000**	**6,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	289,657	289,657	198,385	11,171
Prior Years - IRA Supp.	96,000	96,000	–	–
FY 2024	120,000	120,000	64,363	43,764
FY 2025	100,000	100,000	122,510	38,165
FY 2026	104,343	104,343	160,742	2,900
Outyears	6,000	6,000	74,000	–
Total, TPC	**716,000**	**716,000**	**620,000**	**96,000**

Note:
– *In FY 2021, the Office of Science reprogrammed $19,343,211.24 of prior year funds from this project to support the LCLS-II project at SLAC. The Prior Year Budget Authority in the table above reflects this reprogramming. Also in FY 2021, a total of $10,000,000 in current year and prior year funding was reprogrammed to the LCLS-II-HE project and additional funds are included in the outyears to maintain the project profile.*

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	65,000	55,500	N/A
Design - Contingency	3,000	3,500	N/A
Total, Design (TEC)	**68,000**	**59,000**	N/A
Construction	268,000	262,000	N/A
Site Preparation	2,000	2,000	N/A
Equipment	236,000	236,000	N/A
Construction - Contingency	110,000	119,000	N/A
Total, Construction (TEC)	**616,000**	**619,000**	N/A
Total, TEC	**684,000**	**678,000**	N/A
Contingency, TEC	*113,000*	*122,500*	*N/A*
Other Project Cost (OPC)			
R&D	5,000	10,000	N/A
Conceptual Planning	1,000	1,000	N/A
Conceptual Design	12,000	8,000	N/A
Start-up	8,000	7,000	N/A
OPC - Contingency	6,000	6,000	N/A
Total, Except D&D (OPC)	**32,000**	**32,000**	N/A
Total, OPC	**32,000**	**32,000**	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency, OPC	*6,000*	*6,000*	*N/A*
Total, TPC	716,000	710,000	N/A
Total, Contingency (TEC+OPC)	*119,000*	*128,500*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	358,657	120,000	100,000	—	99,343	678,000
	OPC	27,000	—	—	—	5,000	32,000
	TPC	385,657	120,000	100,000	—	104,343	710,000
FY 2026	TEC	358,657	120,000	100,000	99,343	6,000	684,000
	OPC	27,000	—	—	5,000	—	32,000
	TPC	385,657	120,000	100,000	104,343	6,000	716,000

Note:

– *In FY 2021, the Office of Science reprogrammed $19,343,211.24 of prior year funds from this project to support the LCLS-II project at SLAC. The Prior Year Budget Authority in the table above reflects this reprogramming. Also in FY 2021, a total of $10,000,000 in current year and prior year funding was reprogrammed to the LCLS-II-HE project and additional funds are included in the outyears to maintain the project profile.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2Q FY 2030
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	2Q FY 2055

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations, Maintenance and Repair	21,500	21,500	537,500	537,500

The numbers presented are the incremental operations and maintenance costs above the LCLS-II facility without escalation. The estimate will be updated and additional details will be provided after CD-2, Approve Project Performance Baseline.

7. D&D Information

At this stage of project planning and development, SC anticipates no new area will be constructed for this project.

8. Acquisition Approach

Based on the DOE determination at CD-1, SLAC is acquiring the LCLS-II-HE project under the existing DOE M&O contract.

SLAC has completed the requirements for baselining the project and LCLS-II-HE has received CD-2/3 approval. The necessary project management systems are fully operating and are maintained as a SLAC-wide resource.

SLAC is partnering with other laboratories for design and procurement of key technical subsystem components. Technical system designs require research and development activities. Preliminary cost estimates for these systems are based on actual costs from the LCLS-II project and other similar facilities, to the extent practicable. The M&O contractor is fully exploiting recent cost data in planning and budgeting for the project. SLAC or partner laboratory staff will complete the design of the technical systems. SLAC or subcontracted vendors with the necessary capabilities will fabricate the technical equipment. All subcontracts will be competitively bid and awarded based on best value to the government. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from the LCLS-II project and other similar facilities in planning and executing the LCLS-II-HE project.

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

Summary

The FY 2026 Request for the ALS-U project is $50,000,000 of Total Estimated Cost (TEC) funding. The project has a Total Project Cost (TPC) of $590,000,000. Since the TPC was established at CD-2, Approve Performance Baseline, on April 2, 2021, the project has experienced significant cost and schedule escalation because of factors both external and internal to the project. As a result, the Department is preparing for a rebaseline of the project, which is currently planned for 1Q FY 2026.

Significant Changes

The ALS-U was initiated in FY 2018. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-3, Approve Start of Construction, approved on November 10, 2022. This Construction Project Data Sheet (CPDS) is an update of the FY 2024 CPDS and does not include a new start for FY 2026.

An independent project review (IPR) carried out by the DOE Office of Project Assessment in November 2023 identified significant challenges impacting project performance. Following an internal laboratory assessment and subsequent external Director's review, the lab concluded that the project was on a trajectory to exceed its current baseline. The analysis identified multiple issues which have been validated by a root cause analysis. The project is currently working on a detailed bottom-up cost and schedule analysis that will inform with confidence the expected revised baseline in 1Q FY 2026.

FY 2024 and FY 2025 funding support advancing the remaining procurements for the Accumulator Ring and the Storage Ring. The FY 2026 Request will advance installation of the cable plant and Accumulator Ring in the tunnel and advances the beamline front end engineering and system engineering. The first raft and sector mockup will advance as necessary precursors for pre-staging and assembly of the Storage Ring rafts and components as the vacuum systems, magnets, and diagnostics instruments are received, in preparation for the dark time Storage Ring installation. The FY 2026 Request will allow the lab to continue progressing toward project completion.

A FPD certified to Level II has been assigned to this project, with Level III certification in progress.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4	Re-baseline
FY 2026	9/27/16	4/30/18	9/21/18	4/2/21*	11/10/22	11/10/22	4Q FY 2029	1Q 2026

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	4/2/21	12/19/19

CD-3A – Approve Long-Lead Procurements includes Accumulator Ring equipment on the critical path necessary for installation.

*Note: The ALS-U project is currently working towards a rebaseline in FY 2026 that will establish a new cost and schedule estimate. The current cost and schedule estimates shown are those established at CD-2.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2026	134,340	427,660	562,000	28,000	28,000	590,000

Note:

- *The ALS-U project is currently working towards a rebaseline in FY 2026 that will establish a new cost and schedule estimate. The current cost and schedule estimates shown are those established at CD-2.*

2. Project Scope and Justification

Scope

The ALS-U project will upgrade the existing ALS facility by replacing the existing electron storage ring with a new electron storage ring based on a multi-bend achromat (MBA) lattice design to provide a soft x-ray source that is orders of magnitude brighter—a 10-1000 times increase in brightness over the current ALS—and to provide a significantly higher fraction of coherent light in the soft x-ray region (approximately 50-2,000 electronvolts [eV]) than is currently available at ALS. The project will replace the existing triple-bend achromat storage ring with a new, high-performance storage ring based on a nine-bend achromat design. In addition, the project will add a low-emittance, full-energy accumulator ring to the existing tunnel inner shield wall to enable on- and off-axis, swap-out injection and extraction into and from the new storage ring using fast kicker magnets. The new source will require upgrading x-ray optics on existing beamlines with some beamlines being realigned or relocated. The project adds two new undulator beamlines that are optimized for the novel science made possible by the beam's new high coherent flux. The project intends to reuse the existing building, utilities, electron gun, linac, and booster synchrotron equipment currently at ALS. Prior to CD-2, the scope was increased to include radiation shielding and safety-mandated seismic structural upgrades to the ALS facility. With an aggressive accelerator design, ALS-U will provide the highest coherent flux of any existing or planned storage ring facility worldwide, up to a photon energy of about 3.5 keV. This range covers the entire soft x-ray regime.

Justification

At this time, our ability to observe and understand materials and material phenomena in real-time and as they emerge and evolve is limited. Soft x-rays (approximately 50 to 2,000 eV) are ideally suited for revealing the chemical, electronic, and magnetic properties of materials, as well as the chemical reactions that underpin these properties. This knowledge is crucial for the design and control of new advanced materials that address the challenges of new energy technologies.

Existing storage ring light sources lack a key attribute that would revolutionize x-ray science: stable, nearly continuous soft x-rays with high brightness and high coherent flux—that is, smooth, well organized soft x-ray wave fronts. Such a stable, high brightness, high coherent flux source would enable 3D imaging with nanometer resolution and the measurement of spontaneous nanoscale motion with nanosecond resolution—all with electronic structure sensitivity.

Currently, BES operates advanced ring-based light sources that produce soft x-rays. The NSLS-II, commissioned in 2015, is the brightest soft x-ray source in the U.S. The ALS, completed in 1993, is competitive with NSLS-II for x-rays below 200 eV but not above that. NSLS-II is somewhat lower in brightness than the new Swedish light source, MAX-IV, which began user operations in 2017 and represents the first use of a MBA lattice design in a light source facility. Neither NSLS-II nor ALS make use of the newer MBA lattice design. Switzerland's SLS-2 (an MBA-based design in the planning stage) will be a brighter soft x-ray light source than both NSLS-II and MAX-IV when it is built and brought into operation. These international light sources, and those that follow, will present a significant challenge to the U.S. light source community to provide competitive x-ray sources to domestic users. Neither NSLS-II nor ALS soft x-ray light sources possess sufficient brightness or coherent flux to provide the capability to meet the mission need in their current configurations.

BES is currently supporting two major light source upgrade projects, the APS-U and LCLS-II. These two projects will upgrade existing x-ray facilities in the U.S. and will provide significant increases in brightness and coherent flux. These upgrades will not address the specific research needs that demand stable, nearly continuous soft x-rays with high brightness and high coherence.

APS-U, which is under construction at ANL, will deploy the MBA lattice design optimized for its higher 6 GeV electron energy and to produce higher energy (hard) x-rays in the range of 10-100 keV. Because the ring will be optimized for high energy, the soft x-ray light it produces will not be sufficiently bright to meet the research needs described above.

LCLS-II, which is under construction at SLAC, is a high repetition rate (up to 1 MHz) free electron laser (FEL) designed to produce high brightness, coherent x-rays, but in extremely short bursts rather than as a nearly continuous beam. Storage rings offer higher stability than FELs. In addition, there is a need for a facility that can support a larger number of concurrent experiments than is possible with LCLS-II in its current configuration. This is critical for serving the large and expanding soft x-ray research community. LCLS-II will not meet this mission need.

The existing ALS is a 1.9 GeV storage ring operating at 500 milliamps (mA) of beam current. It is optimized to produce intense beams of soft x-rays, which offer spectroscopic contrast, nanometer-scale resolution, and broad temporal sensitivity. The ALS facility includes an accelerator complex and photon delivery system that can provide the foundations for an upgrade that will achieve world-leading soft x-ray coherent flux. The existing ALS provides a ready-made foundation, including conventional facilities, a $500,000,000 scientific infrastructure investment and a vibrant user community of over 2,500 users per year already attuned to the potential scientific opportunities an upgrade offers. The facility also includes extensive (up to 40) simultaneously operating beamlines and instrumentation, an experimental hall, computing resources, ancillary laboratories, offices, and related infrastructure that will be heavily utilized in an upgrade scenario. Furthermore, the upgrade leverages the ALS staff, who are experts in the scientific and technical aspects of the proposed upgrade.

In summary, the capabilities at our existing x-ray light source facilities are insufficient to develop the next generation of tools that combine high resolution spatial imaging together with precise energy resolving spectroscopic techniques in the soft x-ray range. To enable these cutting-edge experimental techniques, ALS-U is designed and being constructed to be a world-leading facility in soft x-ray science by delivering ultra-bright source of light in soft x-ray regime with high coherent x-ray flux required to resolve nanometer-scale features and interactions, and to allow the real-time observation and understanding of materials and phenomena as they emerge and evolve. Developing such a light source will ensure the U.S. has the tools to maintain its leadership in soft x-ray science and will significantly accelerate the advancement of the fundamental sciences that underlie a broad range of emerging and future energy applications.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets.*

Key Performance Parameters (KPPs)
The Threshold KPPs approved at CD-2 represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Storage Ring Energy	≥ 1.9 GeV	2.0 GeV
Beam Current	> 25 mA	500 mA
Horizontal Emittance	< 150 pm-rad	< 85 pm-rad
Brightness @ 1 keV[a]	> 2 x 10^{19}	≥ 2 x 10^{21}
New MBA Beamlines	2	≥ 2

[a] Units = photons/sec/0.1% BW/mm2/mrad2

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	134,340	134,340	128,340	–
FY 2024			2,132	–
FY 2025	–	–	3,365	–
FY 2026	–	–	503	–
Outyears	–	–	–	–
Total, Design (TEC)	**134,340**	**134,340**	**134,340**	**–**
Construction (TEC)				
Prior Years	363,360	363,360	56,215	48,314
Prior Years - IRA Supp.	96,600	96,600	–	4
FY 2024	57,300	57,300	108,121	22,580
FY 2025	57,000		183	1,566
FY 2026	50,000	107,000	TBD	
Outyears	TBD	TBD	TBD	24,136
Total, Construction (TEC)	**TBD**	**TBD**	**TBD**	**TBD**
Total Estimated Cost (TEC)				
Prior Years	497,700	497,700	184,555	48,314
Prior Years - IRA Supp.	96,600	96,600	–	4
FY 2024	57,300	57,300	108,121	22,580
FY 2025	57,000		60,548	1,566

FY 2026	50,000	107,000	TBD	
Outyears	TBD	TBD	TBD	24,136
Total, TEC	**TBD**	**TBD**	**TBD**	**TBD**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	28,000	28,000	23,560	–
Outyears	–	–	4,440	–
Total, OPC	**28,000**	**28,000**	**28,000**	–

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	525,700	525,700	208,115	48,314
Prior Years - IRA Supp.	96,600	96,600	–	4
FY 2024	57,300	57,300	108,121	22,580
FY 2025	57,000		60,548	1,566
FY 2026	50,000	107,000	TBD	
Outyears	TBD	TBD	TBD	24,136
Total, TPC	TBD	TBD	TBD	TBD

Note:

- *The ALS-U project is currently working towards a rebaseline in FY 2026 that will establish a new cost and schedule estimate. The current cost and schedule estimates shown are those established at CD-2.*

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	117,778	101,098	92,967
Design - Contingency	16,562	33,242	38,778
Total, Design (TEC)	**134,340**	**134,340**	**131,745**
Construction	159,338	150,093	142,165
Equipment	172,938	171,743	161,449
Construction - Contingency	95,384	105,824	126,641

Total, Construction (TEC)	**427,660**	**427,660**	**430,255**
Total, TEC	**562,000**	**562,000**	**562,000**
Contingency, TEC	*111,946*	*139,066*	*165,419*
Other Project Cost (OPC)			
R&D	N/A	4,971	8,241
Conceptual Planning	10,261	2,000	2,000
Conceptual Design	14,100	12,100	12,100
Start-up	1,000	2,000	2,000
OPC - Contingency	2,639	6,929	3,659
Total, Except D&D (OPC)	**28,000**	**28,000**	**28,000**
Total, OPC	**28,000**	**28,000**	**28,000**
Contingency, OPC	*2,639*	*6,929*	*3,659*
Total, TPC	**TBD**	**TBD**	**TBD**
Total, Contingency (TEC+OPC)	***114,585***	***145,995***	***169,078***

Note:

- *The ALS-U project is currently working towards a rebaseline in FY 2026 that will establish a new cost and schedule estimate. The current cost and schedule estimates shown are those established at CD-2.*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	Prior Years IRA Supp.	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	497,700	96,600	57,300	57,000	—	TBD	TBD
	OPC	28,000	—	—	—	—	—	28,000
	TPC	525,700	96,600	57,300	57,000	—	TBD	TBD
FY 2026	TEC	497,700	96,600	57,300	57,000	50,000	TBD	TBD
	OPC	28,000	—	—	—	—	—	28,000
	TPC	525,700	96,600	57,300	57,000	50,000	TBD	TBD

Note:

- *The ALS-U project is currently working towards a rebaseline in FY 2026 that will establish a new cost and schedule estimate. The current cost and schedule estimates shown are those established at CD-2.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2029
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	4Q FY 2054

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations, Maintenance and Repair	71,500	71,500	2,597,500	2,597,500

7. D&D Information

At this stage of project planning and development, SC anticipates that there will be no new area being constructed in the construction project.

8. Acquisition Approach

Based on the DOE determination at CD-1, LBNL is acquiring the ALS-U project under the existing DOE Management and Operations (M&O) contract.

The ALS-U project identified key design activities, requirements, and high-risk subsystem components to reduce cost and schedule risk to the project and expedite the startup. The necessary project management systems are fully up-to-date, operating, and are maintained as a LBNL-wide resource.

LBNL has partnered with BNL for design and procurement of all required power supplies. Technical system designs required research and development and prototyping activities that are now near completion. Cost estimates for the remaining work have been updated by acquiring recent vendor quotes as part of CD-3 approval. All subcontracts are being competitively bid and awarded based on best value to the government. The M&O contractor’s performance is being evaluated through the annual laboratory performance appraisal process.

Lessons learned from other SC projects and other similar facilities are being exploited fully in planning and executing ALS-U.

Overview

The Biological and Environmental Research (BER) program's mission is to support transformative science and scientific user facilities to achieve a predictive understanding of complex biological, Earth and environmental systems, in support of DOE's vision to advance innovative solutions for the Nation's energy expansion and national security challenges. BER's fundamental research, conducted at DOE national laboratories and other research institutions, plays a unique role in ensuring national leadership in biotechnology and in the ability to understand and predict the interdependencies involving energy and the environment over a wide range of conditions. Biology remains a vast, largely untapped resource of genomic potential, capable of performing highly complex chemistry that evolves naturally over time while fully intertwined and dependent on surrounding physical and environmental conditions. BER's biological research focuses on gaining the ability to understand and then re-design biomolecules, metabolic pathways, microorganisms, plants, and microbiomes. This focus leads to a comprehensive understanding of biological processes operating at molecular to field scales underpinning broad biotechnology development. Earth and environmental research supports fundamental research and computationally advanced modeling to enhance predictability of dynamically variable integrated energy, environmental, and Earth systems, in support of DOE's mission involving transformative science for energy and national security.

Over the last three decades, BER's scientific impact has been transformative for biology and biotechnology development. Beginning with the DNA sequencing revolution sparked by the Human Genome Project in 1990 to more recent developments in genome editing technology (CRISPR), and Artificial Intelligence (AI) breakthroughs in computational protein design, BER continues to be at the forefront of genomic science. Focused on non-biomedical plants, microorganisms, and ecosystems, BER science fills a niche among federal basic science agencies by addressing key energy and national security challenges. BER remains positioned to lead the fundamental science underpinning new paradigms in biotechnology development.

A crucial goal for BER's basic research is the integration of advanced AI methods with genomic science and automated experimentation. This is the key to unlocking breakthroughs in genomic science and biotechnology. AI, together with advances in genome editing capabilities (i.e. CRISPR) and lab automation, positions BER to accelerate fundamental research on microbes, plants and microbiomes through laboratory-based experimentation and field-based studies. AI techniques can rapidly synthesize new experimental data in the context of previously published information to pose new hypotheses for additional research that builds on prior results and converges on solutions. BER's Joint Genome Institute (JGI) and the Environmental Molecular Science Laboratory (EMSL) facilities and other major projects are pivoting towards integrated, AI-driven automated experimental and data systems. BER's bioimaging and quantum-science efforts (imaging and sensing), data analytics and computational modeling will provide both visual and calculated validation to experimental results. These advances will unlock the ability to not only understand but rapidly re-design biological systems. The scope of biotechnology potential is vast, including designing proteins, cells, microbes, plants and microbiomes for a range of applications including production of fuels, chemicals, materials, recovery of critical minerals, enhancement of soils, and design of robust plants. Biodesign innovations in biotechnology, biofuels, biochemicals, and bioproducts are currently pursued within the Bioenergy Research Centers, using expanding options for renewable plant biomass. BER is primed to drive a revolution in how we understand, design and employ fundamental biological principles for energy, economic and national security benefits.

Since the 1950s, BER has been critical contributors to fundamental earth and environmental research that complements biological and biotechnology sciences. BER advances the DOE flagship Energy Exascale Earth System Model (E3SM) and a suite of energy sector models to provide insight into how environmental conditions can be leveraged to inform energy expansion. BER research tackles those components of the environmental system that are most uncertain and critical for future energy needs, including those involving clouds, aerosols, and integrated land-energy systems.

AI methods are transforming earth and environmental sciences, enabling modeling of finer spatial scales, enhanced accuracy, increased simulation speeds, integration with energy sector models, and quantification of uncertainties over widely varying conditions. E3SM and its interconnected suite of sectoral models are supplemented with detailed observations for initialization, parameterization development, and validation. Atmospheric and terrestrial research, including detailed biological and ecosystem information, ensure fine-scale fidelity for the models. BER's models are increasingly skillful to provide energy stakeholders with key information needed to expand U.S. energy dominance.

Highlights of the FY 2026 Request

The BER FY 2026 Request of $394.9 million is a decrease of $475.1 million below the FY 2025 Enacted level. BER will initiate new research on Artificial Intelligence (AI) to accelerate biotechnology advances, new Quantum Information Science for bioimaging and sensing applications, and focus on key biodesign research on bio-inspired critical mineral and material extraction, separation, and creation of alternative forms of mineral and materials.

Research

- Genomic Sciences will conduct foundational research on microbial, plant, and microbiome systems and the Bioenergy Research Centers (BRCs) will provide new research both individually and through shared research themes, underpinning energy and biotechnology innovations and biological production of fuels, chemicals, and other products.
- Computational Biosciences efforts are consolidated as BER shifts to include a more AI/ML-centric approach to genomic science and to develop integrated approaches to analyzing both genomic and ecosystem data across platforms and user facilities for advancing biosystems understanding and design.
- Research in Biomolecular Characterization and Imaging Science will focus on quantum information science (QIS)-enabled techniques to visualize and develop new sensing capabilities to understand biological processes.
- Bio-inspired critical minerals and materials (CMM) will support fundamental research to augment or enhance microbes and plants, using synthetic biology approaches to selectively remove or concentrate CMM from source materials and/or dilute solutions. CMM will also explore the biosynthesis of new minerals and materials capable of replacing existing CMMs to provide sustainable, lower-energy manufacturing options.
- Earth and environmental modeling is focused on developing an AI-driven hyper-resolution predictive system for integrated energy and environmental systems, connected to the E3SM model to predict seasonal and near-term (out to 10 years) environmental conditions, and incorporating energy systems to inform regional stakeholders.
- BER activities in environmental system sciences, atmospheric system research, earth system modeling, and data management are all funded under earth system modeling and will be focused on supporting integrated data-driven hybrid modeling with extensive applications of AI in support of science, energy, and national security challenges.

Facility Operations

- The JGI will continue efforts to transition towards a more AI-centric user facility that delivers high-quality genome sequencing, innovative analysis techniques for complex plant and microbiome samples, and advanced AI/ML-driven analytics. Consolidating data analytics and integrating and standardizing data workflows will enable seamless aggregation and harmonization of genomic data, ensuring users benefit from cutting-edge AI-powered insights and streamlined access to comprehensive analytical capabilities.
- EMSL will focus on coupled analyses across multiple analytical capabilities to advance biological and environmental science to uncover the biochemical pathways connecting gene functions to complex biological responses, develop predictive understanding of the mechanistic interplay of physical, biological, and environmental processes and use AI workflows, data analytics, visualization, and computational modeling. EMSL continues the development of a capability for microbial molecular phenotyping.
- The Atmospheric Radiation Measurement (ARM) user facility completes all field campaigns and is closed.

Projects

- The BER FY 2026 Request includes $10.0 million to continue the Microbial Molecular Phenotyping Capability (M2PC) project at the Pacific Northwest National Laboratory.

Biological and Environmental Research
Funding

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Biological and Environmental Research				
Genomic Science	319,435	340,900	166,483	-174,417
Biomolecular Characterization and Imaging Science	45,750	45,750	37,000	-8,750
Biological Systems Facilities & Infrastructure	92,250	95,127	93,596	-1,531
Total, Biological Systems Science	**457,435**	**481,777**	**297,079**	**-184,698**
Atmospheric System Research	39,584	28,656	–	-28,656
Environmental System Sciences	127,000	82,800	–	-82,800
Earth and Environmental Systems Modeling	111,281	109,281	30,000	-79,281
Earth and Environmental Systems Sciences Facilities and Infrastructure	154,700	148,486	57,841	-90,645
Total, Earth and Environmental Systems Sciences	**432,565**	**369,223**	**87,841**	**-281,382**
Subtotal, Biological and Environmental Research	**890,000**	**851,000**	**384,920**	**-466,080**
Construction				
24-SC-31 Microbial Molecular Phenotyping Capability (M2PC), PNNL	10,000	19,000	10,000	-9,000
Subtotal, Construction	**10,000**	**19,000**	**10,000**	**-9,000**
Total, Biological and Environmental Research	**900,000**	**870,000**	**394,920**	**-475,080**

SBIR/STTR funding:
- FY 2024 Enacted: SBIR $21,545,000 and STTR $3,030,000
- FY 2025 Enacted: SBIR $20,437,000 and STTR $2,874,000
- FY 2026 Request: SBIR $7,682,000 and STTR $1,080,000

Biological and Environmental Research
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Biological Systems Science Within Genomic Sciences, the Request reduces lower priority efforts across the portfolio while initiating new research in targeted areas. Foundational genomics will reduce and focus the portfolio on core elements of microbial and plant research underpinning biological discoveries for biotechnology development while in critical mineral and materials (CMM) will focus on key biodesign efforts to enhance microbial and plant abilities to recover, separate, and concentrate critical elements from the environment. The Bioenergy Research Centers will downsize teams and reduce efforts to focus on resolving remaining fundamental research challenges to producing fuels, chemicals, and other products from plant biomass. Biopreparedness Research Virtual Environment (BRaVE) efforts will end while low dose radiation research efforts narrow focus to produce experimental datasets for training AI systems on radiation exposure effects. FAIR efforts are completed. Computational Bioscience will pivot towards integrating new AI techniques to integrate data and experimental systems across the portfolio within open-access online platforms for genomics analyses and in coordination with JGI. The National Microbiome Data Collaborative (NMDC) will ramp down and merge capabilities with both KBase and JGI. Environmental Genomics will reduce overall efforts on natural systems and will prioritize plant and microbiome biotechnology. Biomolecular Characterization and Imaging Science research will reduce more established techniques and emphasize quantum-science enabled imaging and sensing concepts. JGI will prioritize user-initiated sequence production support and data infrastructure reorganization for AI. The Energy Earthshot Research Center activities will end.	-$184,698
Earth and Environmental Systems Sciences All BER facility and programmatic activities are funded under earth system modeling to support the highest priority research efforts. The consolidation includes the environmental system sciences, atmospheric system research, earth system modeling, and data management programs. The Atmospheric Radiation Measurement User Facility completes all campaigns and will close. BER efforts will continue at the EMSL User Facility. EMSL will focus on biological and environmental molecular science as it prepares new technologies for microbial molecular phenotyping. EMSL's experimental and analytic efforts support BER priorities in biotechnology, critical mineral extraction with biology, using AI analytics and laboratory automation to advance biosystems discovery.	-$281,382
Construction Design activities will continue for the Microbial Molecular Phenotyping Capability (M2PC) at Pacific Northwest National Laboratory.	-$9,000
Total, Biological and Environmental Research	-$475,080

Basic and Applied R&D Coordination

BER research underpins the needs of DOE's energy and environmental missions and is coordinated through internal DOE mechanisms, and more broadly through the National Science and Technology Council (NSTC) and other committees of the Office of Science and Technology Policy (OSTP). BER research includes biological and environmental systems investments in theoretical, experimental, predictive modeling research, and science supporting energy expansion. Basic research on genomics, microbes and plants provides fundamental knowledge that can be used to develop new bioenergy and bioproduct production processes that enhance the bioeconomy. Basic research on ecological processes is used to advance predictive capabilities and resilience of energy systems. Coordination with other federal agencies on priority biotechnology science occurs through the Biomass Research and Development Board, a Congressionally mandated interagency group created by the Biomass Research and Development Act of 2000, as amended by the Energy Policy Act of 2005 and the Agricultural Act of 2014. Coordination of BER's environment, geospatial, and Arctic investments occur within the NSTC Committee on Environment. BER coordinates with DOE's applied energy offices through regular joint DOE working groups, program manager meetings, by participating in their internal program reviews and in joint principal investigator meetings and technical workshops.

BER supports some interagency projects to manage databases (such as the Protein Data Bank) through interagency awards and funding for complementary community resources (such as beamlines and cryo-electron microscopy), particularly with NIH and NSF. BER is a member of the advisory committee for DoD's BioMADE project researching synthetic biology applications.

Program Accomplishments

Notable accomplishments in *Biological Systems Science* include:

- *New technology has great potential for accelerating the improvement of plant traits.* Researchers at the Center for Bioenergy Innovation, a BER Bioenergy Research Center, developed a split selectable marker system that allows for gene-stacking in herbaceous and woody plants which enables faster and more efficient multi-gene transformation in plant feedstocks for use in bioproducts and biofuels production.
- *A hybrid chemical-biological approach can upcycle mixed plastic waste with reduced cost*. A mixture of plastic types can cause cross-contamination issues in existing recycling facilities. Depolymerization of mixed plastic types into one biodegradable type has been demonstrated in a joint effort by the Joint BioEnergy Institute and the Advanced Biofuels Process Demonstration Unit and should result in more efficient recycling of plastics using less energy.
- *A new tool, geNomad, provides fast and precise identification of viruses and plasmids based on their gene content.* The Joint Genome Institute (JGI) designed the new geNomad software using computing resources at the NERSC User Facility with data from the National Microbiome Data Collaborative to process over 2.7 trillion base pairs of sequencing data, leading to the discovery of millions of viruses and plasmids (non-pathogenic).
- *Yeast use plastic waste oils to make high-value chemicals*. Growing a yeast strain on depolymerized plastic oil causes it to shift protein production toward energy and lipid metabolism. The yeast strain, with additional genetic modifications, has good potential to produce high-value chemicals from depolymerized plastics.

Notable accomplishments in *Earth and Environmental Systems Sciences* include:

- *The addition of Antarctic ice shelves in global ocean simulations improves tidal processes*. By including ice shelves in ocean simulations, errors of tidal amplitude and phase were reduced by up to 50% near Antarctica and by 5 to 10% globally, leading to improved predictions relevant to coastal energy, infrastructure, and national security operations.
- *Future water scarcity is primarily driven by human demands*. Future projections of water demand from the Global Change Analysis Model (GCAM) were combined with a land-use spatial downscaling model,

global hydrologic model, and a water withdrawal downscaling model to generate a global gridded monthly sectoral water use dataset for use by scientists, agriculture and water resource planners, and multi-sectoral utilities.

- *High latitude wetland methane emission is growing*. This study analyzed two decades (2002–2021) of methane emissions over the boreal-arctic region and revealed a 9 percent increase. Wetland methane emission increases occurred in early summer and were mainly driven by warming and ecosystem productivity.
- *Drought shifts the type of natural carbon emitted from land to the atmosphere*. The nuclear magnetic resonance and Fourier-Transform Ion Resonance capabilities at the Environmental Molecular Sciences Laboratory were used to track carbon in the form of CO_2 and volatile organic carbon in a tropical rainforest. Drought was found to impact microbial activity and increase emissions of soil carbon to the atmosphere.
- *Lidar observations provide critical information on boundary layer turbulence*. Doppler lidar data from five ARM User Facility sites in Oklahoma were used to study rapid changes in wind speed, known as ramp events. The new science is leading to improved prediction of wind energy production.

Biological and Environmental Research
Biological Systems Science

Description
The Biological Systems Science subprogram integrates advanced genomics research with computation and user facility capabilities for basic science on plant and microbial systems relevant to DOE mission in energy and national security underpinning U.S. leadership in biotechnology innovation.

Genomic Science
The Genomic Science activity supports basic research in foundational genomics, bioenergy, environmental genomics, and computational bioscience, including the use of AI/ML techniques. This activity reveals the fundamental principles that drive biological systems, enables the design of new biosystems relevant to DOE missions in energy and national security, and provides the breakthrough science needed to accelerate biotechnological innovation ensuring U.S. leadership in a globally competitive bioeconomy.

Foundational Genomics supports basic research on discovery, characterization, and design of mechanisms controlling gene expression in plants and microbes. This fundamental research applies systems biology approaches and biosystems design research to understand, predict, manipulate, and design biological processes to produce fuels, chemicals, materials, and other bioproducts from dedicated plant biomass. Efforts include designing microbes and plants with enhanced capabilities to scavenge and sequester critical minerals such as rare earth elements and to generate critical materials. Biological processes are adept at scavenging low concentrations of elements in the environment. This work will explore and refine engineering biology techniques to boost materials synthesis in organisms to drive rare earth element uptake, sequestration, and recovery.

The DOE Bioenergy Research Centers (BRCs) address key basic science bottlenecks precluding the ability to convert inedible lignocellulosic biomass grown on underutilized lands to fuels, chemicals, materials, and other bioproducts. These multi-disciplinary, multi-institutional centers accelerate the scientific groundwork necessary for biotechnology innovation to ensure secure supply chains of critical products that can be produced from renewable domestic resources. They collaborate with and spawn new industry efforts to move the basic research forward towards market.

Environmental Genomics supports research to understand genome expression in plants and microbial communities. The research not only provides a basis for understanding the cycling of carbon and nutrients in the soils but also serves as a foundation on which to learn how to engineer microbial communities and plant-microbe interactions for specific industrial or environmental purposes relevant to bioenergy and bioproduct development.

Computational Biosciences supports on-line, open access bioinformatics and modeling capabilities within the DOE Systems Biology Knowledgebase (KBase) and the National Microbiome Data Collaborative (NMDC). These integrated resources support large-scale collaborative genomic science investigations of plant and microbial systems to reveal insights into biological processes and new biosystems designs. New efforts include a concerted effort to integrate AI/ML capabilities into the portfolio to accelerate basic research underpinning biotechnology innovation.

Biomolecular Characterization and Imaging Science
Biomolecular characterization and imaging science supports integrative approaches to detect, visualize, and measure biological processes *in-situ* to gain a predictive understanding of cellular function, critical for advanced genomics research and biotechnology development. This effort includes innovative Quantum Information Science (QIS)-enabled imaging concepts and sensor/detector design.

Biological Systems Facilities and Infrastructure
The DOE Joint Genome Institute is the only federally funded major genome sequencing center focused on genome discovery and analysis in plants and microbes for energy, biotechnology, and environmental

applications. This scientific user facility provides high-throughput DNA sequencing and analysis capabilities for plants, microorganisms, and microbial communities as a foundational basis for BER's genomic science research efforts.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Biological Systems Science	**$481,777**	**$297,079**	**-$184,698**
Genomic Science	$340,900	$166,483	-$174,417
Foundational Genomics research prioritizes understanding the mechanisms controlling plant and microbial interactions in soils. Funding in the Accelerate and Biotechnology to Transform Advanced Manufacturing initiatives shift to priority bioenergy/bioeconomy research. Biosystems design research continues efforts to accelerate the ability to design plants and microorganisms with specific beneficial bioproduct and biomaterials production traits. Efforts continue to support emerging technologies to develop integrated automated sensors that scale from laboratory fabricated ecosystems to field ecosystems. Support for research on a wide variety of microorganisms and plants with bio-inspired bioproduct-relevant traits continues to broaden the range of platform organisms available for biotechnology. A new effort in critical minerals and materials research explores biosystems design concepts to boost uptake and recovery mechanisms of critical elements within plants and microorganisms broadening the range of metabolic capabilities and platform organisms underpinning biotechnology innovations.		Foundational Genomics prioritizes fundamental systems biology research on plants and microorganisms supporting biotechnology innovation and accelerating biosystems design efforts. Efforts in critical minerals and materials research narrow focus on key synthetic biology objectives to explore designing plants and microorganisms for extraction and recovery of critical elements.	Foundational Genomics efforts in Secure Biosystems Design are completed while efforts in broader Biosystems Design research are reduced. Efforts in Microbial Biofuels research are completed while efforts in sustainability research are reduced. Critical minerals and materials efforts are reduced.
BER concludes Energy Earthshot research initiated in FY 2023 on key biological research challenges at the interface between currently supported basic research and applied research supporting development activities to help speed translation of basic discoveries to industry.		The BER Energy Earthshot Research Centers (EERCs) are completed.	No funding is provided for EERCs.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Environmental Genomics continues basic plant functional genomics research to understand genotype to phenotype translations leading to bioenergy crop improvement.	Environmental Genomics prioritizes plant functional genomics and environmental microbiome science to enable efforts in plant biotechnology and engineered microbial communities.	Funding opportunities are reduced across Environmental Genomics to prioritize biotechnology development within plants and microbiomes.
Biopreparedness Research Virtual Environment (BRaVE) continues to add functionality to its expanding computational platform and experimental workflows. BRaVE continues to build a distributed network of data and experimental capabilities that can be accessed by multidisciplinary teams of scientists working together on urgent multiprogram priorities and/or emergency situations. BRaVE expands low dose radiation research efforts.	BRaVE efforts are complete. Low dose radiation research prioritizes research on experimental dataset generation to serve as training sets for AI modeling of low dose radiation effects.	No funding for BRaVE efforts. Low dose radiation research is reduced to prioritize on experimental datasets for AI modeling of low dose radiation effects.
Computational Bioscience supports research efforts within Genomic Science by providing bioinformatics, simulation, and modeling capabilities through the KBase platform and within the NMDC. Both platforms continue integrative activities with each other and with the JGI. New efforts include integration of AI/ML capabilities into the KBase platform modeling, and science in concert with JGI data restructuring activities.	Computational Bioscience continue support for Genomic Science by providing bioinformatics, simulation, and modeling capabilities. Efforts expand to integrate AI/ML infrastructure and capabilities across BER User Facilities and KBase.	Funding will support AI/ML integration into the KBase platform and biological sciences while NMDC ramps down and is folded into the JGI and KBase collaborative activities underpinning an advanced AI system supporting genomic science biotechnology innovation.
The BRCs broaden their collaborative activities to accelerate plant and microbial genome engineering with AI/ML techniques to diversify the range of products that can be produced from plant biomass, expand understanding of plant-microbe interactions to create better agronomic practices, develop new plant varieties with expanded capabilities for bioenergy and bioproduct production and increase collaboration among the broader research community where new crop-	The BRCs sharpen their focus on critical basic science needs to accelerate plant and microbial biotechnology innovation including prioritizing on integrating AI/ML techniques into their research plans and shared research objectives.	BRC teams and collaborators will be restructured to focus on priority research activities across the BRC portfolio with emphasis on activities to accelerate the design of plants and microorganisms for biotechnology purposes. The BRCs will focus on leading edge biosystems design techniques to bolster U.S. biotechnology leadership for producing a range of products from plant biomass.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
based clean energy and bioproduct production could spark new industries and biotechnology development.		
Funding supports EPSCoR Implementation Grants.	Funding will support EPSCoR-State/National Laboratory Partnerships.	Continued support for research in EPSCoR jurisdictions.
Biomolecular Characterizati and Imaging Science $45,750	$37,000	-$8,750
New multimodal bioimaging research provides new capabilities to characterize, measure, visualize and test hypotheses on plant and microbial cell function and metabolism. Quantum-enabled science concepts for imaging techniques will continue.	Imaging and characterization technologies will continue with an emphasis on quantum-science enabled imaging and sensor development tailored to plants and microorganisms, while maintaining capabilities for structural biology.	Research on multi-modal classical bioimaging development will be ramped down while quantum-science for imaging and sensing research ramps up. Capabilities for structural biology are maintained.
Biological Systems Facilities Infrastructure $95,127	$93,596	-$1,531
JGI provides users with high quality genome sequences and new analysis techniques for complex plant and microbiome samples. Integrative activities with KBase and the NMDC provide new cross-platform capabilities for users. Genome-based discovery efforts for natural product production in microbial isolates continues in concert with expanded metagenomics analysis techniques. The multi-year instrument and equipment refresh will continue to support the integrative activities with KBase and the NMDC. New plant transformation research will be conducted to explore techniques to transform a wider variety of plants for genome interrogation and design.	JGI will maintain sequence production capacity to continue to meet the needs of scientific users. JGI will provide users with high quality genome sequences and new analysis techniques for complex plant and microbiome samples. Integrative activities with KBase will continue to provide new cross-platform capabilities for users. Progress on reorganizing JGI's data infrastructure environment will continue as the facility prepares to become a more AI-centric facility for genomic science.	Funding will support continued integrative efforts with KBase to provide new AI/ML analysis capabilities for users. A restructuring of JGI's data portals into a more AI-friendly integrated data infrastructure will continue. These efforts move JGI towards becoming a more AI-centric facility for genomic science and biotechnology innovation.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Biological and Environmental Research
Earth and Environmental Systems Sciences

Description

The Earth and Environmental Systems Sciences subprogram supports fundamental research and scientific user facilities that enable enhanced predictability of dynamically variable environmental and Earth systems, in support of DOE's mission involving transformative science for energy and national security. In FY 2026, all Atmospheric Systems Research and Environmental Systems Sciences activities will be consolidated and funded under the Earth and Environmental Systems Modeling. Research includes improving predictability of variable environmental conditions that influence the design of next generation energy technologies and infrastructure, based on experimental and modeling research on Earth and energy systems. Research includes modeling of the interdependent terrestrial, marine, coastal, cryospheric, and energy components of the Earth system; analysis of energy technologies and infrastructures that are embedded in the Earth system; and uncertainty quantification. This integrated portfolio extends from molecular to regional and global scales and time scales from sub-seasonal to decadal. The research uses the DOE Office of Science (SC) Environmental Molecular Sciences Laboratory (EMSL) user facility to advance basic science through its world-class facilities, multi-modal instrumentation, and scientific leadership that empower and enable researchers to achieve a predictive understanding of complex biological and environmental systems. Modeling activities leverage DOE's exascale leadership computing user facilities and advance with the latest methods in artificial intelligence (AI). The Atmospheric Radiation Measurement (ARM) Office of Science User Facility is closed.

<u>Atmospheric System Research</u>

Atmospheric System Research (ASR) is the primary U.S. research activity advancing the science involving the main source of uncertainty in Earth system models: the interactions and interdependence of cloud, aerosol, precipitation, and radiative transfer processes. Understanding of these processes must be improved for models to inform appropriate deployment of energy systems.

<u>Environmental System Sciences</u>

Environmental System Sciences (ESS) supports research on physical and hydro-biogeochemical processes from the subsurface to the top of the vegetative canopy. ESS combines field research, process modeling, and new multi-scale data sets particularly from regions where energy infrastructures and related sectors are exposed to environmental variabilities and other changes, such as in the Artic, midlatitude boreal zone, urban canopies, rural regions, and coastal watersheds. ESS activities are designed to provide high value science within a next-generation Earth system modeling framework.

<u>Earth and Environmental Systems Modeling</u>

Earth and Environmental Systems Modeling (EESM) develops the physical, biogeochemical, and dynamical science and software capabilities underpinning the design and use of fully coupled Earth System Models (ESMs), that complement and coordinate with other Federal efforts and with a focus on subseasonal (weeks) to decadal timescales. DOE's flagship Energy Exascale Earth System Model (E3SM) is continually being upgraded to apply state-of-the-art AI tools and effectively use DOE's exascale computers. BER invests in data assimilation methodologies, based on field observations, crowd-sourced information, and synthetic data based on AI, to accelerate progress towards new understanding in complex geographic domains relevant to DOE's science, energy, and national security missions.

<u>Earth and Environmental Systems Sciences Facilities and Infrastructure</u>

The Earth and Environmental Systems Sciences Facilities and Infrastructure activity supports data management and the EMSL User Facility. These activities provide the scientific community with data and technical capabilities, scientific expertise, and unique information to facilitate cutting edge science in molecular science areas integral to addressing gaps in understanding and predictive modeling capabilities. EMSL will focus on coupled analyses across multiple analytical capabilities to advance the biological and environmental sciences to uncover the biochemical pathways connecting gene functions to complex biological responses, develop predictive understanding of the mechanistic interplay of physical, biological and environmental processes and will develop and use AI workflows, laboratory automation, data analytics, visualization and computational modeling. The ARM User Facility is closed.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Earth and Environmental Systems Sciences	**$369,223**	**$87,841**	**-$281,382**
Atmospheric System Research	$28,656	$ —	-$28,656
Atmospheric System Research (ASR) completes and closes out most research on clouds, aerosols, and thermodynamic processes, including those with a focus on data from the Atmospheric Radiation Measurement (ARM) facility long-term sites as well as data from the completed TRACER and SAIL campaigns, and the on-going campaigns Cape-K (Cloud and Precipitation Experiment at Kennaook) in Tasmania and CoURAGE (Coast-Urban-Rural Atmospheric Gradient Experiment) in Baltimore, Maryland.		Most ASR research on clouds, aerosols, and thermodynamic processes, analyzing observational datasets is completed except those supporting the modeling activities aligned with administration priorities.	ASR funding will be consolidated under Earth and Environmental Systems Modeling to support the administration's highest priority research.
Environmental System Sciences	$82,800	$ —	-$82,800
Environmental System Sciences (ESS) completes most research on permafrost, boreal ecology, and modeling hydrobiogeochemistry of watersheds and terrestrial-aquatic interfaces, with a focus on urban systems and on the coastal zones encompassed by the Delaware and Susquehanna watersheds and the Great Lakes, and Puget Sound.		Most ESS will research on hydro-biogeochemical processes in terrestrial watershed, coastal systems and urban systems is completed except those supporting the modeling activities aligned with administration priorities.	ESS funding will be consolidated under Earth and Environmental Systems Modeling to support the administration's highest priority research.
Earth and Environmental Systems Modeling	$109,281	$30,000	-$79,281
Many of the Earth and Environmental Systems Modeling (EESM) are completed. Any Energy Exascale Earth System Model (E3SM) activities involving climate are terminated. EESM focuses on		EESM focuses investments on modeling detailed earth-energy system interactions within regionally refined segments of the E3SM model, achieving hyper-resolution scales and incorporating	Funding will be consolidated under this subprogram to focus on supporting the administration's highest priority research.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
investments on further refinement of the science serving administration priorities and includes improving underpinning non-hydrostatic adaptive mesh modeling and incorporating the necessary software for deployment of the model onto more advanced exascale computing architectures. E3SM enhances AI capabilities to enable more sophisticated science that demands higher model resolution and greater accuracy. The new E3SM version 3 advances capabilities for exploring the effects of water cycles on watershed and coastal hydrological systems, research involving urban systems and detailed ice-sheet-ocean interactions in polar regions.	state-of-the-art AI techniques as well as the necessary software for deployment of the model onto more advanced exascale computing architectures. New science will be derived from data and new process representations provided from ASR research on cloud-aerosol-precipitation interactions as well as advanced biogeochemical, watershed, and coastal research derived from ESS.	
Earth and Environmental Systems Sciences Facilities and Infrastructure $148,486	$57,841	-$90,645
EMSL emphasizes new science under two efforts: MONet, which obtains standardized soil samples from across the U.S. in a crowdsourced effort to derive microbial genomic/omic data in partnership with the Joint Genome Institute (JGI), and to molecular characterize associated organic matter, and DigiPhen, which uses a variety of EMSL instrumentation to obtain biochemical and genetic information from an initial complement of fungal proteins.	EMSL will undertake regular MONet solicitations for proposals from the scientific community, expand the DigiPhen effort to derive data from fungal proteins from U.S. sites, and initiate first science on phenotyping anerobic microorganisms using a test automation platform.	EMSL economizes by moving user science from small-scale, individual instrument scientific projects to multi-disciplinary scientific projects that use combinations of EMSL's advanced instrumentation, data analytics, and modeling and simulation capabilities through a variety of workflows, which will facilitate complex systems-level understanding relevant to DOE's energy and environmental missions.
The Atmospheric Radiation Measurement (ARM) SC user facility completes ARM mobile facility campaigns and activities at fixed sites in Alaska, Oklahoma, and the Eastern North Atlantic site. ARM conducts remediation of sites and deployments.	ARM campaigns will be completed, and the facility is closed.	ARM campaigns will be completed.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
The Earth and Environmental Sciences Data Management activity continued support to maintain existing and new critical software and data archives in support of ongoing experimental and modeling research. Essential data archiving and storing protocols, capacity, and provenance are maintained. Advanced analytical methodologies such as AI and Machine Learning are enhanced and used to improve predictability more rapidly using the combination of field observations with Earth system models.	The Earth and Environmental Sciences Data Management activity will continue support to maintain existing and new critical software and data archives in support of ongoing experimental and modeling research.	The Earth and Environmental Sciences Data Management activity will be consolidated under Earth and Environmental Systems Modeling to support the highest priority research proposals.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

This subprogram supports line-item construction for the BER program. All Total Estimated Costs (TEC) are funded in this subprogram, including engineering, design, and construction. The FY 2026 Request continues the Microbial Molecular Phenotyping Capability project.

24-SC-31, Microbial Molecular Phenotyping Capability (M2PC), PNNL

The M2PC will be the world's first fully connected end to end phenotyping platform from genetic diversity creation, to culturing, functional testing, and deep analyses of protein and metabolites allowing for autonomous biological experimentation when combined with AI approaches. The M2PC project will design and construct a new capability that will provide a range of 24,500–50,000 gross square feet (GSF) of instrumentation and support spaces conducive for highly autonomous operations, with a target of 34,500 GSF. In addition, the M2PC design will include acquisition of analytical instrumentation and microbial culturing and characterization capabilities that will be modular and expandable, self-contained, and operate in an automated pod configuration. Capabilities will include a suite of 5 to 10 microbial culturing pods, 3 to 5 biological and functional assay pods, and 4 to 5 analytical phenotyping workflow pods. This new capability will position BER to take a global lead in answering the most pressing challenge in biology—generating molecular phenotypic data at a pace that matches the rapid developments in high throughput genome sequencing and synthesis. Applicability of this capability to BER interests in bioproducts, critical elements, nutrient cycling, and other DOE-relevant bioenergy applications, and will create a knowledge ecosystem that would provide data to amplify BER's genome engineering and biosystems design efforts, as well as mechanistic hydro-biogeochemistry modeling capabilities. In the FY 2026 Request, the TEC funding of $10,000,000 will be used to begin construction of the conventional facility, and initiate procurement of the first phase of the high throughput phenotyping equipment.

Biological and Environmental Research
Construction

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$19,000**	**$10,000**	**-$9,000**
24-SC-31, Microbial Molecular Phenotyping Capability (M2PC), PNNL	$19,000	$10,000	-$9,000
Funding supports the M2PC project at PNNL.		Funding will support the M2PC project at PNNL.	Funding will continue to support the M2PC project at PNNL.

Biological and Environmental Research
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	14,500	3,000	2,071	-929
Minor Construction Activities						
General Plant Projects	N/A	N/A	5,000	–	–	–
Total, Capital Operating Expenses	**N/A**	**N/A**	**19,500**	**3,000**	**2,071**	**-929**

Capital Equipment

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Major Items of Equipment						
Earth and Environmental Systems Sciences						
Atmospheric Radiation Measurement (ARM) Aerial Observation Capability (Air-ARM)	33,186	27,186	6,000	–	–	–
Total, MIEs	N/A	N/A	6,000	–	–	–
Total, Non-MIE Capital Equipment	N/A	N/A	8,500	3,000	2,071	-929
Total, Capital Equipment	**N/A**	**N/A**	**14,500**	**3,000**	**2,071**	**-929**

Note:
- *The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.*

Minor Construction Activities

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
General Plant Projects (GPP)						
GPPs (greater than $5M and $34M or less)						
Project 3 - Relocations (3020EMSL Remodel to Unpack and Relocate), PNNL	5,000	–	5,000	–	–	–
Total GPPs (greater than $5M and $34M or less)	N/A	N/A	5,000	–	–	–
Total, General Plant Projects (GPP)	**N/A**	**N/A**	**5,000**	**–**	**–**	**–**
Total, Minor Construction Activities	**N/A**	**N/A**	**5,000**	**–**	**–**	**–**

Note:

- *GPP activities $5M and less include design and construction for additions and/or improvements to land, buildings, replacements or addition to roads, and general area improvements. AIP activities $5M and less include minor construction at an existing accelerator facility.*

Biological and Environmental Research
Construction Projects Summary

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
24-SC-31, Microbial Molecular Phenotyping Capability (M2PC), PNNL						
Total Estimated Cost (TEC)	117,000	-	10,000	19,000	10,000	-9,000
Other Project Cost (OPC)	5,000	250	950	-	-	-
Total Project Cost (TPC)	122,000	250	10,950	19,000	10,000	-9,000
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	10,000	19,000	10,000	-9,000
Other Project Cost (OPC)	N/A	N/A	950	-	-	-
Total Project Cost (TPC)	N/A	N/A	10,950	19,000	10,000	-9,000

Biological and Environmental Research
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type B					
Environmental Molecular Sciences Laboratory	55,250	54,973	57,729	57,841	+112
Number of Users	715	720	753	754	+1
Joint Genome Institute	92,250	91,757	95,127	93,596	-1,531
Number of Users	2,375	2,456	2,491	2,428	-63
Atmospheric Radiation Measurement User Facility	81,500	81,075	83,757	–	-83,757
Number of Users	1,215	1,062	1,073	–	-1,073
Total, Facilities	229,000	227,805	236,613	151,437	-85,176
Number of Users	4,305	4,238	4,317	3,182	-1,135

Note:
- *Percent optimal operations defines what is achieved at this funding level. This includes staffing, up-to-date equipment and software, operations and maintenance, and appropriate investments to maintain world leadership.*

Biological and Environmental Research
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	1,795	1,740	795	-945
Number of Postdoctoral Associates (FTEs)	420	405	200	-205
Number of Graduate Students (FTEs)	650	630	305	-325
Number of Other Scientific Employment (FTEs)	415	405	205	-200
Total Scientific Employment (FTEs)	**3,280**	**3,180**	**1,505**	**-1,675**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals, and other support staff.*

24-SC-31, Microbial Molecular Phenotyping Capability (M2PC), PNNL
Pacific Northwest National Laboratory, PNNL
Project is for Design and Construction

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

Summary
The FY 2026 Request for the Microbial Molecular Phenotyping Capability (M2PC) project is$10,000,000 of Total Estimated Cost (TEC) funding. The project will design and construct a new research capability that will be broadly available to the scientific community as part of an Office of Science User Facility. DOE approved Critical Decision (CD)-0 on April 28, 2021, and CD-1 on February 15, 2024. The current total project cost (TPC) range is $100,000,000 to $167,000,000. The point estimate TPC for this project is $122,000,000.

Significant Changes
DOE conducted both an Independent Project Review (IPR) and an Independent Cost Review (ICR) of the project in June 2023, as pre-requisites for a CD-1 decision. Through the development of the CD-1 materials and in response to comments from the IPR and ICR reviews, the project scope, schedule, and cost range have been further defined, as reflected in the tables below. The updated project TPC range is $100,000,000 to $167,000,000, and the CD-4 range is FY 2029 to FY 2032. The project achieved CD-1, Approve Alternative Selection and Cost Range on February 15, 2024. The project is pursuing a tailoring strategy to combine CD-2 and CD-3.

FY 2024 funding supported the project's advanced conceptual planning and the refinement of estimates based on initial ideas and plans. In addition, the project developed request for proposal (RFP) documentation for both the high throughput (HTP) capabilities and construction of the facility. The FY 2025 Enacted funding allows the project to solicit vendor proposals for the HTP capabilities and the facility. In addition, the project will refine project artifacts to support an ICR review, in preparation to achieve CD-2/3 approval in early fiscal year 2026. The performance baselines for scope (Key Performance Parameters), schedule, and cost will then be set. The FY 2026 Request will support awards for both the HTP and facility contracts. Design-Build activities for the facility construction will commence and procurement and fabrication of the initial HTP phenotyping equipment components will begin.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	4/28/21	6/30/22	2/15/24	1Q FY 2026	4Q FY 2026	1Q FY 2026	1Q FY 2032

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	29,000	88,000	117,000	5,000	5,000	122,000
FY 2026	29,000	88,000	117,000	5,000	5,000	122,000

2. Project Scope and Justification

Scope

The M2PC project will design and construct a new capability that will provide approximately 34,500 gross square feet (GSF) of instrumentation and support spaces conducive for highly autonomous operations. In addition, the M2PC design will include acquisition of analytical instrumentation and microbial culturing and characterization capabilities that will be modular and expandable, self-contained, and operate in an automated pod configuration. Capabilities will include a suite of 5 to 10 microbial culturing pods, 3 to 5 biological and functional assay pods, and 4 to 5 analytical phenotyping workflow pods.

Justification

Within the Biological and Environmental Research (BER) program, basic research to gain a predictive understanding of biological systems provides the foundation for harnessing and integrating the latest biosystems design techniques with data science and multi-scale modeling approaches. This effort will advance a burgeoning bioeconomy and provide transformative science and technology solutions to enable DOE to meet its energy and environmental challenges. Toward systems-level understanding, BER-supported research has increasingly embraced the integration of multi-omics analyses together with phenotypic characterization of microbial isolates and communities to determine the function of expressed genes and pathways.

While the number of microbial isolates and chassis microbes interrogated is expanding rapidly along with advances in next generation genome sequencing and synthesis, incomplete and constrained genome annotation limits the ability to understand and model the range of activities and functions of individual microbes, engineered microbial consortia with bio-industrial potential or ecological relevance, and microbial communities from natural soil environments. Specifically, there is a significant gap in the ability of the scientific community to identify proteins and biochemical pathways of unknown function in microbes at the single-cell to microbial-community scales, in part because the phenotypes of microbes change rapidly due to environmental factors and perturbations. To address this gap, BER proposes a research capability for a Microbial Molecular Phenotyping Capability that would be broadly available to the scientific community as part of a DOE Office of Science User Facility.

An emphasis on coupled high-throughput autonomous experimental and multimodal analytical capabilities would be the primary components of the instrumentation part of the M2PC. These capabilities would be integrated with, and amplify, existing BER data platforms within the DOE JGI, the NMDC, and the KBase to speed the discovery of new protein functions and metabolic pathways in microbial systems, including fungi, algae, bacteria, protists, archaea, and viruses.

This new capability will position BER to take a global lead in answering the most pressing challenge in biology—generating molecular phenotypic data at a pace that matches the rapid developments in high throughput genome sequencing and synthesis, and it will advance the DOE mission to ensure America's security and prosperity by addressing energy and environmental challenges through transformative science and technology solutions. Applicability of this capability to BER interests in bioproducts, critical elements, nutrient cycling, and other DOE-relevant bioenergy applications, will create a knowledge ecosystem that would provide data to amplify BER's genome engineering and biosystems design efforts, as well as mechanistic hydro-biogeochemistry modeling capabilities.

The project is being conducted in accordance with DOE's project management requirements.

Key Performance Parameters (KPPs)
The KPPs are preliminary and may change as the project continues towards CD-2. At CD-2 approval, the KPPs will be baselined. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure	Threshold	Objective
Demonstrate high-throughput (HTP) Culturing	Capacity to operate with 500 Experiments/Week*	Capacity to operate with 2,000 Experiments/Week*
Demonstrate HTP Microbiome Culturing	Capacity to operate with 100 Microbiome Experiments/Week	Capacity to operate with 500 Microbiome Experiments/Week
Demonstrate HTP Assaying and Phenotyping	Capacity to obtain 1,000,000 Multi-Modal Analytical Measurements/Month	Capacity to obtain 3,000,000 Multi-Modal Analytical Measurements/Month
Remote Capability to Access Operations	Demonstrate that remote users can run pre-defined EMSL protocols to be executed autonomously within M2PC across culturing, assaying, and analyses**	Demonstrate remote users can perform dynamic experimental intervention with help from EMSL staff by modifying an executed protocol during the experimental timeframe**
Total Building Size (GSF)	24,500 sq. ft.	50,000 sq. ft.
*A microbiome start is an experiment consisting of a mix of 2-8 microbial species cultured under a defined set of conditions. **Protocol settings will have built-in acceptable safe operating ranges for selection within established instrument specifications from vendors, EMSL protocol best-practices, and PNNL EH&S safe research operating windows.		

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
FY 2024	10,000	10,000	10,000
FY 2025	19,000	19,000	19,000
Total, Design (TEC)	**29,000**	**29,000**	**29,000**
Construction (TEC)			
FY 2026	10,000	10,000	10,000
Outyears	78,000	73,875	78,000
Total, Construction (TEC)	**88,000**	**83,875**	**88,000**
Total Estimated Cost (TEC)			

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
FY 2024	10,000	10,000	10,000
FY 2025	19,000	19,000	19,000
FY 2026	10,000	10,000	10,000
Outyears	78,000	73,875	78,000
Total, Total Estimated Cost (TEC)	**117,000**	**112,875**	**117,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	250	250	250
FY 2024	950	950	950
Outyears	3,800	3,800	3,800
Total, Other Project Cost (OPC)	**5,000**	**5,000**	**5,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	250	250	250
FY 2024	10,950	10,950	10,950
FY 2025	19,000	19,000	19,000
FY 2026	10,000	10,000	10,000
Outyears	81,800	77,675	81,800
Total, TPC	122,000	117,875	122,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	N/A	20,500	N/A
Design - Contingency	N/A	8,500	N/A
Total, Design (TEC)	**N/A**	**29,000**	N/A
Construction	N/A	66,000	N/A
Construction - Contingency	N/A	22,000	N/A
Total, Construction (TEC)	**N/A**	**88,000**	N/A
Total, TEC	**N/A**	**117,000**	N/A
Contingency, TEC	*N/A*	*30,500*	*N/A*
Other Project Cost (OPC)			
OPC, Except D&D	N/A	3,900	N/A
Conceptual Design	N/A	1,100	N/A
Total, Except D&D (OPC)	**N/A**	**5,000**	N/A
Total, OPC	**N/A**	**5,000**	N/A
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	**N/A**	**122,000**	N/A
Total, Contingency (TEC+OPC)	***N/A***	***30,500***	***N/A***

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	—	10,000	19,000	—	88,000	117,000
	OPC	250	950	—	—	3,800	5,000
	TPC	250	10,950	19,000	—	91,800	122,000
FY 2026	TEC	—	10,000	19,000	10,000	78,000	117,000
	OPC	250	950	—	—	3,800	5,000
	TPC	250	10,950	19,000	10,000	81,800	122,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2032
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2082

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	N/A	223	N/A	11,150
Utilities	N/A	145	N/A	7,250
Maintenance and Repair	N/A	331	N/A	16,550
Total, Operations and Maintenance	N/A	699	N/A	34,950

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at PNNL	34,500
Area of D&D in this project at PNNL	—
Area at PNNL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	—
Area of D&D in this project at other sites	—
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	—
Total area eliminated	—

8. Acquisition Approach

The Acquisition Strategy for the M2PC project was reviewed and approved as part of CD-1. It will include two major acquisitions: the research equipment vendor and facility contract. Both acquisitions will be best value source selections. The research equipment vendor will provide a turn-key solution (design, procurement, installation, fabrication, assembly, testing, KPP verification, training, etc.) for the high-throughput microbial molecular phenotyping capability needed to meet the research-related KPPs. PNNL will procure the facility via a design-build strategy. It will house and provide utilities to operate the research equipment and will meet the facility space KPP. PNNL will competitively bid and award all necessary subcontracts based on best value to the government. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the M2PC project.

Fusion Energy Sciences

Overview

The Fusion Energy Sciences (FES) program's mission is to drive the scientific and technological foundation for a fusion energy source and support the development of a competitive U.S. fusion energy industry. The FES strategy is founded on advancing the basic research needed to solve foundational science and technology (S&T) gaps towards the development of fusion power as an affordable and reliable energy source in the U.S. using multiple tools and strategic approaches. Core capabilities in foundational S&T areas are complemented by alignment with the 2020 Fusion Energy Sciences Advisory Committee (FESAC) Long-Range Plan (LRP) Fusion Materials and Technology (FM&T) gaps, which connects the three science drivers: Sustain a Burning Plasma, Engineer for Extreme Conditions, and Harness Fusion Power.

FES supports exploitation of frontier fusion facilities in the U.S. and abroad in both public and private sectors. The Sustain a Burning Plasma program element includes R&D on domestic short-pulse toroidal facilities (e.g., DIII-D and National Spherical Torus Experiment-Upgrade (NSTX-U)) that enable international collaborations on long pulse tokamaks and stellarators abroad. U.S. world-leading Office of Science (SC) fusion toroidal platforms support artificial intelligence-fusion convergence, optimize magnetic confinement regimes and test prototype fusion technology. Inertial Fusion Energy (IFE) hubs support rapid growth of inertial confinement approaches in an expanded IFE program. FES supports U.S. participation in ITER to provide U.S. scientists access to an industrial scale burning plasma experimental facility and to help build the American fusion energy supply chain. Access to domestic private fusion facilities is also provided under a new Private Facility Research (PFR) program to both address S&T gaps and support the emerging private sector. Studies of future large-scale facilities that best serve the mission of FES and are aligned with the FESAC LRP goals of FM&T gap closure are evaluated.

Complementing facility programs is a suite of nationally coordinated public-private partnership (PPP) programs to support a growing fusion power industry. The Milestone-Based Fusion Energy Development Program supports fusion developer startup companies establish viable fusion pilot plant (FPP) designs. Fusion Innovation Research Engine (FIRE) Collaboratives address critical S&T gaps informed by the private sector. The Innovation Network for Fusion Energy (INFUSE) program provides vouchers to fusion startups to access public fusion infrastructure at national labs and universities. Fusion BRIDGE, a public-private consortium for fusion energy, accelerates cost-sharing of small and medium-scale test stands to de-risk most common and critical FM&T gaps in a network of economic regional hubs aligning advanced manufacturing, digital engineering, and infrastructure to support a U.S.-based fusion innovation supply chain. The U.S. continues to develop the overall fusion strategy and is determining how to partner with allies and industry to prioritize investments that accomplish the best and quickest outcomes to advance fusion energy.

FES supports fusion theory and simulation to enable prediction and interpretation of complex, self-organized plasma phenomena and fusion technology, and to provide validate high-fidelity physical models for plant design. To steward advanced computation for fusion energy, FES supports Scientific Discovery through Advanced Computing (SciDAC) portfolio, in partnership with the Advanced Scientific Computing Research (ASCR) program, to integrate simulation capabilities across a broad range of technical areas. The Fusion Materials and Internal Components areas address the development of novel materials and technologies that can withstand enormous heat and neutron exposure. The Material Plasma Exposure eXperiment (MPEX) facility is being constructed with the aim of addressing knowledge gaps in plasma-material interactions. The Closing the Fusion Cycle areas aim to develop the breeding and processing technology for fusion fuels that ensure fusion is a self-sustaining energy source which is important for the design basis of an FPP.

In plasma science and technology, FES supports research areas such as plasma astrophysics, space plasmas, plasma propulsion, high-energy-density plasmas (HEDP), and low-temperature plasmas. Practical societal applications of plasmas are found in plasma processing of advanced materials, plasma-enabled chemical processing, and plasma medicine. Some of this research is conducted through partnerships and/or coordination with the National Science Foundation (NSF) and the National Nuclear Security Administration (NNSA).

Within the Office of Science, FES invests in several cross-cutting initiatives such as artificial intelligence and machine learning (AI/ML), quantum information science (QIS), and microelectronics. In addition, with continued funding for the Established Program to Stimulate Competitive Research (EPSCoR), FES will build strategic programs to enhance SC-sponsored fusion-relevant research in key states and territories.

Highlights of the FY 2026 Request

The FES FY 2026 Request of $744.8 million is a decrease on net of $45.220 million below FY 2025 Enacted, primarily due to reduced funding for ITER more than offsetting increases for high priority research activities. The Request is aligned with a reassessment of how ITER fits in the overall U.S. fusion strategy, including reviewing partnerships and investment approaches to quickly advance fusion energy. The Request is aligned with recommendations in the FESAC LRP. The FY 2026 Request includes:

Research

- DIII-D research: Characterize and exploit innovative heating and current drive sources relevant for power plants including development of high-confinement, steady-state operating scenarios.
- NSTX-U research: Support collaborative research related to the optimization of tokamak aspect ratio and high field conventional tokamak studies in support of FPP development. Engage in high priority strategic FM&T initiatives.
- Partnerships with the private sector: For the Milestone-Based Fusion Development Program, support subsequent phases of research and commercialization activities of the teams that successfully met their initial milestones; continue to support the Innovation Network for Fusion Energy (INFUSE) program and the Private Facility Research (PFR) program, which started as a pilot program in FY 2025, to perform open research on private fusion and plasma S&T facilities. In addition, a new element, Fusion BRIDGE, is added to explore modalities that support PPPs aimed at developing and building small, medium, and large-scale capabilities, including test stands. These efforts are targeted toward closing critical FM&T gaps defined by both the public and private sectors.
- IFE: Enhance research activities including the IFE-STAR hubs and implement the priority research opportunities that came out of the 2022 IFE Basic Research Needs (BRN) Workshop including de-risk S&T capabilities.
- FIRE Collaboratives: Strengthen support for the multi-institutional, multi-disciplinary research and development centers to address critical S&T gaps outlined in the LRP and support public & private FPP efforts. The Request supports multiple collaboratives in four technical areas: advanced simulation, materials, blanket/fuel cycle, and enabling technologies.
- International Collaborations: Continue to exploit international, long-pulse facilities by multi-institutional teams, and complete fabrication and installation of advanced diagnostic systems on new world-leading facilities. Expand strategic international partnerships on FM&T facilities and partner to build new large-scale facilities and test stands with Fusion BRIDGE in the U.S. fusion ecosystem.
- Discovery Plasma Science and Technology: Continue support for basic plasma research and collaborative research facilities, HEDLP research and facilities, microelectronics, and plasma-based technology research, and expand QIS.
- AI/ML: Increase support for multi-disciplinary teams applying AI/ML for science discovery, data analysis, model extraction, plasma control, analysis of extreme-scale simulations, and data-enhanced prediction and control.
- EPSCoR: Strengthen fusion-relevant research capacity and capabilities in key states and territories.

Facility Operations

- DIII-D operations: Support 16 weeks of facility operations, with a new divertor allowing higher plasma performance, and complete ongoing infrastructure improvements.
- NSTX-U recovery and operations: Continue the recovery and repair activities including machine assembly and continue to support commissioning in preparation for plasma operations.

Projects

- U.S. hardware development and delivery to ITER: Support the testing and final delivery of all Central Solenoid magnet modules. Evaluate and assess the continued design, fabrication, and delivery of U.S. in-kind hardware systems, including tokamak cooling water, tokamak exhaust processing, electron and ion heating transmission lines, diagnostics, tokamak fueling, disruption mitigation, vacuum auxiliary, and roughing pumps.

- Major Item of Equipment (MIE) project for plasma-material interaction research: Continue to support the Material Plasma Exposure eXperiment (MPEX) MIE project, which includes the design, fabrication, installation, and commissioning of the MPEX linear plasma device, and associated facility modification and reconfiguration.
- SLAC National Accelerator Laboratory (SLAC) Matter in Extreme Conditions-Upgrade (MEC-U) project: Activities for the MEC-U project are on hold. There is no request for funding in FY 2026.

Other

- General Plant Projects/General Purpose Equipment (GPP/GPE): Support infrastructure improvements and repairs at the Princeton Plasma Physics Laboratory (PPPL) and other DOE laboratories.

Fusion Energy Sciences
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Fusion Energy Sciences				
Advanced Tokamak	139,600	–	–	–
Spherical Tokamak	98,100	–	–	–
Theory & Simulation	42,300	–	–	–
Public-Private Partnerships (old)	45,000	–	–	–
Artificial Intelligence and Machine Learning	11,000	–	–	–
Inertial Fusion Energy (IFE) (old)	15,000	–	–	–
Total, Burning Plasma Science: Foundations	**351,000**	**–**	**–**	**–**
Long Pulse: Tokamak (old)	13,000	–	–	–
Long Pulse: Stellarators	7,500	–	–	–
Materials & Fusion Nuclear Science	95,000	–	–	–
Future Facilities Studies (old)	2,000	–	–	–
Total, Burning Plasma Science: Long Pulse	**117,500**	**–**	**–**	**–**
Plasma Science and Technology (old)	33,000	–	–	–
Measurement Innovation (old)	3,000	–	–	–
Quantum Information Science (QIS) (old)	10,000	–	–	–
Advanced Microelectronics (old)	13,000	–	–	–
Other FES Research	2,500	–	–	–
Reaching a New Energy Sciences Workforce	6,000	–	–	–
FES-Funding for Accelerated, Inclusive Research (FAIR)	2,000	–	–	–
FES-Established Program to Stimulate Competitive Research (EPSCoR)	2,000	–	–	–
Total, Discovery Plasma Science	**71,500**	**–**	**–**	**–**
Theory and Simulation	–	64,000	74,600	+10,600
Fusion Materials and Internal Components	–	85,000	85,473	+473
Sustain a Burning Plasma	–	123,000	132,900	+9,900
Closing the Fusion Cycle	–	69,000	78,100	+9,100
Discovery Plasma Science and Technology	–	48,000	58,000	+10,000
Public-Private Partnerships	–	71,200	130,000	+58,800
Fusion Workforce Pathways (Parent)	–	2,000	2,000	–
FES Other Research	–	3,890	3,687	-203

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Total, Fusion and Plasma Research	**–**	**466,090**	**564,760**	**+98,670**
DIII-D Operations	–	71,600	57,668	-13,932
National Spherical Torus Experiment-Upgrade (NSTX-U) Operations	–	52,310	44,852	-7,458
Total, Fusion Facility Operations	**–**	**123,910**	**102,520**	**-21,390**
Subtotal, Fusion Energy Sciences	**540,000**	**590,000**	**667,280**	**+77,280**
Construction				
20-SC-61 Matter in Extreme Conditions (MEC) Petawatt Upgrade, SLAC	10,000	–	–	–
14-SC-60 U.S. Contributions to ITER	240,000	200,000	77,500	-122,500
Subtotal, Construction	**250,000**	**200,000**	**77,500**	**-122,500**
Total, Fusion Energy Sciences	**790,000**	**790,000**	**744,780**	**-45,220**

SBIR/STTR funding:
- FY 2024 Enacted: SBIR $11,805,000 and STTR $1,660,000
- FY 2025 Enacted: SBIR $14,156,000 and STTR $1,991,000
- FY 2026 Request: SBIR $17,219,000 and STTR $2,421,000

Fusion Energy Sciences
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Fusion and Plasma Research	+$98,670
Fusion Facility Operations	-$21,390

Fusion and Plasma Research — +$98,670

Funding for DIII-D research will continue to focus efforts on developing the scientific foundation and operating scenarios for a burning plasma. Funding for NSTX-U Research will maintain collaborative research at other facilities and establish new strategic FM&T initiatives. Both domestic assets provide a platform for convergence of AI and fusion energy development. The Request enhances support for the Fusion Development Milestone Program, continues support for Materials and increases support for Fusion Nuclear Science consistent with the FESAC LRP goals. In addition, the Request continues the FIRE Collaboratives on Structural/Plasma Facing Materials, Blanket/Fuel Cycle, Enabling Technologies, and Advanced Simulation for Design and Optimization to address the FESAC LRP gaps. The Request increases support for IFE S&T in IFE-Science and Technology Accelerated Research (STAR) hubs, maintains support for Measurement Innovation, and increases support for AI/ML research in areas such as control theory, materials design, and disruption mitigation research. The Request continues support for high-priority international collaboration activities and establish new ones, for both tokamaks and stellarators that support burning plasma studies for U.S. scientists. The Request supports continuation of the MPEX MIE project. The Request also supports Future Facilities Studies program focusing on new strategic experimental facilities addressing S&T gaps identified in the FESAC LRP.

For General Plasma Science and Technology, the Request emphasizes user research on collaborative research facilities at universities and national laboratories including the Facility for Laboratory Reconnection Experiments (FLARE) at PPPL and work in emerging plasma technology topics. For HEDLP, the Request continues MEC instrument support and research on the ten LaserNetUS networked facilities. Support for SC-wide Microelectronics Science Research Centers will emphasize convergence of plasma technology and advanced microelectronic materials. The Request enhances support for QIS, which supports the core research portfolio stewarded by FES and the National QIS Research Centers. Support continues for EPSCoR. The Request continues the Private Facility Research program, which started as a pilot program in FY 2025, for fusion community to perform research on private fusion and plasma science facilities. It also adds a new element, Fusion BRIDGE, to explore models that support PPPs towards developing and building small-to-midscale test stands targeted toward closing key FM&T gaps.

Fusion Facility Operations — -$21,390

The Request continues to support the recovery activities for the NSTX-U program, including the installation of remaining diagnostics and commissioning in preparation for plasma operations. Funding for DIII-D operations will support 16 weeks of facility operations, operate with a new divertor allowing higher plasma performance, and complete ongoing machine and infrastructure improvements.

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Construction FES will place activities for the MEC-U project on hold as it assesses potential equipment upgrades. The U.S. Contributions to ITER project will continue design, fabrication, and delivery of the highest priority hardware contributions while a reassessment of the project in the U.S. fusion strategy is underway.	-$122,500
Total, Fusion Energy Sciences	-$45,220

Basic and Applied R&D Coordination

FES participates in coordinated intra- and inter-agency initiatives within DOE and with other federal agencies on science and technology issues related to fusion and plasma science. Within SC, FES operates the MEC instrument at the SLAC Linac Coherent Light Source (LCLS) user facility operated by the Basic Energy Sciences (BES) program, supports high-performance computing research with ASCR, uses the BES-supported High Flux Isotope Reactor (HFIR) facility at Oak Ridge National Laboratory (ORNL) for fusion materials irradiation research, and supports the construction of a high field magnet vertical test facility at the Fermi National Accelerator Laboratory with the High Energy Physics (HEP) program. Within DOE, FES manages a joint program with NNSA in HEDP science and continues to coordinate research activities with the Advanced Research Projects Agency-Energy (ARPA-E).

Program Accomplishments

Innovative Plasma Shaping Method Improves Heat Management and Mitigates Material Erosion for Fusion Power Plants

An international team of researchers at the DIII-D National Fusion Facility developed an innovative tokamak operation method by inverting the plasma boundary shape. This approach entirely avoids harmful heat exhaust spikes that enhance material erosion, while also distributing the steady-state exhaust over a larger area of the tokamak first wall, potentially extending the lifespan of critical internal components such as the tokamak divertor. By addressing the challenge of plasma-material interactions—a key element of the FESAC LRP—this innovation has significant implications for fusion power plant design and may become a preferred strategy for managing the extreme heat and particle exhaust from tokamaks, which can reach levels approximately 10,000 times higher than sunlight on Earth.

Milestone Program: Public-private partnerships to advance fusion energy

The Milestone-Based Fusion Development Program aims to accelerate progress toward commercial fusion energy. Eight teams were selected for award negotiations in this program. After extensive discussions, agreements were signed with all eight teams. The award mechanism for this first-of-a-kind Milestone program is Technology Investment Agreements, which offer flexible, tailorable, intellectual property and other terms that are more amenable to private industry participation. The eight teams selected include tokamaks, stellarators, inertial fusion energy, and alternate approaches. The Milestone program is consistent with an Overarching Recommendation from the LRP, to "Expand existing and establish new public–private partnership programs to leverage capabilities, reduce cost, and accelerate the commercialization of fusion power and plasma technologies."

Scientists Develop New 'Spark Plug' for Laser Fusion

Scientists at the University of Rochester's Laboratory for Laser Energetics (LLE) and their collaborators have developed a promising "spark plug" for direct-drive inertial confinement fusion using the OMEGA laser system. Their research demonstrates that firing 28 kilojoules of laser energy at deuterium-tritium fuel capsules successfully produces fusion reactions with an energy output exceeding that of the plasma's internal energy. These results indicate that scaling direct-drive methods to larger lasers could potentially lead to self-sustaining fusion reactions. Advances in predictive modeling and machine learning have played a significant role in these experiments.

Dynamics of nanodiamonds created by laser-driven shock-compression

Advances in laser-driven dynamic compression and bright X-ray sources have enhanced our understanding of materials under extreme conditions. Recent experiments with plastics reveal rapid nanodiamond (ND) formation within sub-nanoseconds. Simulations show that NDs disintegrate during shock release, with higher temperatures accelerating this process. Recrystallization depends on cooling rates. Laser compression of polyethylene terephthalate with X-ray probing indicates stable ND release and pressure dissipation, offering insights for efficient ND synthesis and planetary models.

Programmable quantum emitter formation in silicon

Silicon-based quantum emitters are promising for quantum technologies due to their bright telecom-band photon emission, scalability, and compatibility with existing technologies. Recent research led by Lawrence Berkeley National Laboratory has demonstrated the precise writing and erasing of light-emitting defects using femtosecond laser pulses combined with hydrogen-based activation and passivation. By selecting forming gases during the thermal annealing of carbon-implanted silicon, researchers can control the formation of various quantum emitters. This technique enables the programmable formation of specific quantum emitters.

Fusion Energy Sciences
Fusion and Plasma Research

Description

This subprogram advances our scientific understanding of how to control and sustain a burning plasma utilizing both simulation and experimental results from domestic and international devices. The subprogram supports the development of the required materials, breeding blanket and fusion fuel-cycle technology that can withstand the harsh fusion environment and harness this power to make fusion a future energy source. Innovation in this subprogram establishes the foundation of a competitive fusion power industry in the U.S. through partnerships with the private sector and allied nations on fusion technology development projects. In addition, it supports research that explores the fundamental properties and complex behavior of matter in the plasma state, making plasma science and technology fully available to support the U.S. economic growth and safeguard national security. The Fusion Innovation Research Engine (FIRE) Collaboratives provide coordination among program elements to address critical scientific and technology gaps in fusion energy. Fusion BRIDGE supports the small-to-medium test stands to, in part, help support R&D in FIRE Collaboratives.

Theory and Simulation
The Theory and Simulation activity supports research on foundational theory to advance the scientific understanding of the behavior of fusion plasmas, and multi-institutional interdisciplinary efforts under the Scientific Discovery through Advanced Computing (SciDAC) program, in partnership with the Advanced Scientific Computing Research (ASCR) program, to accelerate scientific discovery in fusion plasma science and technology. This activity also includes the FIRE Collaboratives for advanced simulations for design and optimization, which addresses critical scientific gaps for Fusion Pilot Plant (FPP) concepts in coordination with the other FIRE Collaboratives. This program supports the application of Artificial Intelligence/Machine Learning (AI/ML) techniques encompassing multiple Fusion Energy Sciences (FES) areas including digital engineering in partnership with data and computational scientists through collaborations.

Fusion Materials and Internal Components
Developing materials that can meet the needs of a fusion power plant is a grand challenge in the field of Materials Science and Engineering. Every component, from the innermost chamber walls to the outer power-plant structure, requires materials that can withstand a broad range of conditions, including extremes of heat and particle exposure, especially high energy neutron fluxes. This program aims to advance the understanding of material properties to support predictions of evolving material properties in prototypic fusion power plant environments with the aim to maximize material lifetime and performance. This activity includes FIRE Collaboratives and research capabilities to address many of the difficult and unique fusion materials challenges. The Material Plasma Exposure eXperiment (MPEX) Major Item of Equipment (MIE) project, which is a new U.S. materials experimental capability initiated in FY 2019, will enable researchers to find solutions for the challenges associated with plasma-facing materials, including exposing irradiated samples, and understanding materials degradation in the fusion nuclear environment.

Sustain a Burning Plasma
The Sustain a Burning Plasma (SBP) activity supports a diversity of approaches to confinement of plasmas in fusion energy systems. This element includes traditional toroidal confinement approaches such as advanced tokamaks (ATs), spherical tokamaks (STs) and stellarators. As these approaches address physics and technology gaps and outcomes are translated to development programs, novel approaches, such as linear plasma concepts (field-reverse configuration, axisymmetric mirrors, and plasma pinches), are nurtured and expanded. This element also includes innovative Inertial Fusion Energy (IFE) approaches.

The Toroidal Long Pulse (TLP) area advances steady-state fusion energy approaches by leveraging a coordinated network of tokamaks and stellarators in the U.S. and internationally. Facilities such as the DIII-D National Fusion Facility (an Office of Science user facility), JT-60SA in Japan, and Wendelstein 7-X (W7-X) in Germany support research on long-pulse plasma performance, exhaust handling, and advanced control systems. Guided by the priorities of the Fusion Energy Sciences Advisory Committee (FESAC) Long-Range Plan (LRP) and the National Fusion Science and Technology Roadmap, TLP integrates experimental research, predictive modeling, and AI-driven approaches while building a strong research community and workforce. Supported teams are organized around urgent, high priority technical scopes, making them well-positioned and available for collaboration with the growing private fusion industry. The program is evolving toward a more comprehensive and strategic organization to accelerate progress toward practical magnetic confinement fusion energy while continuing to leverage domestic capabilities. The domestic stellarator program remains focused on improving this concept through the quasi-symmetric shaping of the magnetic field.

The Compact Toroidal Concepts (CTC) area supports research necessary to develop a compact toroidal configuration. Two promising concepts addressed in CTC are the spherical tokamak (ST), such as the National Spherical Torus Experimental Upgrade (NSTX-U), and conventional aspect ratio tokamaks operated at high toroidal magnetic fields, exemplified by the SPARC tokamak. These devices offer complementary strategies for improving confinement and achieving compactness: STs leverage enhanced plasma physics properties while high-field conventional tokamaks rely on high-field magnets. Regardless of the approach, enabling technologies are essential for delivering these compact designs, including high-temperature superconducting magnets, liquid metal plasma-facing components, and non-solenoidal startup techniques that could eliminate the need for a central solenoid to drive plasma current. With several private sector stakeholders pushing the frontiers, the CTC program naturally incorporates the fusion energy industry and fosters strong connections to foundational S&T research.

The IFE area supports the scientific foundations and enabling technologies critical to advancing IFE. Priority research areas include improving target physics, reducing laser-plasma instabilities, developing scalable methods for target fabrication, and creating advanced, radiation-hardened diagnostics capable of operating at high repetition rates. These efforts are supported by the IFE Science & Technology Accelerated Research (IFE-STAR) hubs. The program also emphasizes ecosystem stewardship by fostering collaboration among national laboratories, academic institutions, and the private sector.

The Measurement Innovation area supports the development of world-leading transformative and innovative diagnostic techniques and their application to new, unexplored, or unfamiliar plasma regimes or scenarios. The Future Facilities Studies activity supports studies and research for required facilities that "best serve fusion" and are critical to the development of fusion energy and address needs of both the public and private sectors aligned with the FESAC Long Range Report in 2020 and FESAC Facility Construction Projects Report in 2024.

Closing the Fusion Cycle

Within a fusion energy system, subsystems sustain plasma conditions, extract energy, fuel the plasma, and manage waste. This research area aims to build the capabilities to design and mature each system while simultaneously integrating them efficiently to realize practical fusion power. This includes developing the next generation of real-time systems for plasma control, qualifying blankets that breed fusion fuel, and prototyping fuel-processing technologies that can optimize and sustain the fusion reaction. This activity supports enabling research and development (R&D), fusion nuclear science, FIRE Collaboratives, and research capabilities to advance the readiness of these critical capabilities.

Discovery Plasma Science and Technology

Discovery Plasma Science and Technology (DPST) research supports activities in high energy density laboratory plasmas (HEDLP), foundational plasma science research, transformational plasma science technology, innovation in advanced microelectronics, and efforts in the convergence of plasmas and quantum information science.

Research in HEDLP explores the behavior of plasmas at extreme conditions of temperature, density, and pressure. This activity also includes LaserNetUS, a geographically distributed network of ten high-intensity laser facilities that provide students and scientists with broad access to unique facilities and enabling technologies and advances the frontiers of HED and laser science research.

General Plasma Science and Technology (GPST) research in foundational plasma science and technology aims to increase our understanding of the complex behavior of the plasma state, ranging from astrophysical plasma to low-temperature plasma. GPST supports collaborative research facilities, enabling experiments in new regimes to enhance our understanding of plasma phenomena in nature and in the laboratory. Transformational plasma science technology includes frontier research in low-temperature plasmas, microelectronics, and plasma-based technologies with applications in medicine, space plasmas, plasma-enabled chemical reactions, environmental remediation, and agriculture.

The Advanced Microelectronics activity supports discovery plasma research in a multi-disciplinary, co-design framework to accelerate plasma-based microelectronics fabrication and advance the development of microelectronic technologies.

Quantum Information Science (QIS) activity supports basic research in QIS that can have a transformative impact on FES mission areas as well as research that takes advantage of unique FES-enabled capabilities to advance QIS development.

<u>Public-Private Partnerships</u>
Resilient Public-Private Partnerships (PPPs) will foster bridges between the public and private sectors to address foundational gaps and accelerate fusion toward commercial viability.

Within this PPP framework, the Innovation Network for Fusion Energy (INFUSE) program provides private-sector fusion companies with access to world-class expertise and capabilities at DOE's national laboratories and U.S. universities to overcome critical scientific and technological hurdles.

The Fusion Development Milestone Program aims to accelerate progress toward the development of commercial fusion energy through PPPs, with near-term goals of delivering preconceptual designs and technology roadmaps for a FPP and enabling significant performance improvements of FPP concepts. In fiscal year 2024, the Fusion Development Milestone Program established eight public-private partnerships, and multiple milestones have been met by the teams to date. The current awardees are working toward presenting pre-conceptual designs and technology roadmaps of their FPP concepts within the first 18 months of the Milestone program—roughly by late calendar year 2025. If they successfully meet these milestones, they will proceed into the next phase of the Milestone Program, where the awardees are planning to build and operate integrated experiments and/or demonstrate some of the critical underlying technologies for their FPPs. Since selection, four teams have collectively raised over $386 million of new private funding, compared to the $46 million of federal funding initially committed. Continued progress in the Milestone program is contingent on Congressional appropriations, successful negotiation of future milestones, and successful progress in the program including awardees success in securing the required non-Federal funding to complete their milestones

The Private Facilities Research (PFR) Program offers the opportunity for researchers to conduct open scientific studies on privately constructed facilities for the mutual benefit of all parties. This activity also includes support for Fusion BRIDGE, a public-private consortium model to develop small-to-midscale test stands.

<u>Fusion Workforce Pathways</u>
Fusion Workforce Pathways is a workforce development effort focused on preparing a skilled talent base to support the growing needs of the fusion energy sector. By fostering interactions among industry, educational institutions, and public institutions, the program aims to align training and education with emerging technical demands. It emphasizes research experience, specialized training, and career development in enabling technical areas such as fusion engineering, plasma physics, and simulation to ensure a robust and adaptable workforce for the future. It includes Established Program to Stimulate Competitive Research (EPSCoR) initiatives to provide opportunities to U.S. regions with potential to build critical expertise and capacity.

Other Research

This activity supports the Postdoctoral Research Program, FESAC, multiple fusion and plasma science outreach programs, critical general infrastructure, and environmental monitoring at the Princeton Plasma Physics Laboratory (PPPL) and other DOE laboratories, and other programmatic activities.

Fusion Energy Sciences
Fusion and Plasma Research

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Fusion and Plasma Research $466,090	**$564,760**	**+$98,670**
Theory and Simulation $64,000	$74,600	+$10,600
Funding supports efforts at universities, national laboratories, and private industry focused on the fundamental theory of fusion plasmas. Funding continues to support SciDAC portfolio, FIRE Collaboratives in advanced simulation and design, and cross-cutting interdisciplinary fusion energy R&D towards FPP.	The Request will continue to support efforts focused on the fundamental theory of fusion plasmas, the fourth and final year of the SciDAC portfolio, the development of advanced simulation tools for the FIRE Collaborative and AI/ML research in cross-cutting interdisciplinary fusion energy and plasma science research.	Prioritization with theory and SciDAC will aligned this research with LRP priorities. Funding will continue to support FIRE Collaboratives. Funding for AI/ML research will increase to align with DOE priorities and FPP design efforts.
Fusion Materials and Internal Components $85,000	$85,473	+$473
Funding supports growth in the key area of materials which is critical in developing the scientific foundation for fusion energy. Funding continues to support the FIRE Collaboratives for structural and plasma-facing materials which will focus their efforts on addressing the scientific and technical gaps identified in the FESAC LRP as well as in recent community workshops. Funding continues to support the MPEX MIE project, consistent with the approved baseline for the project.	The Request will enable growth in the key area of materials which is critical in de-risking gaps for fusion energy. The Request will continue to support the FIRE Collaboratives for structural and plasma facing materials. The Request will also continue to support the MPEX MIE project, consistent with the approved baseline for the project.	Funding will continue to support the research on structural and plasma-facing materials to address the scientific/technical gaps in these programs. Funding for the MPEX MIE project will support the project's approved cost/schedule baseline.
Sustain a Burning Plasma $123,000	$132,900	+$9,900
Funding supports research at DIII-D to close remaining S&T gaps for sustaining a burning plasma. In addition, the DIII-D platform supports convergence of AI and fusion energy as well as training opportunities for the next generation of fusion researchers. Funding also supports compact toroid concepts including	The Request will support research efforts at DIII-D and lays the groundwork for the initiation of NSTX-U research activities. The Request supports small-scale U.S. experimental facilities to help close scientific gaps, supports research on international facilities for both tokamak and stellarator	Funding will support DIII-D and NSTX-U platforms aligned with priorities in FESAC LRP and key science drivers. IFE R&D will continue to grow to be aligned with priorities in expanded inertial fusion development.

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
spherical tokamaks as an option of compact low-cost fusion power plant approaches. Funding supports an integrated tokamak program bridging short-pulse domestic platforms to international devices addressing S&T gaps in sustaining burning plasmas with advanced diagnostics and model validation. This supports a growing program in stellarators primarily funding activities on W7-X. Funding supports a growing IFE program consistent with FES priorities.	concepts, and supports the priority research opportunities identified in the IFE BRN Workshop. The development of innovative and transformative diagnostics and studies to help define requirements for future facilities are continued.	
Closing the Fusion Cycle $69,000	$78,100	+$9,100
Funding continues to grow in the key areas of fusion nuclear science and enabling R&D which are critical in developing the scientific foundation for fusion energy. Funding continues to support the FIRE Collaboratives for blanket/fuel cycle and enabling technologies which will focus their efforts on addressing the scientific and technical gaps identified in the FESAC LRP as well as in recent community workshops.	The Request will support the key areas of fusion nuclear science and enabling R&D, including the FIRE Collaboratives for blanket/fuel cycle, and enabling technologies, which are critical in developing the scientific foundation and technology development for fusion energy.	Increase will support new fusion technology capabilities necessary to close key gaps in blanket and fusion fuel cycle.
Discovery Plasma Science and Technology $48,000	$58,000	+$10,000
Funding continues to support basic and translational science, MEC and LaserNetUS operations and user support, and the SC-NNSA joint program. Funding continues support for discovery plasma science and low-temperature plasma R&D. Funding continues for QIS R&D as well as the National QIS Research Centers. In addition, support continues for advanced Microelectronics research.	The Request, in HEDLP, will continue to support basic and translational science and MEC and LaserNetUS operations. In GPST, it will continue to support basic and low temperature plasma science as well as operations of research facilities. For Advanced Microelectronics, it will continue to support the centers selected in FY 2025 and the priority research opportunities identified in the recent workshop. For QIS, it will continue to support the research awards as well as the National QIS Research Centers.	Funding will support the highest-priority activities including QIS, plasma technology, and FLARE facility.

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Public-Private Partnerships $71,200	$130,000	+$58,800
Funding supports public-private partnerships through the Fusion Development Milestone Program and the INFUSE program, both of which connect the private sector to DOE developed capabilities at national laboratories and universities. A new Private Facility Research pilot program is initiated which offers the opportunity for publicly funded researchers to conduct open scientific studies on privately constructed facilities for the mutual benefit of all parties.	The Request will support PPPs through the Fusion Development Milestone Program, the INFUSE program, and the PFR program which started as a pilot program in FY 2025. The Request will also allocate funding to Fusion BRIDGE to support PPPs towards developing and building small-to-midscale capabilities.	Funding increase will support subsequent phases of the Fusion Development Milestone Program, the PFR program, and the new Fusion BRIDGE initiative.
Fusion Workforce Pathways $2,000	$2,000	$ —
Funding supports EPSCoR State-National Laboratory Partnership awards and early career awards.	The Request will continue to support EPSCoR State-National Laboratory Partnership awards and early career awards.	Funding will support the highest priority activities aligned with FESAC LRP.
Other Research $3,890	$3,687	-$203
Funding continues to support programmatic activities such as the FES Postdoctoral Research Program, the FES Fusion and Plasma Science Outreach programs, the U.S. Burning Plasma Organization, peer reviews and project activities, and FESA, along with infrastructure improvements, repair, maintenance, and environmental monitoring at PPPL and other DOE laboratories.	The Request will continue to support programmatic activities and infrastructure improvements.	Funding will support the highest priority activities aligned with FESAC LRP.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

The DIII-D National Fusion Facility and the National Spherical Torus Experiment-Upgrade (NSTX-U) facility are world-leading Office of Science (SC) user facilities for experimental research used by scientists from national laboratories, universities, and private industry research groups to optimize magnetic confinement regimes and test prototype fusion technology in an integrated environment. The operation of these facilities addresses the FESAC Long-Range Plan Fusion Science & Technology recommendation to "utilize research operations on DIII-D and NSTX-U, and collaborate with other world-leading facilities, to ensure that Fusion Pilot Plant (FPP) design gaps are addressed in a timely manner." Gaps that can be addressed by the operation of the FES user facilities include novel heating and current drive technology, low aspect ratio physics, disruption avoidance and mitigation, plasma control, core-edge integration, steady state burning plasma scenario development, and plasma facing component integration, including assessment of liquid metal approaches. These user facilities provide a valuable resource to the private fusion energy sector to resolve science and technology challenges associated with their confinement concepts. In addition, they play a key role in the convergence of AI and fusion energy and have a significant role in training the next generation of fusion scientists and permitting the U.S. research community to take full advantage of operations on international facilities.

DIII-D Operations

The DIII-D scientific user facility at General Atomics (GA) is the most adaptable and well diagnosed magnetic confinement facility in the U.S. Its extensive set of advanced diagnostic systems, evolving set of heating and current drive actuators, and multi-institutional research team make it well suited for closing science and technology gaps and building foundational understanding that enables extrapolation of results to burning plasma conditions. In FY 2024, the program continued to both operate and enhance the facility, supporting 692 onsite and remote users from 98 institutions and 16 countries. It engaged 24 faculty members and 201 students, representing one of the largest contributions to the U.S. fusion workforce. Experimental thrusts focus on exploiting new divertor configurations, assessing a wide range of first wall material options, developing new high-powered heating systems for fusion pilot plants, validating predictive models of energetic particles, and pushing the limits and physics understanding of opaque plasmas. The FY 2026 Request will support 16 weeks of operations, operation with increased heating power for plasma electrons, exploitation of the High-Field Side Lower Hybrid Current Drive system, and training opportunities for the next generation of fusion researchers. Longer-term, the facility will focus on integrated core-edge solutions for the FPP, burning plasma transport and performance optimizations, plasma stability control solutions, validation of simulation predictions, assessment of compatibility of viable FPP scenarios with relevant first wall materials, testing novel technology for plasma fueling, and evaluating the viability of negative triangularity shaped plasmas for fusion plants.

National Spherical Torus Experiment-Upgrade (NSTX-U) Operations

The NSTX-U scientific user facility at Princeton Plasma Physics Laboratory (PPPL) is used to close remaining and critical S&T gaps of the Spherical Tokamak (ST) magnetically confined plasma configuration. The ST has a toroidal magnetic field shaped like a cored apple and low values (<2) of aspect ratio, the ratio of the major to minor radius of the torus. Previous experiments and high-fidelity simulations indicate that STs may offer improved energy confinement relative to larger (>3) aspect ratio tokamaks. The NSTX-U program aims to show that the ST may enable higher fusion power density (reduced device size) and reduced recirculating power (improved economics) leading to affordable and compact fusion power plant option on a path to fusion energy commercialization. NSTX-U is the world's most powerful ST, with external heating of approximately 19 megawatts, toroidal magnetic fields as high as one Tesla, and plasma currents as high as two megaamperes. Combining an upgraded neutral beam heating system with unique ST plasma properties, NSTX-U is also an ideal test bed for studying interactions between plasma waves and fast fuel ions in ways that are relevant to burning plasma science. NSTX-U also provides a unique exhaust environment for testing emerging plasma-facing component systems. The FY 2026 Request will continue to support the machine assembly, system testing and commissioning, and preparation for plasma operations.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Fusion Facility Operations	**$123,910**	**$102,520**	**-$21,390**
DIII-D Operations	$71,600	$57,668	-$13,932
Funding supports 16 weeks of operations at the DIII-D facility. Research continues to exploit innovative current drive systems to assess their potential as actuators for a fusion pilot plant and to optimize plasma performance. include increasing electron cyclotron power, completing the installation of the high-field-side lower hybrid current drive system and commencing experiments.		The Request will support 16 weeks of operations at the DIII-D facility, including exploitation of the high-field-side lower hybrid current drive system installed in FY 2025. Support will continue for enhancements to the DIII-D electron heating system, up to ten gyrotrons providing 7 MW of injected power.	Funding will support the highest priority work elements of the electron heating system with other facility enhancements deferred or paused. Facility operating time is prioritized.
National Spherical Torus Experiment-Upgrade (NSTX-U) Operations	$52,310	$44,852	-$7,458
Funding for operations supports the remaining NSTX-U Recovery fabrication and machine reassembly activities and begins supporting the commissioning of auxiliary heating systems in preparation for plasma operations.		The Request will support NSTX-U Recovery fabrication and machine reassembly activities.	Funding will support the highest priority work elements of the NSTX-U Recovery effort and preparation for operations.

Description

This subprogram supports all line-item construction projects. All Total Estimated Costs (TEC) are funded in this subprogram.

14-SC-60 U.S. Contributions to ITER

The ITER facility, currently under construction in Saint Paul-lez-Durance, France, is designed to provide fusion power output approaching reactor levels of hundreds of megawatts, sustained as a burning plasma for hundreds of seconds. ITER provides an experimental industrial-scale platform supporting the development of energy pilot plants in the private sector and enabling U.S. supply chains helping to keep the U.S. competitive internationally. Construction of ITER is governed under an international agreement (the "ITER Joint Implementing Agreement"). As a co-owner and Member of ITER, the U.S. contributes in-kind hardware components and financial contributions for the ITER Organization (IO) management and overhead (e.g., design integration, nuclear licensing, quality control, safety, overall project management, and installation and assembly of the components provided by the U.S. and other Members). The IO also employs over 30 U.S. nationals who work on site.

An independent review of Critical Decision-2 (CD-2), "Approve Performance Baseline," for the U.S. Contributions to ITER—First Plasma subproject (SP-1) was completed in November 2016 and then subsequently approved by the Project Management Executive on January 13, 2017, with a total project cost (TPC) of $2,500,000,000. Responding to Congressional direction in the FY 2021 Appropriations Act, the entire project was baselined in December 2023 and achieved CD-2/3B, which includes a rebaseline of SP-1 scope, baseline of Post-First Plasma (SP-2) scope, and financial contributions for the project to CD-4, "Approve Project Completion". U.S. Contributions to ITER will include the delivery of the completed Central Solenoid Magnet System, Steady-State Electrical Network, Disruption Mitigations System, Tritium Exhaust Processing System, Ion Cyclotron Heating and Electron Cyclotron Heating Systems, Diagnostics, and Roughing Pumps. U.S. investment in ITER has advanced the nation's industrial capabilities supporting a U.S. fusion power industry and resulted in over $1.4B awarded to American companies through 2024 in 46 states. US companies, DOE labs and U.S. universities contribute to the design, fabrication, and delivery of in-kind hardware for ITER.

The FY 2026 Request of $77,500,000 will support the continued systems design, fabrication, and delivery of in-kind hardware. The revised baseline is $6,500,000,000, which includes all U.S. in-kind hardware and financial construction contributions through the completion of the ITER project. The IO provided an updated baseline at the June 2024 ITER Council meeting. U.S. Contributions to ITER are estimated to remain within the TPC of $6,500,000,000.

The U.S. in-kind contribution represents 9.09 percent (1/11th) of the overall ITER project but will provide U.S. researchers and industry access to 100 percent of the science and engineering associated with what will be the largest magnetically confined burning plasma experiment ever created. The U.S. involvement in ITER is consistent with the recommendations of the FESAC LRP, and it was ranked as a top priority by the FESAC *Facilities Construction Projects*[a] assessment. ITER also contributes to FES PPPs through the sharing of design information as well as lessons learned in the design, fabrication, and installation of hardware to sustain ITER operating conditions. The Request is aligned with a reassessment of how ITER fits in the overall U.S. fusion strategy, including reviewing partnerships and investment approaches to quickly advance fusion energy.

[a] https://science.osti.gov/-/media/fes/fesac/pdf/2024/FCPREPORT--final-submittedapproved0424.pdf

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Major Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$200,000**	**$77,500**	**-$122,500**
14-SC-60, U.S. Contributions to ITER (Historical)	$200,000	$77,500	-$122,500
Funding continues to support design and fabrication of in-kind hardware systems and requested construction financial contributions.		The Request will support continued design and fabrication of in-kind hardware systems.	Funding will support design and fabrication of the highest priority in-kind hardware contributions.

Fusion Energy Sciences
Capital Summary

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	40,400	46,400	49,380	+2,980
Total, Capital Operating Expenses	**N/A**	**N/A**	**40,400**	**46,400**	**49,380**	**+2,980**

Capital Equipment

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Major Items of Equipment						
Fusion and Plasma Research						
Material Plasma Exposure eXperiment (MPEX)	188,736	117,456	23,900	22,200	25,180	+2,980
Total, MIEs	N/A	N/A	23,900	22,200	25,180	+2,980
Total, Non-MIE Capital Equipment	N/A	N/A	16,500	24,200	24,200	–
Total, Capital Equipment	**N/A**	**N/A**	**40,400**	**46,400**	**49,380**	**+2,980**

Note:
- The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.
- The total estimated cost for MPEX is $187,036,000. The actual amount obligated in FY 2024 is $22,200,000 and is not reflected in this table.

Burning Plasma Science: Long Pulse MIEs:

Material Plasma Exposure eXperiment (MPEX)

FES is developing a first-of-a-kind, world-leading experimental capability to explore solutions to the plasma-materials interactions challenge. This device, known as MPEX, will be located at ORNL and will enable dedicated studies of reactor-relevant plasma-material interactions at a scale not previously accessible to the fusion program. The overall goal of this project is to create a new class of fusion materials science enabling the study of the combined effects of fusion-relevant heat, particle, and neutron fluxes for the first time anywhere in the world. The project received CD-2/3 "Approve Performance Baseline/Start of Construction" on August 22, 2022, with a TPC of $201,000,000. The FY 2026 Request includes $25,180,000 in TEC funding and $293,000 in Other Project Costs (OPC) funding and allows the project to execute the approved performance baseline. MPEX scope includes the design, fabrication, installation, and commissioning of the MPEX linear plasma device, as well as associated facility and infrastructure modifications and reconfiguration.

Fusion Energy Sciences
Construction Projects Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
20-SC-61, Matter in Extreme Conditions (MEC) Petawatt Upgrade, SLAC						
Total Estimated Cost (TEC)	448,700	55,487	10,000	-	-	-
Other Project Cost (OPC)	12,300	6,900	-	-	-	-
Total Project Cost (TPC)	**461,000**	**62,387**	**10,000**	**-**	**-**	**-**
14-SC-60, U.S. Contributions to ITER						
Total Estimated Cost (TEC)	6,429,698	2,595,617	240,000	200,000	77,500	-122,500
Other Project Cost (OPC)	70,302	70,302	-	-	-	-
Total Project Cost (TPC)	**6,500,000**	**2,665,919**	**240,000**	**200,000**	**77,500**	**-122,500**
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	250,000	200,000	77,500	-122,500
Other Project Cost (OPC)	N/A	N/A	-	-	-	-
Total Project Cost (TPC)	N/A	N/A	250,000	200,000	77,500	-122,500

Fusion Energy Sciences
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type A					
DIII-D National Fusion Facility	**131,600**	**124,311**	**114,600**	**97,668**	**-16,932**
Number of Users	692	692	550	500	-50
Achieved Operating Hours	–	585	–	–	–
Planned Operating Hours	560	585	640	640	–
Unscheduled Down Time Hours	–	109	–	–	–
National Spherical Torus Experiment-Upgrade	**98,100**	**94,906**	**82,310**	**69,852**	**-12,458**
Number of Users	430	332	380	350	-30
Total, Facilities	**229,700**	**219,217**	**196,910**	**167,520**	**-29,390**
Number of Users	1,122	1,024	930	850	-80
Achieved Operating Hours	–	585	–	–	–
Planned Operating Hours	560	585	640	640	–
Unscheduled Down Time Hours	–	109	–	–	–

Notes:
- *Achieved Operating Hours and Unscheduled Downtime Hours will only be reflected in the Congressional budget cycle which provides actuals.*
- *Percent optimal operations defines what is achieved at this funding level. This includes staffing, up-to-date equipment and software, operations and maintenance, and appropriate investments to maintain world leadership.*

Fusion Energy Sciences
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	1,025	1,141	1,050	-91
Number of Postdoctoral Associates (FTEs)	127	141	120	-21
Number of Graduate Students (FTEs)	342	380	350	-30
Number of Other Scientific Employment (FTEs)	1,528	1,703	1,550	-153
Total Scientific Employment (FTEs)	**3,022**	**3,365**	**3,070**	**-295**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals, and other support staff.*

14-SC-60 U.S. Contributions to ITER
Project is for Design and Construction

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

<u>Summary</u>

The FY 2026 Request for the U.S. Contributions to ITER (U.S. ITER) project is $77,500,000 of Total Estimated Cost (TEC) funding. The Total Project Cost (TPC) for the project is $6,500,000,000. In FY 2023, the entire U.S. ITER project was baselined, with a TPC of $6,500,000,000 which included all the Subproject-1 (SP-1) and Subproject-2 (SP-2) scope, as well as the total construction cash contributions to the ITER Organization (IO). The U.S. involvement in ITER is consistent with the recommendations of the FESAC LRP, and it was designated as a facility that "best serves" the FES mission by the FESAC *Facilities Construction Projects*[b] assessment. U.S. Contributions to ITER also supports a U.S. fusion supply chain that supports the growing fusion power industry. ITER also contributes to FES public-private partnerships through the sharing of design information as well as lessons learned in the design, fabrication, and installation of hardware to sustain ITER operating conditions. Sections of this Construction Project Data Sheet (CPDS) have been tailored to reflect the unique nature of the U.S. ITER project. The Request is aligned with a reassessment of how ITER fits in the overall U.S. fusion strategy, including reviewing partnerships and investment approaches to quickly advance fusion energy.

<u>Significant Changes</u>

The U.S. ITER project was initiated in FY 2006. On January 13, 2017, U.S. ITER SP-1 achieved both Critical Decision (CD)-2, "Approve Performance Baseline," and CD-3, "Approve Start of Construction." CD-4, "Project Completion," for SP-1 is currently planned for December 2028.

In response to Congressional direction articulated in the Consolidated Appropriations Act 2021 to baseline the entire project, the full requirement to complete the U.S. Contributions to ITER project was baselined in December 2023. The U.S. baselined the entire U.S. Contributions to ITER project, including re-baselining SP-1 and the baselining of SP-2 as a result of the IO rebaselining for the overall project due to COVID and first-of-a-kind component delivery delays, material specification and fabrication issues as well as quality challenges. The IO submitted an updated cost and schedule to the ITER Council at the June 2024 meeting which delays machine startup. This submittal was assessed by a U.S.-led Independent Assessment (IA) team consisting of several ITER members and its conclusions presented to the ITER IO in Fall of 2024. The IA report, along with other input, is currently supporting a reassessment of ITER and how it fits the overall U.S. strategy on fusion energy.

In FY 2024, one Central Solenoid Module (CSM) was delivered, bringing the total to four of seven that make up the Central Solenoid Magnet (including one spare). Two additional CSMs are scheduled for delivery to the IO in FY 2025. The first fabrication contract was awarded for the Electron Cyclotron Heating system in FY 2025. The FY 2025 funding supports the continued systems design, fabrication, and delivery of in-kind hardware, and financial contributions for IO construction operations. The FY 2026 Request will support the continued design and fabrication of multiple in-kind hardware with no cash contribution.

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[b] https://science.osti.gov/-/media/fes/fesac/pdf/2024/FCPREPORT--final-submittedapproved0424.pdf

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	CD-3	CD-4
FY 2026	7/5/05	–	1/25/08	12/12/2023	12/12/2023	1Q FY 2040

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-1 Cost Range Update	CD-1R	CD-3A	CD-3B	CD-3C	CD-4
FY 2026	1/13/17	1/13/17	1/13/17	1/13/17	12/12/23	12/16/24	1Q FY 2040

CD-1R – Approve Alternative Selection and Cost Range, Revised; **CD-3A** – Approval of the project starting construction of original 2017 approved baseline; **CD-3B** - Approval of the project starting construction under the 2023 approved baseline; **CD-3C** – Approval of additional Long-Lead In-Kind Hardware Procurements in the following areas: Electron Cyclotron Heating, Tokamak Cooling Water System, Roughing Pump and Vacuum Auxiliary Systems; **CD-4** - Completion of In-kind Hardware Scope.

Project Cost History

At the time of CD-1 approval in January 2008, the preliminary cost range was $1,450,000,000 to $2,200,000,000. Until 2016, however, it was not possible to confidently baseline the project due to delays early in the international ITER construction schedule. Various factors (e.g., schedule delays, design and scope changes, funding constraints, regulatory requirements, risk mitigation, and inadequate project management and leadership issues in the IO at that time) affected the project cost and schedule. Shortly after the arrival of the new Director General in March 2015, the overall ITER Project was baselined for cost and schedule.

In response to a 2013 Congressional request, a DOE SC Independent Project Review (IPR) Committee assessed the project and determined that the existing cost range estimate of $4,000,000,000 to $6,500,000,000 would likely encompass the final TPC (includes SP-1, SP-2, and Cash Contributions). In preparation for baselining SP-1, based on the results of an Independent Project Review, the acting Director for the Office of Science updated the lower end of this range to reflect updated cost estimates, resulting in the current approved CD-1 Revised (CD-1R) range of $4,700,000,000 to $6,500,000,000.

FY 2023 reflects only SP-1 and associated cash contributions. Beginning in FY 2024, the entire U.S. ITER Project was baselined per Congressional direction in the Consolidated Appropriations Act, 2021. The TPC for the entire project is projected to be $6,500,000,000.

U.S. Contributions to ITER In-kind Hardware and Construction Cash Contributions

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Cash Contributions	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	439,243	4,677,455	1,313,000	6,429,698	70,302	70,302	6,500,000
FY 2026	439,243	4,677,455	1,313,000	6,429,698	70,302	70,302	6,500,000

2. Project Scope and Justification

ITER, currently one of the largest science experiments in the world, is a major fusion research facility under construction in St. Paul-lez-Durance, France by an international partnership of seven Members or domestic agencies, specifically, the U.S., China, the European Union, India, Korea, Japan, and the Russian Federation. ITER is co-owned and co-governed by the seven Members. The Energy Policy Act of 2005 (EPAct 2005), Section 972(c)(5)(C) authorized U.S. participation in ITER. The Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project (Joint Implementation Agreement or JIA), signed on November 21, 2006, provides the legal framework for the four phases of the program: construction, operation, deactivation, and decommissioning. The JIA is a Congressional-Executive Hybrid Agreement. The other six Members entered the project by treaty. The IO is a designated international legal entity located in France.

Scope

U.S. Contributions to ITER – Construction Project Scope

The overall U.S. ITER project includes three major elements:

- In-kind Hardware systems (13 in total), built under the responsibility of the U.S., and then shipped to the ITER site for IO assembly, installation, and operation. Included in this element is cash provided in-lieu of U.S. in-kind component contributions to adjust for certain reallocations of hardware contributions between the U.S. and the IO.
- Funding to the IO to support common expenses, including ITER research and development (R&D), design and construction integration, overall project management, nuclear licensing, IO staff and infrastructure, IO-provided hardware, on-site assembly/installation/testing of all ITER components, installation, safety, quality control, and operation.
- Other Project Costs (OPC), including R&D (other than mentioned above) and conceptual design-related activities.

Justification

The purpose of ITER is to investigate and conduct research in the “burning plasma” regime—a performance region that exists beyond the current experimental state of the art. Creating a self-sustaining burning plasma will provide essential scientific knowledge necessary for practical fusion power. There are two planned experimental outcomes expected from ITER. The first is to investigate the fusion process in the form of a "burning plasma," in which the heat generated by the fusion process exceeds that supplied from external sources (i.e., self-heating). The second is to sustain the burning plasma for a long duration (e.g., several hundred to a few thousand seconds), during which time equilibrium conditions can be achieved within the plasma and adjacent structures. ITER will provide a sustained burning plasma for long-term experimentation which is a necessary step toward developing a fusion pilot plant.

Although not classified as a Capital Asset, the U.S. ITER project is being conducted following project management principles of DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets,* to the greatest extent possible.

Key Performance Parameters (KPPs)

The U.S. Contributions to ITER Project will not deliver an integrated operating facility, but rather in-kind hardware contributions, which represent a portion of the international ITER facility. The U.S. ITER project defines project completion as delivery and IO acceptance of the U.S. in-kind hardware.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	439,243	439,243	439,243	—
Total, Design (TEC)	**439,243**	**439,243**	**439,243**	**—**
Construction (TEC)				
Prior Years	1,449,877	1,449,877	1,126,459	43,449
Prior Years - IRA Supp.	190,000	190,000	—	—
FY 2024	202,500	202,500	13,058	141,580
FY 2025	144,000	144,000	144,000	4,971
FY 2026	77,500	77,500	77,500	—
Outyears	2,613,578	2,613,578	3,126,438	—
Total, Construction (TEC)	**4,677,455**	**4,677,455**	**4,487,455**	**190,000**
Cash Contributions (TEC)				
Prior Years	450,497	450,497	450,497	63,086
Prior Years - IRA Supp.	66,000	66,000	—	—
FY 2024	37,500	37,500	35,264	2,914
FY 2025	56,000	56,000	58,236	—
Outyears	703,003	703,003	703,003	—
Total, Cash Contributions (TEC)	**1,313,000**	**1,313,000**	**1,247,000**	**66,000**
Total Estimated Cost (TEC)				
Prior Years	2,339,617	2,339,617	2,016,199	106,535
Prior Years - IRA Supp.	256,000	256,000	—	—
FY 2024	240,000	240,000	48,322	144,494
FY 2025	200,000	200,000	202,236	4,971
FY 2026	77,500	77,500	77,500	—
Outyears	3,316,581	3,316,581	3,829,441	—
Total, Total Estimated Cost (TEC)	**6,429,698**	**6,429,698**	**6,173,698**	**256,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	70,302	70,302	70,302	–
Total, Other Project Cost (OPC)	**70,302**	**70,302**	**70,302**	**–**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	2,409,919	2,409,919	2,086,501	106,535
Prior Years - IRA Supp.	256,000	256,000	–	–
FY 2024	240,000	240,000	48,322	144,494
FY 2025	200,000	200,000	202,236	4,971
FY 2026	77,500	77,500	77,500	–
Outyears	3,316,581	3,316,581	3,829,441	–
Total, TPC	**6,500,000**	**6,500,000**	**6,244,000**	**256,000**

Notes:
- *The entire project was baselined in December 2023 with a TPC of $6,500,000,000.*
- *All Appropriations to date for the U.S. Contributions to ITER project include both funding for SP-1 and funding for Cash Contributions, as well as for work associated with the new overall In-kind Hardware baseline.*
- *Obligations and costs through FY 2024 reflect actuals; obligations and costs for FY 2025 and the outyears are estimates.*

4. Details of Project Cost Estimate

The overall U.S. Contributions to ITER project has an approved revised CD-1R. Cost Range (CD-1R). In 2016, DOE chose to divide the project hardware scope into two distinct subprojects (First Plasma or SP-1, and Post-First Plasma or SP-2) so that an initial portion of the project that was mature enough to baseline could be accomplished. The baseline for SP-1 In-kind Hardware ($2,500,000,000) was approved in January 2017. In December 2023, per Congressional direction, the entire project was baselined with a total project cost of $6,500,000,000 and achieved CD-2/3B.

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	439,243	439,243	573,660
Design - Contingency	N/A	N/A	122,365
Total, Design (TEC)	**439,243**	**439,243**	**696,025**

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Construction	3,317,455	3,317,455	N/A
Equipment	N/A	N/A	1,362,521
Construction - Contingency	1,360,000	1,360,000	371,152
Total, Construction (TEC)	**4,677,455**	**4,677,455**	**1,733,673**
Cash Contributions	1,313,000	1,313,000	N/A
Total, Cash Contributions (TEC)	**1,313,000**	**1,313,000**	**N/A**
Total, TEC	**6,429,698**	**6,429,698**	**2,429,698**
Contingency, TEC	*1,360,000*	*1,360,000*	*493,517*
Other Project Cost (OPC)			
OPC, Except D&D	70,302	70,302	70,302
Total, Except D&D (OPC)	**70,302**	**70,302**	**70,302**
Total, OPC	**70,302**	**70,302**	**70,302**
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	**6,500,000**	**6,500,000**	**2,500,000**
Total, Contingency (TEC+OPC)	*1,360,000*	*1,360,000*	*493,517*

Notes:

- *In the table above, the previous total estimate includes cash contributions estimate to align with the TPC budget request. The "Original Validated Baseline" reflects SP-1 only.*
- *Current total estimated design reflects work done prior to CD-2/3. SP-2 design work is accounted for in TEC Construction as part of SP-1 scope approved at CD-2/3.*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	2,595,617	240,000	225,000	—	3,369,081	6,429,698
	OPC	70,302	—	—	—	—	70,302
	TPC	2,665,919	240,000	225,000	—	3,369,081	6,500,000
FY 2026	TEC	2,595,617	240,000	200,000	77,500	3,316,581	6,429,698
	OPC	70,302	—	—	—	—	70,302
	TPC	2,665,919	240,000	200,000	77,500	3,316,581	6,500,000

6. Related Operations and Maintenance Funding Requirements

The U.S. Contributions to ITER operations phase is to begin with initial integrated commissioning activities with an assumed useful life of 30 to 35 years. The fiscal year in which commissioning activities begin depends on the international ITER project schedule. As a result of COVID-19 and other known delays, the IO has submitted an overall ITER project updated cost and schedule to the ITER Council at the June 2024 meeting. This update indicates a start of commissioning activities after 2033.

Start of Operation or Beneficial Occupancy	1Q FY 2040
Expected Useful Life	35 years
Expected Future Start of D&D of this capital asset	1Q FY 2075

7. D&D Information

Since ITER is being constructed in France by a coalition of countries and will not be a DOE asset, the "one-for-one" requirement is not applicable to this project.

The U.S. Contributions to ITER decommissioning phase is assumed to begin no earlier than 30 years after the start of operations. The deactivation phase is also assumed to begin no earlier than 30 years after operations begin and will continue for a period of five years. The U.S. is responsible for 13 percent of the total decommissioning and deactivation cost; this requirement will be collected and escrowed out of Research Operations funding.

8. Acquisition Approach

The U.S. ITER Project Office (USIPO) at Oak Ridge National Laboratory, with its two partner laboratories (Princeton Plasma Physics Laboratory and Savannah River National Laboratory), will procure and deliver in-kind hardware in accordance with the Procurement Arrangements established with the IO. The USIPO will subcontract with a variety of research and industry sources for design and fabrication of its ITER components, ensuring that designs are developed that permit fabrication, to the maximum extent possible, to use fixed-price subcontracts (or fixed-price arrangement documents with the IO) based on performance specifications, or more rarely, on build-to-print designs. USIPO will use cost-reimbursement type subcontracts only when the work scope precludes accurate and reasonable cost contingencies being gauged and established beforehand. USIPO will use best value, competitive source-selection procedures to the maximum extent possible, including foreign firms on the tender/bid list when necessary. Such procedures shall allow for cost and technical trade-offs during source selection. For the large-dollar-value subcontracts (and critical path subcontracts as appropriate), USIPO will utilize unique subcontract provisions to incentivize cost control and schedule performance. In addition, where it is cost effective and it reduces risk, the USIPO will participate in common procurements led by the IO or request the IO to perform activities that are the responsibility of the U.S. SC will evaluate the Management and Operation (M&O) contractor's performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the project.

Overview

The High Energy Physics (HEP) program is dedicated to unraveling the mysteries of the universe by exploring the fundamental building blocks of matter and energy. Through groundbreaking scientific discoveries in particle physics and the management of top-tier scientific facilities, HEP plays a crucial role in advancing research and development. By ensuring the timely completion of significant projects and maintaining state-of-the-art facilities, HEP contributes to positioning the U.S. as a key player in global particle physics research and collaboration.

Our current understanding of the elementary constituents of matter and energy, as well as the forces that govern them, is encapsulated in the Standard Model of particle physics. However, experimental measurements indicate that the Standard Model is incomplete, hinting at the possibility of uncovering new physics through future experiments. In December 2022, the Department of Energy (DOE) and National Science Foundation (NSF) charged the High Energy Physics Advisory Panel (HEPAP) to assemble a new Particle Physics Project Prioritization Panel (P5) subpanel to formulate a ten-year plan for the field. At the December 2023 HEPAP meeting, the subpanel presented the new 2023 P5 report, "Exploring the Quantum Universe: Pathways to Innovation and Discovery in Particle Physics,"[a] which HEPAP unanimously approved. The report emphasized finishing ongoing major HEP projects. The 2023 P5 report outlines six core science drivers that offer promising pathways towards unraveling the mysteries beyond the Standard Model.

- Reveal the secrets of the Higgs boson,
- Elucidate the mysteries of neutrinos,
- Search for direct evidence of new particles,
- Pursue quantum imprints of new phenomena,
- Determine the nature of dark matter,
- Understand what drives cosmic evolution.

In FY 2024, the Office of Science (SC) made a strategic move by realigning the Accelerator R&D and Production (ARDAP) program activities into a new division under the HEP program. This shift aims to consolidate expertise and capabilities in accelerator research and development (R&D), fostering efficiency and effectiveness in SC investments in this crucial field. The establishment of the HEP Accelerator and Technology (AT) Division represents a significant step forward, encompassing not only traditional accelerator technologies but also cutting-edge areas such as artificial intelligence/machine learning (AI/ML) and quantum information science (QIS). This integration of critical and innovative technologies will undoubtedly propel advancements in accelerator R&D, shaping the future of scientific innovation.

The HEP program enables scientific discovery and supports cutting edge R&D in five focused subprograms:

- Energy Frontier Experimental Physics accelerates particles to the highest energies ever made by humanity and collide them to produce and study the fundamental constituents of matter.
- Intensity Frontier Experimental Physics uses a combination of intense particle beams and highly sensitive detectors to make extremely precise measurements of particle properties, to study some of the rarest interactions predicted by the Standard Model, and to search for new physics.
- Cosmic Frontier Experimental Physics uses naturally occurring cosmic particles and phenomena to reveal the nature of dark matter, understand the cosmic acceleration caused by dark energy and inflation, infer certain neutrino properties, and explore the unknown.
- Theoretical and Interdisciplinary Physics provides the framework to explain experimental observations and gain a deeper understanding of nature.
- Accelerator and Technology R&D fosters innovative research methods and enabling technologies that emerge from AI/ML, QIS, microelectronics, accelerators, and instrumentation that will advance scientific knowledge in HEP and in a broad range of related fields, advancing DOE's strategic goals for science.

[a] https://science.osti.gov/-/media/hep/hepap/pdf/Reports/2024/2023_P5_Report_Single_Pages.pdf

Highlights of the FY 2026 Request

The HEP FY 2026 Request of $1,112.8 million is a decrease of $111.7 million below the FY 2025 Enacted level.[b] This funding will prioritize fundamental research, operation and maintenance of scientific user facilities, facility upgrades, and projects outlined in the 2023 P5 report.

Research

The Request will provide continued support for HEP core competencies in theoretical and experimental activities and world-leading advanced technology R&D in pursuit of discovery science. Funding will also enable key advances in SC cross-cutting initiatives including:

- AI/ML: Extract rare particle signatures from increasingly high volumes of data, operate accelerators and detectors in real-time and extremely high data-rate environments, and create more realistic and accurate simulations of complex physical processes.
- QIS: Co-development of quantum information experiment, theory, and technology aligned with HEP science drivers and exploring new capabilities in quantum sensing and computing. HEP will support the Superconducting Quantum Materials and Systems (SQMS) National QIS Research Center, led by Fermi National Accelerator Laboratory (FNAL).
- Microelectronics: Accelerate R&D into sensor materials, detector devices, advances in front-end electronics; provide adaptation to high-radiation, cryogenic temperature, or low radioactive background environments.

Facility Operations

The Request will support three scientific user facilities: the Fermilab Accelerator Complex, the Facility for Advanced Accelerator Experimental Tests II (FACET-II), and the Brookhaven Accelerator Test Facility (ATF). These facilities will operate 4,480, 2,880, and 2,947 hours, respectively. BeamNetUS will provide user access to beam test facilities at nine U.S. facilities. HEP also supports laboratory-based accelerator and detector test facilities, and supports the maintenance and operations of large-scale experiments and facilities that are not based at a DOE national laboratory, such as the U.S. A Toroidal LHC Apparatus (ATLAS) and Compact Muon Solenoid (CMS) detectors at the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland; Sanford Underground Research Facility (SURF) in Lead, South Dakota; Vera C. Rubin Observatory in Chile; and Dark Energy Spectroscopic Instrument (DESI) at the Mayall telescope in Kitt Peak, Arizona.

Projects

The Request will support the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE-US) and Proton Improvement Plan II (PIP-II) construction projects. The Request will also support three Major Item of Equipment (MIE) projects: 1) Accelerator Controls Operations Research Network (ACORN), 2) High Luminosity Large Hadron Collider (HL-LHC) ATLAS Detector Upgrade, and 3) HL-LHC CMS Detector Upgrade.

[b] In FY 2025, HEP and ARDAP enacted amounts total $1,225 million and $27 million, respectively. In comparison to the sum of the FY 2025 HEP and ARDAP Enacted budgets, the FY 2026 Request represents a decrease of $138.7 million.

High Energy Physics
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
High Energy Physics				
Energy Frontier, Research	69,848	66,835	31,450	-35,385
Energy Frontier, Facility Operations and Experimental Support	52,800	51,750	52,000	+250
Energy Frontier, Projects	35,700	33,700	28,400	-5,300
Total, Energy Frontier Experimental Physics	**158,348**	**152,285**	**111,850**	**-40,435**
Intensity Frontier, Research	65,394	58,103	33,902	-24,201
Intensity Frontier, Facility Operations and Experimental Support	190,411	221,000	234,000	+13,000
Intensity Frontier, Projects	5,000	10,000	10,000	–
Total, Intensity Frontier Experimental Physics	**260,805**	**289,103**	**277,902**	**-11,201**
Cosmic Frontier, Research	47,727	47,409	24,184	-23,225
Cosmic Frontier, Facility Operations and Experimental Support	57,056	56,500	54,900	-1,600
Cosmic Frontier, Projects	4,500	4,500	–	-4,500
Total, Cosmic Frontier Experimental Physics	**109,283**	**108,409**	**79,084**	**-29,325**
Theoretical, Computational, and Interdisciplinary Physics, Research	166,584	169,042	–	-169,042
Theoretical,Comp,&InterPhy,Facility Operations and Experimental Supp	–	8,845	–	-8,845
Total, Theoretical, Computational, and Interdisciplinary Physics	**166,584**	**177,887**	**–**	**-177,887**
Theoretical and Interdisciplinary Physics, Research	–	–	26,103	+26,103
Total, Theoretical and Interdisciplinary Physics	**–**	**–**	**26,103**	**+26,103**
Advanced Technology R&D, Research	74,361	72,886	–	-72,886
Advanced Technology R&D, Facility Operations and Experimental Support	54,619	48,000	–	-48,000
Total, Advanced Technology R&D	**128,980**	**120,886**	**–**	**-120,886**
Accelerator & Technology R&D, Research	–	–	186,521	+186,521
Accel & Tech R&D, Facility Operations & Experimental Support	–	–	66,376	+66,376
Total, Accelerator & Technology R&D	**–**	**–**	**252,897**	**+252,897**

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Subtotal, High Energy Physics	824,000	848,570	747,836	-100,734
Construction				
18-SC-42 Proton Improvement Plan II (PIP-II), FNAL	125,000	125,000	114,000	-11,000
11-SC-40 Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment	251,000	251,000	251,000	–
Subtotal, Construction	376,000	376,000	365,000	-11,000
Total, High Energy Physics	1,200,000	1,224,570	1,112,836	-111,734

SBIR/STTR funding:

- FY 2024 Enacted: SBIR $13,385,000 and STTR $1,882,000
- FY 2025 Enacted: SBIR $13,241,000 and STTR $1,862,000
- FY 2026 Request: SBIR $9,496,000 and STTR $1,335,000

High Energy Physics
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Energy Frontier Experimental Physics The Request will decrease due in part to the HL-LHC ATLAS and CMS Detector Upgrade Projects planned reduction in accordance with the baselined funding profiles. The Request will strategically focus research on the highest impact areas.	-40,435
Intensity Frontier Experimental Physics The Request includes a net decrease with increased support for SURF and the Fermilab Accelerator Complex to operate 4,480 hours and support a new GPP, which will replace a critical 345kV substation transformer that provides power to the accelerators. Funding for research decreases and is redirected to administration priorities. Research will focus on maximizing scientific return from ongoing experiments and making critical contributions to the LBNF/DUNE project.	-11,201
Cosmic Frontier Experimental Physics The Request includes a pause for the CMB-S4 project as it reassesses its approach to achieving the science goals without the South Pole site access. Research funding will strategically focus on researchers and collaborations focused on maximizing scientific return from leading dark energy and dark matter experiments.	-29,325
Theoretical, Computational, and Interdisciplinary Physics This subprogram will conclude in FY 2025. Beginning with the FY 2026 Request, Theoretical Physics and Broadening Engagement in HEP, will move to the Theoretical and Interdisciplinary Physics subprogram, and the technology activities of Computational HEP, QIS, and AI/ML will move to the Accelerator & Technology R&D subprogram.	-177,887
Theoretical and Interdisciplinary Physics While this is a new subprogram in FY 2026, the Request will enhance HEP research capacity, workforce training, and career pathways for individuals and institutions while strategically supporting key theoretical research groups to sustain momentum in the most promising areas of high energy physics.	+26,103
Advanced Technology R&D This subprogram will conclude in FY 2025. Beginning with the FY 2026 Request, the HEP accelerator R&D and detector R&D activities will move to the Accelerator & Technology R&D subprogram.	-120,886

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Accelerator & Technology R&D[c] The Request will increase support to 1) highly targeted AI/ML methods to identify phenomena, improve fundamental tests, and measure with precision; and 2) QIS to enable expanded work in quantum sensing and computing at the national laboratories, strengthening the contribution of QIS techniques and expertise to the HEP mission. The Request will support FACET-II and ATF to operate 2,880 and 2,947 hours, respectively and support BeamNetUS. Research funding will strategically focus on supporting world-leading accelerator R&D, advanced particle detector technology, and computationally advanced tools and methods to maximize HEP discovery science. The increase also represents the shift of funds from the Theoretical, Computational, and Interdisciplinary Physics and Advanced Technology R&D subprograms, and the ARDAP program activities.	+252,897
Construction The Request will decrease support for PIP-II in accordance with the baselined funding profile.	-11,000
Total, High Energy Physics	-111,734

[c] This new subprogram will begin with the FY 2026 Request, comprised of activities: HEP General Accelerator R&D, Accelerator Stewardship, Accelerator Development, Detector R&D, Computational HEP, AI/ML, QIS, and Microelectronics.

Basic and Applied R&D Coordination

The General Accelerator R&D (GARD), Accelerator Stewardship, Accelerator Development, AI/ML, and QIS activities advance crosscutting technology R&D and supply chain risk reduction efforts that support the mission of HEP and other Office of Science programs.

Technology R&D activities are guided by experts from DOE, other federal agencies, universities, national laboratories, and the private sector who help identify key research areas and supply chain needs beyond the SC research mission.[d] Cross-cutting accelerator R&D is closely coordinated within SC[e] and with partner agencies[f] to ensure federal stakeholders have input in crafting funding opportunity announcements, reviewing applications, and evaluating the efficacy and impact of funded activities. To ensure commercial viability, funded activities are expected to include collaboration with a U.S. company to guide the early-stage R&D. Coordination across the U.S. government occurs through interagency discussions and via the Presidential Council of Advisors on Science and Technology (PCAST)[g] and the National Quantum Coordination Office.

Formulation of the GARD activity is based on input from the community, including high-level advice on long term facility goals from HEPAP and P5, and more detailed technical advice developed through a series of Roadmap Workshops[h]. Formulation of the Accelerator Stewardship, Accelerator Development, and AI/ML activities are based on guidance from other SC Programs, federal advisory committee reports, community input (e.g., SC AI Roundtables[i]), data capture, and Basic Research Needs workshops[j] held in conjunction with other federal agencies.

To maximize impact, the HEP QIS research activity collaborates with the Department of Commerce's National Institute of Standards and Technology on both quantum metrology and quantum sensor development. The SC National QIS Research Center (NQISRC) efforts engage industry to connect both use-inspired research with development efforts, and it utilizes partnerships to improve technology for superconducting quantum computing.

Program Accomplishments

Excavation completes on colossal caverns for underground neutrino laboratory (Construction)

On August 15, 2024, a ribbon-cutting event was held at the Sanford Underground Research Facility (SURF) in Lead, S.D. to mark the completion of excavation work for the Long-Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE), an international project led by the U.S. Department of Energy's Fermi National Accelerator Laboratory (FNAL). The "Into the Depths of Discovery" event, hosted by FNAL and the South Dakota Science and Technology Authority (SDSTA), was attended by supporters of the three-year excavation of the caverns, including state and federal leaders as well as DOE officials. Engineering, construction and excavation teams have worked 4,850 feet below the surface since 2021 at SURF to prepare the space needed for the experiment. Over 800,000 tons of rock were excavated and moved from underground to an expansive former surface mining area known as the Open Cut, a testament to the scale of the project. To accomplish this feat, construction crews dismantled heavy mining equipment and, piece by piece, transported it underground. Workers then reassembled the machinery and have since been diligently blasting and relocating rock. To house the gigantic LBNF/DUNE particle detector modules, two colossal caverns were completed, each

[d] https://www.osti.gov/servlets/purl/1863553

[e] Specifically, with the Basic Energy Sciences, Fusion Energy Sciences, Nuclear Physics, and Isotope R&D and Production programs.

[f] Specifically, with the National Institutes of Health/National Cancer Institute (NIH/NCI); ultrafast laser technology R&D with the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA); and microwave and high power accelerator R&D coordinated with the National Nuclear Security Administration (NNSA) and DOD, the Department of Homeland Security's Domestic Nuclear Detection Office in the Countering Weapons of Mass Destruction Office (DHS/CWMD), and the National Science Foundation/Mathematical and Physical Sciences (NSF/MPS) Division.

[g] Supercharging Research: Harnessing Artificial Intelligence to Meet Global Challenges https://www.whitehouse.gov/wp-content/uploads/2024/04/AI-Report_Upload_29APRIL2024_SEND-2.pdf

[h] Roadmap Workshop reports may be found at https://science.osti.gov/hep/Community-Resources/Reports

[i] HEP participation was concentrated in the roundtables on Facilities, High Energy and Nuclear Physics, and Microelectronics.

[j] Basic Research Needs workshop reports may be found at https://science.osti.gov/ardap/Resources

more than 500 feet long and seven stories tall. The two detectors will each be filled with 17,000 tons of liquid argon cooled to minus 184 degrees Celsius to record and study the rare interactions of neutrinos.

First results from DESI make the most precise measurement of our expanding universe (Cosmic Frontier Experimental Physics)
With 5,000 tiny robots in a mountaintop telescope, researchers using the Dark Energy Spectroscopic Instrument (DESI) have peered 11 billion years into the past, creating an unprecedented view of the early universe. This innovative technology allows us to map the cosmos as it was in its youth and track its growth to the present day. Understanding the evolution of our universe is crucial in unraveling the mysteries of dark energy, the force propelling the universe to expand at an accelerated pace. DESI has crafted the most extensive 3D map of our cosmos to date, showcasing the universe's evolution over the past 11 billion years with unprecedented precision. By measuring the expansion history of the early universe with over 1 percent accuracy, scientists have gained unparalleled insights into its evolution, revolutionizing our understanding of its composition. The leading model of the universe, Lamda CDM, incorporating cold dark matter and dark energy, has provided a framework for understanding the cosmos. However, DESI's findings, when combined with data from other studies, reveal subtle deviations from the model's predictions. As DESI continues its five-year survey, more refined results will shed light on potential new explanations or modifications required to enhance our model. DESI's ongoing research will not only refine our understanding of dark energy effects but also provide insights into crucial aspects like the Hubble constant and the mass of neutrinos. The pursuit of knowledge through DESI's groundbreaking work promises to deepen our comprehension of the cosmos and its intricate workings.

SLAC completes construction of the largest digital camera ever built for astronomy (Cosmic Frontier Experimental Physics)
After two decades of dedicated work, scientists and engineers at the DOE’s SLAC National Accelerator Laboratory (SLAC) and partners mark the completion of the groundbreaking Legacy Survey of Space and Time (LSST) Camera. The 3,200-megapixel camera, at the core of the Vera C. Rubin Observatory, promises unparalleled insights into our universe. Over ten years, this camera will amass a vast amount of data on the southern night sky, powering the pursuit of understanding dark energy and dark matter, fundamental to the universe's workings. The SLAC team and collaborators have crafted the most extensive digital camera for astronomy, akin to a small car in size and weighing over 3.3 tons. Featuring a front lens over five feet across, the camera boasts a three-foot-wide lens essential for maintaining optical clarity and sealing the vacuum chamber. Its focal plane, composed of 201 custom-designed CCD sensors, ensures precision with pixels only 10 microns wide. Following rigorous testing at SLAC, the LSST Camera heads to Chile, destined for the Simonyi Survey Telescope atop 8,900-foot-high Cerro Pachón in the Andes. Once operational, this camera will meticulously map celestial objects, offering valuable insights such as weak gravitational lensing, shedding light on the universe's mass distribution and the impact of dark energy on cosmic expansion. Exciting times lie ahead for cosmologists and researchers as the LSST Camera gears up to unravel the mysteries of the cosmos.

FNAL delivers new capabilities in quantum information processing using accelerator technology (QIS)
Fermilab leads the Superconducting Quantum Materials and Systems Center (SQMS), one of DOE’s five National QIS Research Centers. This center works to leverage the decades of expertise Fermilab has developed in superconducting technology and the operation of world-class large-scale scientific facilities to realize the potential of quantum computing. This year, the FNAL team unveiled a groundbreaking quantum device with world-record coherence time using superconducting radiofrequency (SRF) cavities. These SRF cavities, originally developed to enable high-power accelerator beams, are now repurposed to precisely manipulate quantum states of light to enable high-density, scalable quantum information processing. In a field where devices can often only be operated for microseconds before encountering a fatal error, SRF cavities can store quantum information for up to two seconds, while enabling gates with error rates of less than 0.1%. Additionally, these multi-level devices, called “qudits,” dramatically pack large amounts of information into a single device, allowing more complicated computations to be run on less hardware. In the future, Fermilab will work with industry partners to realize a scaled-up version of this new model of computing while co-developing the required control and refrigeration technology. As these technologies advance, they can also enable new modes of quantum sensing that could be used to detect dark matter, gravitational waves, or other new physics targets.

High Energy Physics
Energy Frontier Experimental Physics

Description

The Energy Frontier Experimental Physics subprogram supports U.S. researchers at the international Large Hadron Collider (LHC), participating in the ATLAS and CMS experiments. These large, international collaborations greatly benefit from U.S. researchers contributions, who represent approximately 20-25% of the ATLAS and CMS collaborations, and play key leadership roles. This subprogram addresses four of the six P5 science drivers, as detailed below.

- *Reveal the secrets of the Higgs boson*
  LHC experiments measure the Higgs boson's properties to determine if it behaves as predicted by the Standard Model and to search for new physics.
- *Search for direct evidence of new particles*
  Direct searches at the LHC are looking for new particles, leveraging increased collision rates for more precise studies. Over a decade of LHC searches has yielded vast datasets and innovative analyses.
- *Pursue quantum imprints of new phenomena*
  LHC researchers probe for evidence of physics beyond the Standard Model. Upgraded LHC detectors will be more sensitive to deviations from the Standard Model.
- *Determine the nature of dark matter*
  LHC collisions could potentially produce dark matter particles, inferring their properties through the behavior of the other particles. This "indirect" detection complements direct detection experiments in the Cosmic and Intensity Frontiers.

Research

This activity supports scientists at research institutions and DOE national laboratories who work on the ATLAS and CMS experiments in many roles – from designing equipment to analyzing data. Advanced computational techniques, including AI/ML, contribute to:

- **Analyzing Higgs boson decay patterns:** Revealing subtle deviations from the Standard Model and providing insights into new physics.
- **Processing LHC data:** Identifying new particle signatures, suppressing background noise, and optimizing search strategies.
- **Investigating complex collision events:** Detecting subtle imprints of new phenomena and identifying deviations from expected particle behavior.
- **Searching for dark matter signatures:** Pinpointing potential dark matter signals in LHC collision data.

Facility Operations and Experimental Support

The U.S. LHC Detector Operations activity maintains U.S.-supplied components of the ATLAS and CMS detectors and supports the U.S.-based computer infrastructure used to analyze LHC data, including Tier 1 computing centers at Brookhaven National Laboratory (BNL) and FNAL. These centers provide 24/7 support, store data, perform reprocessing, and store output.

Projects

CERN is upgrading the LHC to the High-Luminosity LHC (HL-LHC), increasing the collision rate to explore new physics. HEP contributed by delivering the next-generation superconducting accelerator components, leveraging U.S. expertise. The HL-LHC will create challenging detector conditions, making the HL-LHC ATLAS and CMS Detector Upgrades critical investments to ensure continued operation and maximize scientific return.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Energy Frontier Experimental Physics	**$152,285**	**$111,850**	**-$40,435**
Research	$66,835	$31,450	-$35,385
This funding supports researchers who are actively involved in the ATLAS and CMS experiments, leveraging AI/ML techniques across various activities to accelerate discoveries and enhance our understanding of fundamental physics.		The Request will continue support for researchers actively involved in the ATLAS and CMS experiments, prioritizing the use of AI/ML techniques to sustain progress in fundamental physics discovery.	Research funding will strategically focus on the highest impact areas: exploring new physics at the LHC and making critical contributions to the HL-LHC detector upgrades.
Facility Operations and Experimental Support	$51,750	$52,000	+$250
This funding supports ongoing ATLAS and CMS detector maintenance and operations activities at CERN, and data taking using the U.S.-based computing infrastructure and resources.		The Request will continue to support vital LHC detector components and computing infrastructure, utilizing AI/ML to optimize performance and ensure reliable, high-quality data for U.S. researchers.	Increased funding will prioritize the essential upgrades to U.S.-based computing infrastructure, ensuring efficient analysis of the large datasets from the LHC. This is partially offset by a reduction in ongoing ATLAS and CMS detector maintenance activities as integration efforts for the HL-LHC detector upgrades progress.
Projects	$33,700	$28,400	-$5,300
This funding supports fabrication activities for the HL-LHC ATLAS and the HL-LHC CMS Detector Upgrades.		The Request will support fabrication activities for the HL-LHC ATLAS and the HL-LHC CMS Detector Upgrades.	Funding will decrease as planned, according to the established funding profile for each HL-LHC detector upgrade project, as they continue through their respective fabrication activities.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

High Energy Physics
Intensity Frontier Experimental Physics

Description
The Intensity Frontier Experimental Physics subprogram investigates rare processes using high-power beams and intense sources to make precision measurements of fundamental particle properties. These measurements probe for new phenomena not directly observable at the Energy Frontier, either because they occur at much higher energies or involve extremely weak interactions. This subprogram addresses four of the six P5 science drivers, as detailed below.

- *Elucidate the mysteries of neutrinos*
  Research into fundamental neutrino properties may reveal important clues about the unification of forces and the early history of the universe, addressing the Standard Model's limitations regarding neutrino mass and oscillations.
- *Search for direct evidence of new particles*
  Experiments seeking direct evidence for new particles, whether heavy particles produced at colliders or light particles produced with high intensity, can ignite major paradigmatic shifts.
- *Pursue quantum imprints of new phenomena*
  Intense proton beams can reveal quantum imprints of new phenomena beyond the reach Energy Frontier accelerators. The physics of quarks and leptons is particularly sensitive to these imprints.
- *Determine the nature of dark matter*
  Experiments with highly efficient detectors within intense accelerator beams offer an opportunity to explore theoretical models with new particles and forces that rarely interact with normal matter.

Research

This activity supports scientists at research institutions and DOE national laboratories who work on neutrino and rare decay experiments in many roles – from designing equipment to analyzing data. A major focus is accelerator-based neutrino physics at Fermi National Accelerator Laboratory (FNAL), including the Short-Baseline Neutrino (SBN) program, which searches for neutrino types beyond the three currently described in the Standard Model, and the LBNF/DUNE, a U.S.-hosted world-leading neutrino research facility. Advanced computational techniques, including AI/ML, contribute to:

- Enhanced data processing: AI/ML algorithms are being used to efficiently process the massive datasets generated by neutrino experiments, accelerating the search for new physics.
- Improved signal identification: AI/ML techniques enhance the ability to distinguish faint signals from background noise, increasing the sensitivity of rare decay experiments.
- Optimized detector performance: AI/ML is being used to monitor and optimize detector performance, maximizing data quality and experiment up time.

Facility Operations and Experimental Support

The key component of this activity is support for facility operations and experimental activities, including the Fermilab Accelerator Complex User Facility. This includes the operations of all accelerators and beamlines at FNAL; the operation of detectors; computing support; and scientific collaboration support. Accelerator Improvement Project (AIP) and General Plant Project (GPP) funding supports facility improvements. From data analysis and accelerator control, AI/ML is being widely applied in HEP to enhance efficiency, improve accuracy, and unlock new insights from complex datasets.

This subprogram supports the South Dakota Science and Technology Authority (SDSTA) cooperative agreement which supports basic services and critical infrastructure upgrades at the Sanford Underground Research Facility (SURF) in South Dakota. SURF hosts experiments including the HEP-supported LZ experiment, and will be the home of the DUNE far site detectors.

Projects

FNAL is upgrading its outdated accelerator control system with a modern system capable of utilizing advances in AI/ML to create a high-performance accelerator. The Accelerator Controls Operations Research Network (ACORN) MIE is critical for initiating particle beam production, controlling beam parameters; steering beams, and monitoring beam transport throughout the Fermilab Accelerator Complex.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Intensity Frontier Experimental Physics	**$289,103**	**$277,902**	**-$11,201**
Research	$58,103	$33,902	-$24,201
This funding drives progress in understanding neutrino properties and rare processes by supporting key experiments like SBN and DUNE, with AI/ML playing a crucial role in data analysis, signal identification, and experimental optimization.		The Request will maintain support for researchers actively involved in the ongoing experiments and future projects, prioritizing the use of AI/ML techniques to sustain progress in fundamental physics discovery.	Research funding will strategically focus on maximizing scientific return from ongoing experiments and making critical contributions to the LBNF/DUNE project. Prioritization of AI/ML-driven data analysis and experimental optimization will ensure efficient progress towards unlocking fundamental insights.
Facility Operations and Experimental Support	$221,000	$234,000	+$13,000
This funding supports HEP facility operations, experimental activities, and critical infrastructure at FNAL and SURF, including the incorporation of AI/ML to enhance efficiency and facilitate scientific discovery.		The Request will continue supporting the Fermilab Accelerator Complex and SURF, carefully balancing the operational needs of the user community with the need to reduce deferred maintenance and to advance modernization efforts, such as AI/ML upgrades.	Increased funding will support a new GPP, which will replace a critical 345kV substation transformer that provides power to the accelerators. It will also support new infrastructure at the Helen Edwards Engineering Research Center at FNAL, as well as ongoing modernization efforts at SURF.
Projects	$10,000	$10,000	$ —
This funding supports the ACORN MIE system design and other related engineering activities required to reach CD-1.		The Request will support the ACORN MIE system design and other related engineering activities required to reach CD-1 in FY 2026.	No change.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

High Energy Physics
Cosmic Frontier Experimental Physics

Description

The Cosmic Frontier Experimental Physics subprogram uses measurements and observations to probe fundamental physics questions about dark matter, dark energy, neutrino properties, and new phenomena. Experiments are typically conducted at ground-based observatories and facilities, space-based missions, and detectors deep underground. This subprogram addresses four of the six P5 science drivers as described below:

- *Determine the nature of dark matter*
  Direct-detection experiments search for dark matter particles, complementing accelerator-based searches performed in the Energy and Intensity Frontiers.
- *Understand what drives cosmic evolution*
  Surveys of galaxies will determine the nature of dark energy. Measurements of the cosmic microwave background (CMB) signal and light from distant galaxies map cosmic acceleration and inform researchers about inflation.
- *Elucidate the mysteries of neutrinos*
  Dark energy experiments using large-scale structures and the CMB will constrain neutrino properties, complementing measurements in the Intensity Frontier.
- *Search for Direct Evidence of New Particles*
  Studies of the CMB may reveal relic particles from the early universe, leaving imprints that can be investigated.

Research

This activity supports scientists at research institutions and DOE national laboratories across the US. These scientists work together on projects in many roles – from designing experiments to analyzing data. Advanced computational techniques, including AI/ML, contribute to:

- **Accelerate data analysis**: Handle the massive datasets generated by these experiments, identifying patterns and anomalies that would be impossible for humans to find manually.
- **Optimize experimental design**: Use AI to simulate different experimental configurations and identify the most efficient and effective designs.
- **Improve simulations**: Create more realistic and accurate simulations of complex physical processes, such as the behavior of dark matter particles or the evolution of the universe.

Major experiments like the Dark Energy Spectroscopic Instrument (DESI) and the Vera C. Rubin Observatory are driving progress in understanding dark energy. This subprogram also leads the global effort to detect and characterize dark matter through experiments like LZ and SuperCDMS-SNOLAB.

Facility Operations and Experimental Support

This activity covers the costs of running Cosmic Frontier experiments, including maintenance, operation, data handling, and dissemination. The DOE conducts reviews to ensure readiness and assess ongoing operations. DESI is located on the NSF's Mayall Telescope in Arizona, managed by LBNL. DOE and NSF jointly operate the Vera C. Rubin Observatory in Chile, with SLAC managing DOE's responsibilities. The LZ and SuperCDMS-SNOLAB dark matter experiments are located deep underground. LBNL manages LZ operations at SURF in South Dakota, and SLAC manages DOE's responsibilities for SuperCDMS-SNOLAB at the Sudbury Neutrino Observatory in Canada, in partnership with NSF and Canada[k].

[k] Canadian funding for SuperCDMS-SNOLAB operations is provided by the Ministry for Innovation, Science, and Economic Development through the Canada Foundation for Innovation (CFI).

Projects

The DOE was a partner in the CMB-S4 project (CD-0 issued July 25, 2019) seeking to detect primordial gravitational waves and search for relic particles. However, because the NSF has put the South Pole component of CMB-S4 on hold, the DOE is pausing its involvement to reassess its approach.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Cosmic Frontier Experimental Physics	**$108,409**	**$79,084**	**-$29,325**
Research	$47,409	$24,184	-$23,225
This funding drives progress in understanding dark energy and dark matter by supporting key experiments like DESI, Vera Rubin, LZ, and SuperCDMS-SNOLAB, with AI/ML playing a crucial role in data analysis, signal identification, and experimental optimization.		The Request will continue to support researchers exploring dark energy and dark matter, emphasizing collaborative efforts and the efficient application of AI/ML to drive discoveries within the leading experiments.	Research funding will strategically focus on researchers and collaborations focused on maximizing scientific return from leading dark energy and dark matter experiments. Prioritization of AI/ML-driven data analysis and experimental optimization will ensure efficient progress towards unlocking fundamental insights.
Facility Operations and Experimental Support	$56,500	$54,900	-$1,600
This funding ensures the smooth operation of key Cosmic Frontier experiments like DESI, Vera Rubin, LZ, and SuperCDMS-SNOLAB.		The Request will continue to support the collection, processing, and analysis of data from leading Cosmic Frontier experiments.	Funding will prioritize the efficient operation of key Cosmic Frontier experiments, particularly the Vera C. Rubin Observatory and SuperCDMS-SNOLAB, utilizing AI/ML to improve efficiency and accelerate discoveries in dark energy and dark matter research.
Projects	$4,500	$ —	-$4,500
This funding supports continued engineering and design efforts for the CMB-S4 project, including a site study for a Chile-only deployment.		No funding will be requested for this activity.	The DOE will pause the CMB-S4 project and will reassess its approach to achieving the science goals.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

High Energy Physics
Theoretical and Interdisciplinary Physics

Description

The Theoretical and Interdisciplinary Physics subprogram (formerly the Theoretical, Computational, and Interdisciplinary Physics subprogram) develops the mathematical, phenomenological, and computational tools needed to understand the behavior of particles and fields, as well as the fundamental nature of space and time. This theoretical research is essential for interpreting experimental results in other HEP subprograms, directly contributing to all six P5 science drivers and supporting for the Energy, Intensity, Cosmic Frontiers, and Accelerator and Technology R&D. This subprogram also promotes connections with new research areas (e.g., AI/ML, QIS) and institutions through workshops, collaborations, and workforce training programs.

Theory

The HEP theory activity supports world-leading research groups at research institutions and national laboratories, enabling them to address key HEP research areas. Laboratory groups focus on data-driven investigations and calculations of experimentally observable quantities. Research institutions focus on building models of physics beyond the Standard Model and studying their phenomenology and mathematical theory (e.g., string theory, quantum field theory), aiming to develop a more complete understanding of the universe. Specific examples of AI/ML and QIS applications include:

- **Accelerated computations and data analysis:** Using AI/ML to speed up calculations and extract insights from datasets, identifying potential signatures of new physics.
- **Model building with AI/ML:** Employing AI/ML to explore models beyond the Standard Model and identify those consistent with data.
- **Quantum simulations:** Utilizing quantum computers to simulate complex quantum systems, including quantum field theories.
- **QIS-inspired theoretical techniques:** Developing non-perturbative techniques in field theory and quantum gravity using QIS to understand fundamental aspects of the universe.

Broadening Engagement in HEP

This activity expands participation in HEP research by reaching new communities and institutions. Supported initiatives include:

- **DOE Established Program to Stimulate Competitive Research (EPSCoR):** Strengthens research capacity in U.S. states and territories with limited federal research funding, thereby reaching communities and institutions with limited involvement in the HEP portfolio.
- **Science Accelerating Growth and Engagement (SAGE) Journey internships:** Provides hands-on research experiences for students and early-career professionals at DOE national laboratories.
- **Veteran Applied Laboratory Occupational Retraining (VALOR)**: Offers training and career placement at DOE national laboratories for Junior Reserve Officer Training Corps (JROTC) cadets and veterans transitioning to civilian careers.

High Energy Physics
Theoretical and Interdisciplinary Physics

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Theoretical, Computational, and Interdisciplinary Physics	**$177,887**	**$ —**	**-$177,887**
Research	$169,042	$ —	-$169,042
Theory	*$42,564*	*$ —*	*-$42,564*
This funding supports world-leading theoretical research groups focused on key areas in high energy physics, leveraging AI/ML for accelerating calculations and building new models, and QIS for exploring novel theoretical frameworks and simulating complex quantum systems.		N/A	Funding for FY 2026 is requested in the Theoretical and Interdisciplinary Physics subprogram.
Computational HEP	*$20,236*	*$ —*	*-$20,236*
This funding supports the multi-laboratory HEP and ASCR SciDAC partnerships, and a dedicated Traineeship Program.		N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.
Quantum Information Science	*$50,566*	*$ —*	*-$50,566*
This funding brings together experts in HEP and QIS to work on joint research projects. It also supports the Superconducting Quantum Materials and Systems Center (SQMS), which is one of the national centers for QIS research.		N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Artificial Intelligence and Machine Learning *$52,877*	*$ —*	*-$52,877*
This funding advances the HEP mission by investing in AI/ML research and development, promoting innovative solutions to cross-cutting challenges and building a strong AI/ML community within the field.	N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.
Broadening Engagement in HEP *$2,799*	*$ —*	*-$2,799*
This funding broadens participation in HEP by providing research and training opportunities at DOE national labs through initiatives like EPSCoR, SAGE, and VALOR.	N/A	Funding for FY 2026 is requested in the Theoretical and Interdisciplinary Physics subprogram.
Facility Operations and Experimental Support *$8,845*	*$ —*	*-$8,845*
This funding supports AI enhanced faciltities from optimizing accelerator control systems and detector performance to enabling the processing of very large datasets and accelerating the pace of scientific discovery.	N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram
Theoretical and Interdisciplinary Physics **$ —**	**$26,103**	**+$26,103**
Research $ —	$26,103	+$26,103
Theory *$ —*	*$23,103*	*+$23,103*
The Theory activity was requested as part of the Theoretical, Computational, and Interdisciplinary Physics subprogram in FY 2025 with a funding level of $42,564,000.	The Request will continue to support world-leading theoretical particle physics research.	This funding will strategically support key theoretical research groups, emphasizing the innovative application of AI/ML and QIS to sustain momentum in the most promising areas of high energy physics.
Broadening Engagement in HEP *$ —*	*$3,000*	+$3,000
The Broadening Engagement in HEP activity was requested as	The Request will continue to support HEP awards through	Funding will enhance HEP research capacity, workforce training, and

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
part of the Theoretical, Computational, and Interdisciplinary Physics subprogram in FY 2025 with a funding level of $2,799,000.	EPSCoR, and internships through SAGE Journey and VALOR.	career pathways for individuals and institutions.

Note:

- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

High Energy Physics
Accelerator & Technology R&D

Description

The Accelerator and Technology R&D subprogram (formerly the Advanced Technology R&D subprogram and Accelerator R&D and Production program) supports the cutting-edge basic research necessary to develop 21st century tools of science, such as advanced particle accelerators and detectors. The subprogram supports research and development (R&D) in a wide range of areas, including: the physics of particle beams, accelerator technology, particle and radiation detection, computational methods for High Energy Physics (HEP), quantum information science (QIS), artificial intelligence/machine learning (AI/ML), and microelectronics. It also funds world-leading scientific facilities at five DOE national laboratories. These activities directly contribute to all six P5 science drivers and support the Energy, Intensity, and Cosmic Frontier Experimental Physics subprograms, as well as Theoretical Physics. Furthermore, the subprogram develops technologies with broad benefits for science and society, and provides advanced training to develop a highly skilled workforce in scientific and technical fields. This subprogram achieves its goals through targeted efforts in General Accelerator R&D, Accelerator Stewardship, Accelerator Development, Detector R&D, Computational HEP, AI/ML, QIS, and Microelectronics.

General Accelerator R&D

The GARD activity supports the science underlying the technologies used in particle accelerators, colliders, and storage rings, as well as the fundamental physics of charged particle beams to enable future discoveries in HEP. Long-term research goals include developing technologies to dramatically improve particle accelerator performance by optimizing beam energy, intensity, quality, and control, while reducing cost and size. This supports scientists and engineers at research institutions and DOE national laboratories, focusing on five key areas: accelerator and beam physics, advanced acceleration concepts, particle sources and targetry, radio-frequency (RF) acceleration technology, and superconducting magnets and materials. In 2023, DOE published a technology report, developed through a community study, to guide future research in accelerator and beam physics.[i] This activity supports the graduate Traineeship Program for Accelerator Science and Engineering. This program aims to revitalize education, training, and innovation in accelerator physics, benefiting HEP, other Office of Science programs, and various DOE initiatives that rely on the aforementioned technologies. This activity also supports curiosity driven accelerator R&D, investing in Office of Science facilities to maintain U.S. leadership and develop a skilled workforce for future facilities.

Accelerator Stewardship

This activity supports use-inspired accelerator technology R&D with a wide range of applications that make use of accelerators in discovery science, medicine, industry, security, and environmental science. The activity facilitates access to unique state-of-the-art superconducting accelerator R&D infrastructure for the private sector and other users through BeamNetUS. This activity also supports the development of software and material properties databases that are essential for accelerator design. Research activities in cross-cutting accelerator technologies encompass a wide range of areas: superconducting magnets and accelerators, beam physics, new particle sources, advanced high-intensity laser technology, and high-efficiency RF power sources. These efforts also include developing science-based accelerator controls and advanced simulation software.

Accelerator Development

This activity fosters partnerships between industry, academia, and DOE national laboratories. These collaborations address critical supply chain vulnerabilities for scientific facilities supported by the Office of Science. Strengthening domestic accelerator technology suppliers enhance their ability to produce advanced components and drive innovation, ultimately supporting the Office of Science mission to conduct world-leading scientific research. Focus areas include advanced superconducting wire and cable, superconducting RF cavities, novel materials, and high efficiency RF power sources for accelerators.

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[i] https://science.osti.gov/hep/-/media/hep/pdf/2022/ABP_Roadmap_2023_final.pdf

Detector R&D
This activity supports the development of the next generation instrumentation, particle detectors, and radiation-hardened devices. This is essential for maintaining U.S. scientific leadership that is expanding into new research areas and leveraging state-of-the-art technologies such as quantum sensors, advanced microelectronics, and real-time AI/ML in front-end electronics. This activity also supports the graduate Traineeship Program for HEP Instrumentation. This program aims to revitalize education, training, and innovation in the physics of particle detectors and next generation instrumentation.

Computational HEP
This activity supports advanced computing R&D to address challenges in high energy physics, enabling scientific discoveries that are otherwise inaccessible through experiments, observations, or traditional theoretical methods. This activity also supports the multi-laboratory HEP Center for Computational Excellence (CCE), which advances HEP computing by developing common software tools and adapting HEP applications to the latest high performance computing platforms, including exascale systems. Computational HEP partners with the Office of Science's Advanced Scientific Computing Research (ASCR) program to support Scientific Discovery through Advanced Computing (SciDAC), to ensure optimized HEP computing ecosystems for the near- and long-term future. This activity also supports the graduate Traineeship Program in Computational High Energy Physics, training scientists in critical skills, including AI/ML and software development supporting exascale systems.

Artificial Intelligence and Machine Learning
The AI/ML activity supports the development and application of cutting edge artificial intelligence and machine learning techniques to significantly enhance high energy physics research driving discoveries in this data-intensive science. AI is integrated in all aspects of the HEP program, from research and theoretical modeling to experiment design, facility operations, and enhanced AI-ready infrastructure like particle accelerators. This activity focuses on specific AI challenges that advance our scientific agenda and develop scientists with the AI expertise necessary to lead future flagship experiments.

Quantum Information Science
This activity supports QIS research and technology development that either extends the scientific reach of HEP, or uses HEP techniques to improve our understanding of quantum systems. The HEP QIS research activities were re-competed in 2024 and focus on topics in fundamental Quantum Theory, advancing Quantum Sensing, and deploying "pathfinder" experiments that demonstrate new capabilities and expand the discovery space for both HEP and QIS. The five National QIS Research Centers, jointly supported by multiple Office of Science programs, translate fundamental research into practical QIS applications and foster collaborations that support of the overall Office of Science mission.

Microelectronics
This activity supports sensor materials R&D, advances in front-end electronics, and integrated sensor/processor architectures. HEP applications typically need to operate with exquisite energy efficiency and in extreme temperature or radiation environments. To address these requirements, HEP participates in a multi-program effort to conduct basic research in microelectronics technologies for computing, communication, sensing, and power, seeking transformative advances in energy efficiency and resilience when operating in extreme environments.

Facility Operations and Experimental Support
This activity supports the maintenance and operation of two Office of Science user facilities: FACET-II (a beam-driven plasma wakefield acceleration facility at SLAC National Accelerator Laboratory), and the Accelerator Test Facility (ATF) at Brookhaven National Laboratory. This activity also supports the accelerator and detector test facilities at FNAL and Lawrence Berkeley National Laboratory. The activity also supports the BeamNetUS program, which provides limited user access to nine beam test facilities across the nation. AI/ML techniques are being integrated into these facilities to optimize beam performance, automate control systems, dynamically adjust resource deployment, and accelerate data analysis.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Advanced Technology R&D	**$120,886**	**$ —**	**-$120,886**
Research	$72,886	$ —	-$72,886
General Accelerator R&D	*$48,360*	*$ —*	*-$48,360*
This funding supports researchers to advance particle accelerator technology in key areas such as high-field magnets and high-power lasers. The Traineeship Program for Accelerator Science and Engineering is also supported.		N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.
Detector R&D	*$24,526*	*$ —*	*-$24,526*
This funding supports researchers to advance particle detector technology in key areas such as novel devices and new modalities for calorimetry, tracking, and timing. The Traineeship Program in HEP Instrumentation is also supported.		N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.
Facility Operations and Experimental Support	$48,000	$ —	-$48,000
This funding provides access to and supports the operation of FACET-II at SLAC, as well as key accelerator and detector test facilities at DOE national laboratories, enabling cutting-edge high energy physics research.		N/A	Funding for FY 2026 is requested in the Accelerator and Technology R&D subprogram.
Accelerator & Technology R&D	**$ —**	**$252,897**	**+$252,897**
Research	$ —	$186,521	+$186,521
General Accelerator R&D	*$ —*	*$19,082*	*+$19,082*
The General Accelerator R&D activity was requested as part of the Advanced Technology R&D subprogram in FY 2025 with a funding level of $48,360,000.		The Request will maintain support for key expertise while sustaining essential aspects of accelerator R&D, including the Traineeship Program for Accelerator Science and Engineering.	Research funding will strategically focus on supporting world-leading accelerator R&D, particularly in high-priority areas like high-field magnets and high-power lasers.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
HEP Accelerator Stewardship *$ —*	*$9,373*	*+$9,373*
The Accelerator Stewardship research activity was requested as part of the Accelerator R&D and Production program in FY 2025 with a funding level of $13,713,000.	The Request will maintain targeted support for key research activities, emphasizing advancements in superconducting magnets, beam physics, and data analytics-based accelerator controls across various research sectors.	Research funding will focus its resources on supporting high-impact cross-cutting research in technologies with use in science, medicine, security, and industry; with the goal of strengthening U.S. competitiveness in research for the future.
Accelerator Development *$ —*	*$2,990*	*+$2,990*
The Accelerator Development research activity was requested as part of the Accelerator R&D and Production program in FY 2025 with a funding level of $5,522,000.	The Request will continue to support efforts to work with and strengthen domestic suppliers for critical accelerator technologies and ongoing business sector studies to inform future collaborations and strategic insights.	Research funding will strategically focus on its most effective public-private partnerships and collaborative R&D efforts aimed at strengthening domestic suppliers of critical accelerator technologies, such as high-efficiency RF power sources and advanced superconducting wire and cable.
Detector R&D *$ —*	*$12,254*	*+$12,254*
The Detector R&D activity was requested as part of the Advanced Technology R&D subprogram in FY 2025 with a comparatively adjusted funding level of $14,070,000[m].	The Request will maintain support for key expertise while sustaining essential aspects of Detector R&D, including the Traineeship Program in HEP Instrumentation.	Research funding will strategically focus on advanced particle detector technology in key areas such as novel devices and new modalities for calorimetry, tracking, and timing.
Computational HEP *$ —*	*$10,630*	*+$10,630*
The Computational HEP research activity was requested as part of the Theoretical, Computational, and Interdisciplinary Physics subprogram in FY 2025 with a funding level of $20,236,000.	The Request will maintain support for key expertise while sustaining essential aspects of Computational HEP, including the Traineeship Program in Computational HEP.	Research funding will prioritize computationally advanced tools and methods to maximize HEP discovery science, while continuing support for critical expertise in AI/ML and exascale computing.
Artificial Intelligence and Machine Learning *$ —*	*$64,670*	*+$64,670*
The AI/ML research activity was requested as part of the Theoretical, Computational, and Interdisciplinary Physics	The Request will support key advances from the use of AI/ML, enabling the management and analysis of vast datasets, the	Increased funding will support highly targeted AI/ML methods to identify phenomena, improve fundamental tests, and measure

[m] The funding total referenced is comparatively adjusted by removing the funding requested for Microelectronics as that funding is now being requested as an independent activity in FY 2026 in the Accelerator Technology R&D subprogram.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
subprogram in FY 2025 with a funding level of $52,877,000.	optimization of complex detector and particle beam systems, and the acceleration of scientific discovery through identification of subtle patterns and anomalies.	precision. This includes innovative methods for subtle signals in unprecedented data sets from current and upcoming experiments (e.g., LHC, Vera Rubin, DUNE), techniques for dark matter, novel dimensions, and searches for broken areas of symmetry.
Quantum Information Science $ —	*$57,066*	*+$57,066*
The QIS research activity was requested as part of the Theoretical, Computational, and Interdisciplinary Physics subprogram in FY 2025 with a funding level of $50,566,000.	The Request will support interdisciplinary HEP QIS efforts through individual research grants and the National QIS Research Centers.	Increased funding will enable expanded work in quantum sensing and computing at the national laboratories, strengthening the contribution of QIS techniques and expertise to the HEP mission.
Microelectronics $ —	*$10,456*	*+$10,456*
The Microelectronics research activity was requested within the Detector R&D activity in FY 2025 with a funding level of $10,456,000.	The Request will continue supporting microelectronics development at multiple national laboratories and universities as well as support for the Microelectronics Science Research Center projects.	No changes.
Facility Operations and Experimental Support $ —	$66,376	+$66,376
Funding for the BNL-ATF operations was requested as part of the Accelerator R&D and Production program and all other operations within the Advanced Technology R&D subprogram in FY 2025 with a combined comparatively adjusted funding level of $64,610,000.	The Request will continue support for FACET-II at SLAC and ATF at BNL, key accelerator and detector test facilities at DOE national laboratories., and user access to nine test facilities through BeamNetUS. The Request will also support AI/ML to optimize the performance of HEP facilities, by automating control systems, predicting potential failures, and improving resource allocation.	Increased funding will support enhanced user access to accelerator facilities and user access to test facilities through BeamNetUS.

Note:

- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

This subprogram supports line-item construction for the entire HEP program. All Total Estimated Costs (TEC) are funded in this subprogram, including engineering, design, and construction.

18-SC-42, Proton Improvement Plan II (PIP-II), FNAL

The PIP-II project is enhancing the Fermilab Accelerator Complex to enable higher-power proton beams for neutrino production, facilitating groundbreaking neutrino physics discoveries. Construction includes an 800 MeV superconducting radio-frequency (SRF) proton linear accelerator and beam transfer line, along with modifications to the existing FNAL Booster, Recycler, and Main Injector synchrotrons. International, in-kind contributions will provide some components and the cryoplant. PIP-II received Critical Decision (CD)-3 approval on April 18, 2022, with a Total Project Cost (TPC) of $978,000,000. The CD-4 milestone date is 1Q FY 2033.

11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment, FNAL

The LBNF/DUNE-US construction project is a federal, state, private, and international partnership focused on advancing particle accelerators and detector technologies to enable groundbreaking research into neutrinos, the universe's most abundant yet enigmatic particles. LBNF/DUNE will investigate how muon neutrinos transform as they travel 800 miles from FNAL, where they are produced in a high-energy proton beam, to a massive detector in South Dakota. By analyzing these rare, flavor-changing transformations, the experiment aims to unravel the fundamental properties of neutrinos and address the puzzling matter-antimatter imbalance in the universe.

The LBNF/DUNE-US project is a national flagship particle physics initiative, representing the first multi-billion dollar international science facility hosted by the United States. LBNF/DUNE-US comprises two key collaborative efforts: LBNF, responsible for the neutrino beamline at FNAL and the Sanford Underground Research Facility (SURF) in South Dakota; and DUNE, an international collaboration defining the experiment's scientific goals, technical requirements, detector design, construction, commissioning, and subsequent research.

The DOE High Energy Physics program manages both LBNF and DUNE as a single line-item construction project: LBNF/DUNE-US. Under the leadership of DOE and FNAL, and with participation from international partners including CERN, LBNF will construct a megawatt-class neutrino source ("Near Site") at FNAL and underground caverns with cryogenic facilities ("Far Site") in South Dakota to house the DUNE detectors. DUNE involves over 1,400 scientists and engineers from more than 200 institutions across 35+ countries, with the DOE funding approximately half of DUNE under the designation DUNE-US.

The LBNF/DUNE-US project received approval for CD-1RR (Update cost range, reaffirm the alternative selection, and approve a new tailoring strategy for baselining the project into five subprojects) on February 16, 2023, with a TPC Point Estimate of $3,277,000,000. The five subprojects are:

- Far Site Conventional Facilities – Excavation (FSCF-EXC)
- Far Site Conventional Facilities – Buildings and Site Infrastructure (FSCF-BSI)
- Far Detectors and Cryogenic Infrastructure (FDC)
- Near Site Conventional Facilities and Beamline (NSCF+B)
- Near Detector (ND)

The TPC Point Estimate will be refined as the project matures. When the last subproject is baselined, the LBNF/DUNE-US TPC will be the aggregate of all subproject TPCs plus any contingency being held by the parent LBNF/DUNE-US project.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$376,000**	**$365,000**	**-$11,000**
18-SC-42, Proton Improvement Plan II (PIP-II), FNAL	$125,000	$114,000	-$11,000
This funding enables the construction of the linac building, as well as the fabrication and testing of production RF cavities, cryomodules, and related technical systems.		The Request will support ongoing construction of the linac building and the fabrication and testing of production RF cavities, cryomodules, and related technical systems.	The funding decrease is consistent with the baselined funding profile.
11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment, FNAL	$251,000	$251,000	$ —
This funding supports both ongoing activities and the recently completed EXC subproject. Ongoing activities include construction of FSCF-BSI, long-lead procurements for FDC and NSCF+B subprojects, preparations for installation of far detector components for FDC, preparations for construction subcontracts for the Near Site facilities, and continue design and other planning efforts for NSCF+B and ND.		The Request will support ongoing construction of FSCF-BSI, begin installation of far detector components at FDC, and the design and prototyping activities for NSCF+B and ND.	Funding will remain constant and will be allocated to the subprojects.

High Energy Physics
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	46,200	58,924	37,800	-21,124
Minor Construction Activities						
General Plant Projects	N/A	N/A	171	5,000	9,000	+4,000
Accelerator Improvement Projects	N/A	N/A	900	–	–	–
Total, Capital Operating Expenses	**N/A**	**N/A**	**47,271**	**63,924**	**46,800**	**-17,124**

High Energy Physics
Capital Equipment

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Energy Frontier Experimental Physics						
High Luminosity Large Hadron Collider ATLAS Upgrade Project	183,485	130,785	16,200	16,200	15,300	-900
High Luminosity Large Hadron Collider CMS Upgrade Project	158,550	112,838	19,500	17,500	7,500	-10,000
Intensity Frontier Experimental Physics						
Accelerator Controls Operations Research Network	102,301	–	500	1,000	10,000	+9,000
Total, Non-MIE Capital Equipment	N/A	N/A	10,000	24,224	5,000	-19,224
Total, Capital Equipment	**N/A**	**N/A**	**46,200**	**58,924**	**37,800**	**-21,124**

Note:
- *The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.*

High Energy Physics
Minor Construction Activities

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
General Plant Projects (GPP)						
GPPs (greater than $5M and $34M or less)						
High Voltage Transformer Replacement	7,100	–	–	–	7,100	+7,100
Total GPPs (greater than $5M and $34M or less)	N/A	N/A	–	–	7,100	+7,100
Total GPPs $5M or less	N/A	N/A	171	5,000	1,900	-3,100
Total, General Plant Projects (GPP)	**N/A**	**N/A**	**171**	**5,000**	**9,000**	**+4,000**
Accelerator Improvement Projects (AIP)						
Total AIPs $5M or less	N/A	N/A	900	–	–	–
Total, Accelerator Improvement Projects (AIP)	**N/A**	**N/A**	**900**	**–**	**–**	**–**
Total, Minor Construction Activities	**N/A**	**N/A**	**1,071**	**5,000**	**9,000**	**+4,000**

Note:
- *GPP activities $5M and less include design and construction for additions and/or improvements to land, buildings, replacements or addition to roads, and general area improvements. AIP activities $5M and less include minor construction at an existing accelerator facility.*

High Energy Physics
Major Items of Equipment Description(s)

Energy Frontier Experimental Physics MIEs:
High-Luminosity Large Hadron Collider ATLAS Detector Upgrade Project (HL-LHC ATLAS)
The HL-LHC ATLAS Detector Upgrade Project received CD-2/3 approval on January 31, 2023, with a TPC of $200,000,000. Compared to the data-taking period prior to the HL-LHC upgrades, the ATLAS detector will integrate a higher amount of data by at least a factor of ten. To operate the ATLAS detector for an additional decade at such intense physical conditions, the silicon pixel and strip tracker, muon, and calorimeter detectors, and the trigger and data acquisition systems will be upgraded.[n] The FY 2026 Request for TEC funding of $15,300,000 will be in accordance with the project's baselined funding profile and focuses on continuing fabrication activities of U.S.-built deliverables for the project.

High-Luminosity Large Hadron Collider CMS Detector Upgrade Project (HL-LHC CMS)
The HL-LHC CMS Detector Upgrade Project received CD-2/3 approval on April 4, 2023, with a TPC of $200,000,000. Compared to the data-taking period prior to the HL-LHC upgrades, the CMS detector will integrate a higher amount of data by at least a factor of ten. To operate the CMS detector for an additional decade at such intense physical conditions, the silicon pixel tracker and outer tracker, muon, and calorimeter detectors, and the trigger and data acquisition systems will be upgraded,[a] and a novel timing detector will be added.[o] The FY 2026 Request for TEC funding of $7,500,000 is in accordance with the project's baselined funding profile and will focus on continuing fabrication activities of U.S.-built deliverables for the project.

Intensity Frontier Experimental Physics MIE:
Accelerator Controls Operations Research Network (ACORN)
The ACORN project received CD-0 approval on August 28, 2020, with an estimated cost range of $100,000,000 to $142,000,000. This project will replace FNAL's outdated accelerator control system with a modern system compatible with PIP-II and capable of utilizing advances in AI/ML to create a high-performance accelerator for the future. The control system of the Fermilab Accelerator Complex initiates particle beam production; controls beam energy and intensity; steers particle beams to their ultimate destination; measures beam parameters; and monitors beam transport through the complex to ensure safe, reliable, and effective operations. The project is expected to receive CD-1 approval in FY 2026. The FY 2026 Request for TEC funding of $10,000,000 will fund system design and other related engineering activities.

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[n] The National Science Foundation (NSF) approved support for a Major Research Equipment and Facility Construction (MREFC) project in FY 2020 to provide different scope to the HL-LHC ATLAS and HL-LHC CMS detector upgrades. DOE and NSF are coordinating their contributions to avoid duplication.
[o] The ATLAS and CMS detectors share a similar technical configuration, but employ different types of tracker subsystems, calorimeters, muon detector subsystems, and triggers.

High Energy Physics
Minor Construction Description(s)

General Plant Projects $5 Million to less than $30 Million

High Voltage Transformer Replacement
General Plant Project Details

Project Name:	High Voltage Transfer Replacement
Location/Site:	Fermilab Accelerator Complex
Type:	GPP
Total Estimated Cost:	$7,100,000
Construction Design:	$0
Project Description:	The 345kV substations on site are beyond end of life and are a critical part of the infrastructure needed to run the accelerator complex. This project would replace a single 345kV transformer.

High Energy Physics
Construction Projects Summary

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
18-SC-42, Proton Improvement Plan II (PIP-II), FNAL						
Total Estimated Cost (TEC)	891,200	380,000	125,000	125,000	114,000	-11,000
Other Project Cost (OPC)	86,800	73,594	-	-	-	-
Total Project Cost (TPC)	**978,000**	**453,594**	**125,000**	**125,000**	**114,000**	**-11,000**
11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment						
Total Estimated Cost (TEC)	3,169,955	1,155,781	251,000	251,000	251,000	-
Other Project Cost (OPC)	107,045	105,625	-	-	-	-
Total Project Cost (TPC)	**3,277,000**	**1,261,406**	**251,000**	**251,000**	**251,000**	**-**
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	376,000	376,000	365,000	-11,000
Other Project Cost (OPC)	N/A	N/A	-	-	-	-
Total Project Cost (TPC)	N/A	N/A	376,000	376,000	365,000	-11,000

High Energy Physics
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type A					
Fermilab Accelerator Complex	**141,571**	**150,663**	**181,500**	**191,500**	**+10,000**
Number of Users	2,200	2,230	1,020	1,561	+541
Achieved Operating Hours	–	1,940	–	–	–
Planned Operating Hours	2,240	2,240	5,376	4,480	-896
Unscheduled Down Time Hours	–	1,014	–	–	–
Accelerator Test Facility	**–**	**–**	**–**	**8,980**	**+8,980**
Number of Users	–	–	–	88	+88
Planned Operating Hours	–	–	–	2,947	+2,947
Facility for Advanced Accelerator Experimental Tests II (FACET II)	**16,500**	**16,500**	**13,000**	**16,000**	**+3,000**
Number of Users	144	152	152	135	-17
Achieved Operating Hours	–	3,678	–	–	–
Planned Operating Hours	3,120	3,120	2,640	2,880	+240
Unscheduled Down Time Hours	–	580	–	–	–
Total, Facilities	**158,071**	**167,163**	**194,500**	**216,480**	**+21,980**
Number of Users	2,344	2,382	1,172	1,784	+612
Achieved Operating Hours	–	5,618	–	–	–
Planned Operating Hours	5,360	5,360	8,016	10,307	+2,291
Unscheduled Down Time Hours	–	1,594	–	–	–

Note:
- *Percent optimal operations defines what is achieved at this funding level. This includes staffing, up-to-date equipment and software, operations and maintenance, and appropriate investments to maintain world leadership.*
- *In FY 2024 and FY 2025, funding, hours, and users for the Accelerator Test Facility were requested within the Accelerator R&D and Production program. For FY 2024 Enacted, $8,169,000, was planned to support 2,100 hours, and 112 users. In FY 2024 Current, $8,340,000 achieved 2,531 hours, 83 users, with 376 unscheduled downtime hours. In FY 2025 Enacted, $7,765,000 supports 480 planned hours, and 32 users.*
- *In FY 2026, the Fermilab Accelerator Complex will be running the Booster Neutrino Beamline with the possibility of up to 16 weeks of Main Injector running if the substation transformer repairs are completed.*

High Energy Physics
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	753	722	520	-202
Number of Postdoctoral Associates (FTEs)	364	349	250	-99
Number of Graduate Students (FTEs)	514	489	365	-124
Number of Other Scientific Employment (FTEs)	1,508	1,477	1,475	-2
Total Scientific Employment (FTEs)	**3,139**	**3,037**	**2,610**	**-427**

Note:

- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals, and other support staff.*
- *The FY 2026 numbers represent a net decrease, which factors in both the addition of the FTEs from the merger of ARDAP program into HEP and the impact of the FY 2026 President's Budget Request funding level.*

18-SC-42, Proton Improvement Plan II (PIP-II), FNAL
Fermi National Accelerator Laboratory, FNAL
Project is for Design and Construction

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

Summary

The FY 2026 Request for the Proton Improvement Project II (PIP-II) is $114,000,000 of Total Estimated Cost (TEC) funding. The project has an approved Total Project Cost (TPC) of $978,000,000.

The PIP-II project will enhance the Fermilab Accelerator Complex to enable it to deliver higher-power proton beams to the neutrino-generating target for groundbreaking discovery in neutrino physics. The project will design and construct an 800 megaelectronvolt (MeV) superconducting radio frequency (SRF) proton linear accelerator and beam transfer line. The PIP-II project also will modify the existing Fermi National Accelerator Laboratory (FNAL) Booster, Recycler, and Main Injector synchrotrons downstream from the new linear accelerator to accept the increased beam intensity. Some of the new components and the cryo-plant will be provided through international, in-kind contributions.

Significant Changes

This project was initiated in FY 2018. The most recent DOE Order 413.3B Critical Decision (CD) is CD-3 (Approve Construction), approved on April 18, 2022. The planned date for CD-4, Project Completion, is 1Q FY 2033.

Anticipated in-kind technical contributions from international partners total $330,000,000 (equivalent to DOE costing). Legally binding agreements with all partnering countries, (except for the French Atomic Energy Commission [CEA]) have been signed to cover the planned in-kind contributions. The legally binding agreement with France for CEA has been drafted and signatures are expected in 2026. Non-binding Project Planning Documents (PPDs) that provide additional technical details beyond those provided in the legally binding agreements are being signed by the international partners. As of January 2022, PPDs were signed with the Italian, Polish, and UK partner institutions. The PPD with India's Department of Atomic Energy laboratories is expected to be signed in 2025.

The FY 2024 Appropriation supports the completion of the cryogenic plant building, continuation of the linac building civil construction, and continued development and testing of prototypes of the superconducting RF cavities and the cryomodules that hold them.

Significant usage of project cost contingency through 3Q FY 2024 was in response to a number of factors including: civil construction contract cost in excess of the baseline estimate due to market conditions; project-wide costs of the seven-month delay for recovery from the civil construction accident and restarting construction with augmented safety processes and management oversight; increased Fermilab overhead charge rates in FY 2024; procurement costs for mitigating schedule delays for delivery of critical in-kind contributions; electrical system design modifications for the cryoplant and linac to significantly improve personnel safety by reducing the risk of arc flash events (based on recently learned lessons at other DOE laboratories); and costs for management implementation of an overall schedule recovery plan.

The FY 2025 Enacted will support continuation of the linac building civil construction, continuing development and testing of prototypes of the superconducting RF cavities and cryomodules, as well as testing of the initial production cryomodules delivered by international partners as in-kind contributions.

The FY 2026 Request will support completion of linac building civil construction, and the fabrication and testing of production RF cavities, cryomodules, and other technical systems.

A Federal Project Director (FPD) has been assigned to this project and has approved this construction project datasheet. The FPD has a Level III certification.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	11/12/15	7/23/18	7/23/18	12/14/20	4/18/22	4/18/22	1Q FY 2033

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	12/14/20	3/16/21

CD-3A – Approve long-lead procurement of niobium for superconducting radio frequency (SRF) cavities and other long lead components for SRF cryomodules

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	135,895	755,305	891,200	86,800	86,800	978,000
FY 2026	135,895	755,305	891,200	86,800	86,800	978,000

2. Project Scope and Justification

Scope

Specific scope elements of the PIP-II project include construction of (a) the superconducting radio frequency (SRF) linac, (b) cryoplant to support SRF operation, (c) beam transfer line, (d) modifications to the Booster, Recycler and Main Injector synchrotrons, and (e) conventional facilities:

a) 800-MeV Superconducting H^- linac consisting of a 2.1 MeV warm (normal-conducting) front-end injector and five types of SRF cryomodules that are continuous wave capable but operating initially in pulsed mode. The cryomodules include Half Wave Resonator cavities (HWR) at 162.5 MHz, two types of Single Spoke Resonator cavities (SSR1 and SSR2) at 325 MHz, Low-Beta and High-Beta elliptical cavities at 650 MHz (LB-650 and HB-650). The warm front-end injector consists of an H^- ion source, Low Energy Beam Transport (LEBT), Radiofrequency Quadrupole (RFQ) and Medium Energy Beam Transport (MEBT) that prepare the beam for injection into the SRF cryomodules. The scope includes the associated electronic power sources, instrumentation, and controls to support linac operation.

   The PIP-II Injector Test Facility at FNAL is an R&D prototype for the low-energy proton injector at the front-end of the linac, consisting of H^- ion source, LEBT, RFQ, MEBT, HWR, and one SSR1 cryomodule. It was developed to reduce technical risks for the project, with participation and in-kind contributions from the India Department of Atomic Energy (DAE) Labs. The Test Facility has successfully completed its program and has been converted to a cryomodule test stand for testing the cryomodules for the project.

b) Cryoplant with storage and distribution system to support SRF linac operation. The cryoplant is an in-kind contribution by the India DAE Labs that is similar to the cryoplant being designed and constructed for a high-intensity superconducting proton accelerator project in India.[p]
c) Beam Transfer Line from the linac to the Booster Synchrotron, including accommodation of a beam dump and future delivery of beam to the FNAL Muon Campus.
d) Modification of the Booster, Recycler and Main Injector synchrotrons to accommodate a 50 percent increase in beam intensity and construction of a new injection area in the Booster to accommodate 800-megaelectronvolt (MeV) injection.
e) Civil construction of conventional facilities, including housings, service buildings, roads, access points and utilities with the special capabilities required for the linac and beam transport line. A portion of the civil construction scope comprises the ECF subproject. That subproject scope includes the cryogenics plant building and site work. The ECF subproject was initiated in FY 2020 with a total estimated cost of $36,000,000 and was completed January 16th, 2025 for a total costs of $29,168,000. The remaining subproject funds were redistributed to the PIP-II project contingency for remaining project risks.

Significant pieces of the linac and cryogenic scope (a and b above) will be delivered as in-kind international contributions not funded by DOE. These include assembly and/or fabrication of linac SRF components and the cryoplant. The rationale or motivation behind these contributions are institutional and/or industrial technical capability, and interest in SRF technology, as well as interest in LBNF/DUNE. The construction phase scope of in-kind contributions is divided between U.S. DOE national laboratories, India Department of Atomic Energy (DAE) Labs, Italy National Institute for Nuclear Physics (INFN) Labs, French Atomic Energy Commission (CEA) and National Center for Scientific Research (CNRS)-National Institute of Nuclear and Particle Physics (IN2P3) Labs, UK Science & Technology Facilities Council (STFC) Labs, and Wroclaw University of Science and Technology in Poland, tentatively as indicated in the following table of Scope Responsibilities for PIP-II.

Construction-phase Scope Responsibilities for PIP-II Linac RF Components

Components	Quan-tity	Freq. (MHz)	SRF Cavities	Responsibility for Cavity Fabrication	Responsibility for Module Assembly	Responsibility for RF Amplifiers	Cryogenic Cooling Source and Distribution System
RFQ	1	162.5	N/A	N/A	U.S. DOE (LBNL)	U.S. DOE (FNAL)	N/A
HWR Cryomodule	1	162.5	8	U.S. DOE (ANL)	U.S. DOE (ANL)	U.S. DOE (FNAL)	India DAE Labs, Poland WUST, FNAL
SSR1 Cryomodule	2	325	16	U.S. DOE (FNAL), India DAE Labs	U.S. DOE (FNAL)	India DAE Labs	India DAE Labs, Poland WUST, FNAL
SSR2 Cryomodule	7	325	35	France CNRS (IN2P3 Lab)	U.S. DOE (FNAL)	India DAE Labs	India DAE Labs, Poland WUST, FNAL
LB-650 Cryomodule	9	650	36	Italy INFN (LASA)	France CEA (Saclay Lab)	India DAE Labs	India DAE Labs, Poland WUST, FNAL
HB-650 Cryomodule	4	650	24	UK STFC Labs	UK STFC Labs, U.S. DOE (FNAL)	India DAE Labs	India DAE Labs, Poland WUST, FNAL

[p] See Section 8.

Justification

The PIP-II project will enhance the Fermilab Accelerator Complex by providing the capability to deliver higher-power proton beams to the neutrino-generating target that serves the LBNF/DUNE program for groundbreaking discovery in neutrino physics, a major field of fundamental research in high energy particle physics. Increasing the neutrino beam intensity requires increasing the proton beam power on target. PIP-II will raise the proton beam power from 800 kW to 1,200 kW over an energy range of 60-120 GeV and will enable the eventual increase to 2,400 kW with upgrades to the Booster accelerator. The PIP-II project will provide more flexibility for future science-driven upgrades to the entire accelerator complex and increase the system's overall reliability by addressing some of the accelerator complex's elements that are far beyond their design life.

PIP-II was identified as one of the highest priorities in the 10-year strategic plan for U.S. High Energy Physics developed by the High Energy Physics Program Prioritization Panel (P5) and unanimously approved by the High Energy Physics Advisory Panel (HEPAP), advising DOE and NSF, in 2014.[q]

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Linac Beam Energy	H- beam will be accelerated to 600 MeV.	H- beam will be accelerated to 700 MeV. Linac systems required for 800 MeV will be installed and tested.
Linac Beam Intensity	H- beam will be delivered to the beam absorber at the end of the linac.	H- beam with intensity of 1.3 x 10^{12} particles per pulse at 20 Hz pulse-repetition rate will be delivered to the Beam Transfer Line absorber.
Booster, Recycler and Main Injector Synchrotron Upgrades	Upgrades of the Booster, Recycler and Main Injector Synchrotrons, required to support delivery of 1.2 MW onto the LBNF target, will be installed and tested without beam.	Linac beam will be injected into and circulated in the Booster.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	135,895	135,895	135,895	—
Total, Design (TEC)	**135,895**	**135,895**	**135,895**	**—**
Construction (TEC)				

[q] "Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context," HEPAP, 2014.

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Prior Years	234,105	234,105	95,966	1,293
Prior Years - IRA Supp.	10,000	10,000	—	—
FY 2024	125,000	125,000	86,997	6,728
FY 2025	125,000	125,000	125,000	1,979
FY 2026	114,000	114,000	114,000	—
Outyears	147,200	147,200	323,342	—
Total, Construction (TEC)	**755,305**	**755,305**	**745,305**	**10,000**
Total Estimated Cost (TEC)				
Prior Years	370,000	370,000	231,861	1,293
Prior Years - IRA Supp.	10,000	10,000	—	—
FY 2024	125,000	125,000	86,997	6,728
FY 2025	125,000	125,000	125,000	1,979
FY 2026	114,000	114,000	114,000	—
Outyears	147,200	147,200	323,342	—
Total, Total Estimated Cost (TEC)	**891,200**	**891,200**	**881,200**	**10,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	73,594	73,594	73,420
FY 2024	–	–	1
FY 2025	–	–	173
Outyears	13,206	13,206	13,206
Total, Other Project Cost (OPC)	**86,800**	**86,800**	**86,800**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	443,594	443,594	305,281	1,293
Prior Years - IRA Supp.	10,000	10,000	–	–
FY 2024	125,000	125,000	86,998	6,728
FY 2025	125,000	125,000	125,173	1,979

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
FY 2026	114,000	114,000	114,000	–
Outyears	160,406	160,406	336,548	–
Total, TPC	**978,000**	**978,000**	**968,000**	**10,000**

Note:
- *Prior Years reflect actual costs; remaining years are cost estimates.*

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	135,895	135,895	146,314
Design - Contingency	N/A	N/A	30,686
Total, Design (TEC)	135,895	135,895	177,000
Construction	182,000	177,000	124,009
Site Preparation	13,000	13,000	12,783
Equipment	455,305	403,760	378,705
Construction - Contingency	105,000	161,545	198,703
Total, Construction (TEC)	755,305	755,305	714,200
Total, TEC	**891,200**	**891,200**	**891,200**
Contingency, TEC	*105,000*	*161,545*	*229,389*
Other Project Cost (OPC)			
R&D	67,117	67,117	67,117
Conceptual Planning	8,324	8,324	8,324
Conceptual Design	2,855	2,855	2,855
OPC - Contingency	8,504	8,504	8,504
Total, Except D&D (OPC)	86,800	86,800	86,800
Total, OPC	**86,800**	**86,800**	**86,800**
Contingency, OPC	*8,504*	*8,504*	*8,504*
Total, TPC	**978,000**	**978,000**	**978,000**
Total, Contingency (TEC+OPC)	*113,504*	*170,049*	*237,893*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	380,000	125,000	125,000	—	261,200	891,200
	OPC	73,594	—	—	—	13,206	86,800
	TPC	453,594	125,000	125,000	—	274,406	978,000
FY 2026	TEC	380,000	125,000	125,000	114,000	147,200	891,200
	OPC	73,594	—	—	—	13,206	86,800
	TPC	453,594	125,000	125,000	114,000	160,406	978,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2033
Expected Useful Life	20 years
Expected Future Start of D&D of this capital asset	1Q FY 2053

FNAL will operate the PIP-II linac as an integral part of the entire Fermilab Accelerator Complex. Related funding estimates for operations, utilities, maintenance, and repairs are incremental to the balance of the FNAL accelerator complex for which the present cost of operation, utilities, maintenance, and repairs is approximately $100,000,000 annually.

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	4,000	4,000	80,000	80,000
Utilities	3,000	3,000	60,000	60,000
Maintenance and Repair	2,000	2,000	40,000	40,000
Total, Operations and Maintenance	9,000	9,000	180,000	180,000

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at FNAL	127,676
Area of D&D in this project at FNAL	—
Area at FNAL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	—
Area of D&D in this project at other sites	—
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	127,676
Total area eliminated	—

The one-for-one replacement will be met through banked space. A waiver from the one-for-one requirement to eliminate excess space at FNAL to offset PIP-II and other projects was approved by DOE Headquarters on November 12, 2009. The waiver identified and transferred to FNAL 575,104 square feet of excess space to accommodate new facilities including Mu2e, LBNF, DUNE, and other facilities, planned or anticipated for future experiments, from space that was banked at other DOE facilities. The PIP-II Project is following all current DOE procedures for tracking and reporting space utilization.

8. Acquisition Approach

DOE is acquiring the PIP-II project through Fermi Research Alliance (FRA), the Management and Operating (M&O) contractor responsible for FNAL, rather than have the DOE compete a contract for fabrication to a third party. FRA has a strong relationship with the high energy physics community and its leadership, including many FNAL scientists and engineers. This arrangement will facilitate close cooperation and coordination for PIP-II with an experienced team of project leaders managed by FRA, which will have primary responsibility for oversight of all subcontracts required to execute the project. The arrangement is expected to include subcontracts for the purchase of components from third party vendors as well as delivery of in-kind contributions from non-DOE partners.

Project partners will deliver significant pieces of scope as in-kind international contributions, not funded by U.S. DOE. The rationale or motivation behind these contributions are institutional and/or industrial technical capability, long-standing collaborations in the physics programs at FNAL that PIP-II will support, and interest in SRF technology. Scientific institutions from several countries, tabulated below, are engaged in discussion of potential PIP-II scope contributions within the framework of international, government-to-government science and technology agreements.

Scientific Agencies and Institutions Discussing Contributions of Scope for PIP-II

Country	Funding Agency	Institutions
U.S.	Department of Energy	Fermi National Accelerator Laboratory; Lawrence Berkeley National Laboratory; Argonne National Laboratory
India	Department of Atomic Energy	Bhabha Atomic Research Centre, Mumbai; Inter University Accelerator Centre, New Delhi; Raja Ramanna Centre for Advanced Technology, Indore; Variable Energy Cyclotron Centre, Kolkata
Italy	National Institute for Nuclear Physics	Laboratory for Accelerators and Applied Superconductivity, Milan
France	Atomic Energy Commission National Center for Scientific Research	Saclay Nuclear Research Center; National Institute of Nuclear & Particle Physics, Paris
UK	Science & Technology Facilities Council	Daresbury Laboratory
Poland	Wroclaw University of Science and Technology	Wroclaw University of Science and Technology

For example, joint participation by U.S. DOE and the India DAE in the development and construction of high intensity superconducting proton accelerator projects at FNAL and in India is codified in Annex I to the “Implementing Agreement between DOE and Indian Department of Atomic Energy in the Area of Accelerator and Particle Detector Research and Development for Discovery Science for High Intensity Proton Accelerators,” signed in January 2015 by the U.S. Secretary of Energy and the India Chairman of DAE. FNAL and DAE Labs subsequently developed a “Joint R&D Document” outlining the specific roles and goals of the collaborators during the R&D phase of the PIP-II project. This R&D agreement is expected to lead to a similar agreement for the construction phase, describing roles and in-kind contributions. DOE and FNAL have signed similar agreements with Poland, Italy, France (CNRS and IN2P3), and UK for PIP-II. DOE is coordinating with France (CEA) to develop and sign a PIP-II cooperative agreement in FY 2026; the PPD is expected to be signed the year after.

SC is putting mechanisms into place to facilitate joint consultation between the partnering funding agencies, such that coordinated oversight and actions will ensure the success of the overall program. SC is successfully employing similar mechanisms for international partnering for the DOE LBNF/DUNE-US project and for DOE participation in LHC-related projects hosted by CERN.

Domestic engineering and construction subcontractors will perform the civil construction at FNAL. FNAL is utilizing a firm fixed-price contract for architectural-engineering services to complete all remaining designs for conventional facilities with an option for construction support. The general construction subcontract has been placed on a firm-fixed-price basis, and work has begun at the laboratory.

All subcontracts will be competitively bid and awarded based on best value to the government. Fermi Site Office provides contract oversight for FRA's plans and performance. Project performance metrics for FRA are included in the M&O contractor's annual performance evaluation and measurement plan.

11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment, FNAL
Fermi National Accelerator Laboratory, FNAL
Project is for Design and Construction

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

Summary

The Deep Underground Neutrino Experiment (DUNE) is an international flagship experiment to unlock the mysteries of neutrinos. DUNE will be installed in the Long-Baseline Neutrino Facility (LBNF). DUNE scientists will potentially transform our understanding about the nature of matter and the evolution of the universe. Department of Energy's Fermilab is the host laboratory for DUNE, in partnership with funding agencies and more than 1,400 scientists and engineers[r] from all over the globe. The Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE-US) is the line-item project that enables the facilities and technologies needed to operate the experiment.

The FY 2026 Request for Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE-US) project is $251,000,000 of Total Estimated Cost (TEC) funding.

The LBNF/DUNE-US scope is organized into five subprojects for improved planning and management control. The CD-1 Reaffirmation (CD-1RR) was approved on February 16, 2023. It established the subproject strategy and a cost range of $3,160,000,000 to $3,677,000,000. At the time of CD-1RR approval, the Total Project Cost (TPC) Point Estimate was $3,277,000,000. This TPC Point Estimate was for planning purposes and will be refined as the project matures and each subproject is baselined. The aggregate of the new baselined subproject TPCs must be below the upper end of the approved cost range. When the last subproject is baselined, the LBNF/DUNE-US TPC will be the aggregate of all subproject TPCs plus any contingency being held by the parent LBNF/DUNE-US project. As the project matures, the distribution of project engineering and design (PED) and construction are refined for accuracy. In addition, earlier investments with PED, like prototyping, have reduced risks and costs for the outyear execution phases.

The five subprojects are:

- Far Site Conventional Facilities – Excavation (FSCF-EXC)
- Far Site Conventional Facilities – Buildings and Site Infrastructure (FSCF-BSI)
- Far Detectors and Cryogenic Infrastructure (FDC)
- Near Site Conventional Facilities and Beamline (NSCF+B)
- Near Detector (ND)

Significant Changes

Since the previous project datasheet, the FDC subproject obtained CD-3c approval on February 21, 2025.

The FY 2024 funding supported completion of excavation of the far detector caverns, long-lead procurement items for FDC and NSCF+B, and site preparation activities for NSCF+B; initiated procurements of FSCF-BSI infrastructure including HVAC, electric, plumbing, etc.; and funded design, prototyping, and other planning efforts for FDC, NSCF+B, and ND in preparation for baseline and approval of construction.

The FY 2025 funding supports construction of FSCF-BSI; continue long-lead procurements for FDC and NSCF+B subprojects, preparations for installation of far detector components for FDC; preparations for construction subcontracts for the Near Site facilities, and continue design and other planning efforts for NSCF+B and ND.

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[r] https://lbnf-dune.fnal.gov/people/dune-collaboration/

The FY 2026 Request will continue to support the construction of FSCF-BSI, beginning the installation of far detector components at FDC, and the design and prototyping activities for NSCF+B and ND. NSCF+B activities will also to the potential award of construction subcontracts for the facilities.

A Federal Project Director with a certification level 4 is assigned to this project and has approved this CPDS.

Critical Milestone History

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
LBNF/DUNE-Overall	1/8/10	11/5/15	11/5/15	1Q FY 2027	1Q FY 2027	3Q FY 2028	1Q FY 2035
Far Site Conventional Facilities-Excavation	–	–	–	8/19/22	12/31/20	8/19/22	1Q FY 2027
Far Site Conventional Facilities-Buildings and Site Infrastructure	–	–	–	3/25/23	11/20/20	3/25/23	4Q FY 2028
Far Detectors and Cryogenic Infrastructure	–	–	–	2Q FY 2026	8/10/23	2Q FY 2026	1Q FY 2033
Near Site Conventional Facilities and Beamline	–	–	–	3Q FY 2026	1Q FY 2027	3Q FY 2026	2Q FY 2034
Near Detector	–	–	–	1Q FY 2027	1Q FY 2027	3Q FY 2028	1Q FY 2035

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

	Performance Baseline Validation	CD-1R	CD-1RR	CD-3A	CD-3B	CD-3C
LBNF/DUNE-Overall	1Q FY 2027	11/5/15	2/16/23	3/25/23	2/28/24	2/21/25
Far Site Conventional Facilities-Excavation	8/19/22	—	2/16/23	10/27/20	–	–
Far Site Conventional Facilities-Buildings and Site Infrastructure	3/25/23	—	2/16/23	–	–	–
Far Detectors and Cryogenic Infrastructure	2Q FY 2026	—	2/16/23	2/21/23	2/28/24	2/21/25
Near Site Conventional Facilities and Beamline	3Q FY 2026	—	2/16/23	3/25/23	–	–

	Performance Baseline Validation	CD-1R	CD-1RR	CD-3A	CD-3B	CD-3C
Near Detector	1Q FY 2027	—	2/16/23	–	–	–

CD-1R – Refresh of CD-1 approval for the new Conceptual Design.

CD-1RR – Update cost range, reaffirm the alternative selection, and approve a new tailoring strategy for baselining the project in multiple subprojects.
CD-3A – Approve initial construction and long lead procurements in order to mitigate risks and avoid delays. The CD-3a scope for the Far Site Conventional Facilities- Excavation Subproject was for initial construction activities, including systems to prepare for large-scale cavern excavation, excavation of ancillary spaces, and establishing underground ventilation paths. The CD-3A scope for the Far Detectors and Cryogenic Infrastructure subproject is long-lead procurement of certain components of the detector electronics, photon detectors, and the anode plane assemblies. The CD-3A scope for the Near Site Conventional Facilities and Beamline subproject is long-lead procurement of shielding and accelerator kicker components, early fabrication of magnetic horn components, and wetlands work that must be completed before the corresponding USACE permit expires.
CD-3B – Approve long lead procurements in order to mitigate risks and avoid delays. The CD-3B scope for the Far Detectors and Cryogenic Infrastructure subproject is long-lead procurement of certain components of cryogenic systems, detector systems, and infrastructure items to support the detectors.
CD-3C – Approve long lead procurements in order to mitigate risks and avoid delays. The proposed CD-3C scope for the Far Detectors and Cryogenic Infrastructure subproject is long-lead procurement of certain components of cryogenic systems, detector systems, and infrastructure items to support the detectors.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	569,694	2,593,641	3,163,335	113,665	113,665	3,277,000
FY 2026	705,838	2,464,117	3,169,955	107,045	107,045	3,277,000

Notes:
- *The project is Pre-CD-2 for some subprojects. All estimates are preliminary. The approved TPC range for CD-1RR is $3,160,000,000 to $3,677,000,000.*
- *No construction, other than site preparation and approved long-lead procurement, will be performed prior to validation of the Performance Baseline and approval of CD-3 for each subproject.*

2. Project Scope and Justification

Scope

The LBNF/DUNE-US construction project is a federal, state, private, and international partnership developing and implementing the technologies of particle accelerators and detectors to enable world-leading research into the fundamental physics of neutrinos, which are the most ubiquitous and among the most mysterious particles in the universe. Neutrinos are intimately involved in nuclear decay processes and high energy nuclear reactions. LBNF/DUNE will study the transformations of muon neutrinos into electron neutrinos, which occur as muon neutrinos travel to large detectors in South Dakota, 800 miles away from FNAL, where they are produced in a high-energy beam. The experiment will analyze the rare transformations of neutrinos in flight which are expected to help explain the fundamental physics of neutrinos and the puzzling matter-antimatter asymmetry that enables our existence in a matter-dominated universe.

LBNF/DUNE will be composed of a neutrino beam created by new construction as well as modifications to the existing Fermilab Accelerator Complex, massive neutrino detectors and associated cryogenics infrastructure located in large underground caverns to be excavated 800 miles "downstream" from the neutrino source at the Sanford Underground Research Facility (SURF). A much smaller neutrino detector will be installed at FNAL for monitoring the neutrino beam near its source. A primary beam of protons will produce a neutrino beam directed into a target for converting the protons into a secondary beam of particles (pions and muons) that decay into neutrinos, followed by a decay tunnel hundreds of meters long where the decay neutrinos will emerge and travel through the earth to the massive detector. The Neutrinos at the Main Injector (NuMI) beam at FNAL is an existing example of this type of configuration for a neutrino beam facility. The new LBNF beam line will provide a neutrino beam of greater intensity than the NuMI beam and would point to far detector modules at a greater distance than is used with NuMI experiments.

For the LBNF/DUNE-US project, FNAL will be responsible for design, construction, and operation of the major components of facilities which enable the DUNE research program including: the primary proton beam, neutrino production target, focusing structures, decay pipe, absorbers and corresponding beam instrumentation; the conventional facilities and experiment infrastructure on the FNAL site required for the near detector; and the conventional facilities and experiment infrastructure at SURF for the large detectors including the cryostats and cryogenics systems. LBNF/DUNE-US provides detector components for the DUNE research program and supports the installation and integration of detector components provided by international partners.

<u>Justification</u>

As part of implementation of High Energy Physics Advisory Panel (HEPAP)-Particle Physics Project Prioritization Panel (P5) recommendations the LBNF/DUNE-US project comprises a national flagship particle physics initiative and consists of two multinational collaborative efforts:

- LBNF is responsible for the beamline and other experimental and civil infrastructure at FNAL and at SURF in South Dakota. SURF is currently operated by the South Dakota Science and Technology Authority (SDSTA), an agency of the State of South Dakota, and hosts experiments supported by DOE, NSF, and major research universities.

- DUNE is an international scientific collaboration responsible for defining the scientific goals and technical requirements for the beam and detectors, as well as the design, fabrication of detector components and subsequent research program. The U.S. contributes to DUNE along with other international funding agencies. DOE and FNAL host the international DUNE research program.

DOE's High Energy Physics program manages the DOE contributions to both activities as a single, line-item construction project—LBNF/DUNE-US. LBNF, with DOE/FNAL leadership and minority participation by international partners including CERN, will construct a megawatt-class neutrino source and related facilities at FNAL (the "Near Site"), as well as underground caverns and cryogenic facilities in South Dakota (the "Far Site") needed to house the DUNE detectors. DUNE has international leadership and participation of over 1,400 scientists and engineers from over 200 institutions in over 30 countries. DOE will fund approximately one half of the DUNE detectors. This excludes the cryostats that hold the detectors. The cryostats will be provided by CERN. The project continues to refine the development of the design and cost estimates as the U.S. DOE contributions to the multinational effort now are better understood. The cost estimate for DOE contributions will be updated as planning continues in preparation for baselining each subproject.

FNAL and DOE have confirmed contributions to LBNF documented in international agreements from CERN, the UK, and other international partners. For the DUNE detectors, the collaboration put in place a process to complete a technical design of the detectors and divide the work of building the detectors between the collaborating institutions. The review of the detector design with a complete set of funding responsibilities by the Long Baseline Neutrino Committee began in 2019, and development of the set of funding responsibilities continues to advance appropriately. Commitments for detector contributions and associated planning are being finalized in advance of each relevant subproject being baselined. SC will manage all DOE contributions to the facility and the detectors according to DOE Order 413.3B, and FNAL will provide unified project management reporting.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

Key Performance Parameters (KPPs)
The KPPs are preliminary and will be finalized and approved with each subproject.
The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. KPPs for each subproject are finalized with the approval of relevant subproject CD-2.

Performance Measure	Threshold	Objective
Far Site Conventional Facilities – Excavation (FSCF-EXC)	1) Provide power capacity at the 4850L capable of supporting 10 MW demand. 2) Provide a ventilation route capable of exhausting 200,000 Cubic Feet per Minute though the spray chamber. 3) Complete the Ross Shaft brow enlargement and the excavation of all ancillary spaces and access drifts to create a minimum of 71,500 Gross Square Feet (GSF). 4) Complete the excavation of three caverns with the following volumes including all required ground support, shotcrete placement and networked geotechnical monitoring system: a. North cavern (102,000 Cubic Yards (CY)) b. South cavern (102,000 CY) c. Central utility cavern (46,800 CY) 5) Provide a minimum of 170,000 GSF of concrete floor.	All Threshold KPPs
Far Site Conventional Facilities – Buildings and Site Infrastructure (FSCF-BSI)	1) 1200A at 12.47kV power capacity installed in the CUC (sufficient to support four cryostats/detectors). 2) Power distribution at 120/240V, 480V, and 4160V installed at the 4850L to support two detectors, along with all general use power installed at the 4850L and 4910L. 3) Heat rejection cooling tower installed with 2,000-ton (7 MW) rejection capacity (sufficient to support four detectors. 4) 1,600 ton (5.6 MW) chilled water capacity installed to support two detectors and all general cooling loads at the 4850L.	Expanded power distribution and chilled water systems installed to support four cryostats/detectors. This adds 400 tons (1.4 MW) for a total of 2000 tons (7 MW) of chilled water capacity and transformers/power distribution specific to detectors 3 and 4.
Far Detector – Horizontal Drift Detector Components (FDC)	Fabricate, deliver to SURF, and install the deliverables as specified in the detailed FDC subproject Threshold KPPs for the Horizontal Drift detector providing coverage for at least 95 percent of the detector volume.	Fabricate, deliver to SURF, and install the deliverables as specified in the detailed FDC subproject Objective KPPs for the Horizontal

Performance Measure	Threshold	Objective
	This includes: the Anode Plane Assemblies, High Voltage field cage structures and Cathode Planes; TPC electronics; components of the Photon Detector System; and purity monitors for one horizontal-drift Liquid Argon (LAr) TPC. Deliver and install the corresponding detector parts, DAQ servers and services outside the cryostat.	Drift Detector providing full (100 percent) coverage.
Far Detector – Vertical Drift Detector Components (FDC)	Fabricate, deliver to SURF, and install the deliverables as specified in the detailed FDC subproject threshold KPPs for the Vertical Drift Detector providing coverage for at least 95 percent of the detector volume. This includes: the Charge Readout Planes for the bottom drift volume, High Voltage field cage structures; electronics for the readout of the bottom charge readout planes; components of the Photon Detector System; and purity monitors for one vertical-drift LAr TPC. Deliver and install the corresponding detector parts, DAQ servers and services outside the cryostat.	Fabricate, deliver to SURF, and install the deliverables specified in the detailed FDC subproject Objective KPPs for the Vertical Drift Detector providing full (100 percent) coverage.
Far Site Cryogenic Infrastructure (FDC)	1) Design, procure, install and commission the Nitrogen refrigeration system capable of providing 300 kW cooling capacity to the detector modules. 2) Install and commission the surface receiving facilities for the cryogenic liquids. 3) Install and commission the Argon purification, circulation, regeneration and Argon condensers system for two cryostat detectors. 4) Install and test internal cryogenics for Gaseous Argon/LAr distribution. 5) Provide operational readiness clearance for the operation of the cryogenic systems and for filling with LAr the first two cryostats. 6) Set up the contract with options to procure the necessary amount of LAr for each of the Far Detectors (Horizontal and Vertical drift) LAr TPC modules per FDC Requirements. Commit funds for the procurement of 30 percent of the LAr for each of the two far detectors.	In addition to the threshold KPPs: 1) Commit the funds for the procurement of the remaining 70 percent of the LAr for the two Far detectors. 2) Procure the required Liquid Xenon (10 ppm) required to improve light collection efficiency for the Vertical Drift Detector.

Performance Measure	Threshold	Objective
Far Site Far Detector Integration (FDC)* *Note that the KPPs defined for Far Detector Horizontal and Vertical Detector Components and the Cryogenic Infrastructure are pre-requisites to the KPPs for the Far Detector Integration.	1) Prior to the final closure of the cryostat, demonstrate, at room temperature, continuous readout of the TPC electronics and of the photon detector system through the data acquisition system for one week with a live time of at least 50 percent and a minimum of 95 percent fully functional electronic readout channels. 2) Close both cryostats in preparation for purging/filling Purge and fill both cryostats to minimum level (30 percent) and demonstrate LAr recirculation and purification.	1) Prior to the final closure of the two cryostats, demonstrate, at room temperature, continuous readout of the TPC electronics and of the photon detector system through the data acquisition system for one week with a live time of at least 90 percent and a minimum of 99 percent fully functional electronic readout channels. 2) Purge and fill both cryostats to maximum level (100 percent) and demonstrate LAr recirculation and purification. 3) Establish an electrical field in the drift volume of at least 250 V/cm with a live time of at least 80 percent. 4) Demonstrate that all the channels can continue to be read out in each detector module after the cryostats are filled. Observe signals from cosmic ray tracks with the charge and light detection systems. Demonstrate coincidences between TPC and photon detector signals. Perform measurements of the electron lifetime in LAr using the purity monitors for each of the two cryostats.

Performance Measure	Threshold	Objective
Near Site Conventional Facilities and Beamline (NSCF+B)	1) Primary Beamline: • Conventional facilities and beamline constructed to be capable of 2.4MW operation • Beamline under vacuum with all magnets ramped on 120 GeV operations cycle 2) Neutrino Beamline: • Conventional facilities constructed to support 2.4MW proton beam • Target Hall to support a three-horn focusing system optimized for oscillation science • Decay Region minimum 635 ft in length • Shielding and absorber constructed to support 2.4MW operation • Horns, target, radioactive water system, and beam windows fabricated for 1.2 MW proton beam • Operation of target pile, decay pipe, horn, and absorber cooling systems • Two-horn focusing system pulsed in situ to 240kA • Target cooling system flow demonstrated in situ • Target shield pile sealed to outside air 3) ND Complex: • Cavern space with minimum volume of 700,000 cubic ft • Power infrastructure has a capacity of 2,700kVA running load • Cooling infrastructure includes a minimum of 650 tons of chiller capacity	1) Primary Beamline: • 120GeV protons delivered to the absorber with the target removed 2) Neutrino Beamline: • Three horns pulsed in situ to 300kA • Muons observed downstream of absorber 3) Near Detector Complex • All threshold KPPs

Performance Measure	Threshold	Objective
Near Detector	Hardware installed for a neutrino beam monitor capable of detecting a 1 percent shift in the horn current within a period of one week of nominal 1.2MW exposure with performance verified by simulation.	Using parts and components provided by both the project and in-kind by international partners: 1) Deliver a LAr Time Projection Chamber (TPC) detector system capable of measuring neutrino interactions in argon at the near site with similar performance as specified for the Far Detector to directly support long-baseline physics measurements in the DUNE FD 2) Ability to move the LAr TPC near detector system to an off-axis location 3) Ability to monitor the on-axis neutrino beam when the LAr TPC near detector system is off-axis

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	555,684	555,684	452,692	—
FY 2024	76,734	76,734	39,087	—
FY 2025	36,260	36,260	170,278	—
FY 2026	29,910	29,910	32,650	—
Outyears	7,250	7,250	11,131	—
Total, Design (TEC)	**705,838**	**705,838**	**705,838**	**—**
Construction (TEC)				
Prior Years	475,097	475,097	374,056	2,563
Prior Years - IRA Supp.	125,000	125,000	—	—
FY 2024	174,266	174,266	118,458	17,339
FY 2025	214,740	214,740	310,986	93,698
FY 2026	221,090	221,090	221,830	11,400
Outyears	1,253,924	1,253,924	1,313,787	—
Total, Construction (TEC)	**2,464,117**	**2,464,117**	**2,339,117**	**125,000**
Total Estimated Cost (TEC)				

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Prior Years	1,030,781	1,030,781	826,748	2,563
Prior Years - IRA Supp.	125,000	125,000	—	—
FY 2024	251,000	251,000	157,545	17,339
FY 2025	251,000	251,000	481,264	93,698
FY 2026	251,000	251,000	254,480	11,400
Outyears	1,261,174	1,261,174	1,324,918	—
Total, Total Estimated Cost (TEC)	**3,169,955**	**3,169,955**	**3,044,955**	**125,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	105,625	105,625	93,474
FY 2024	–	–	1,005
FY 2025	–	–	4,438
FY 2026	–	–	2,941
Outyears	1,420	1,420	5,187
Total, Other Project Cost (OPC)	**107,045**	**107,045**	**107,045**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	1,136,406	1,136,406	920,222	2,563
Prior Years - IRA Supp.	125,000	125,000	–	–
FY 2024	251,000	251,000	158,550	17,339
FY 2025	251,000	251,000	485,702	93,698
FY 2026	251,000	251,000	257,421	11,400
Outyears	1,262,594	1,262,594	1,330,105	–
Total, TPC	3,277,000	3,277,000	3,152,000	125,000

Note:
- *Prior Years reflect actual costs; remaining years are cost estimates.*

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	691,246	555,102	N/A
Design - Contingency	14,592	14,592	N/A
Total, Design (TEC)	**705,838**	**569,694**	N/A
Construction	1,369,163	1,362,798	N/A
Equipment	594,984	571,488	N/A
Construction - Contingency	499,970	659,355	N/A
Total, Construction (TEC)	**2,464,117**	**2,593,641**	N/A
Total, TEC	**3,169,955**	**3,163,335**	N/A
Contingency, TEC	*514,562*	*673,947*	*N/A*
Other Project Cost (OPC)			
R&D	16,000	16,000	N/A
Conceptual Planning	44,958	44,958	N/A
Conceptual Design	31,977	31,977	N/A
Other OPC Costs	11,220	17,840	N/A
OPC - Contingency	2,890	2,890	N/A
Total, Except D&D (OPC)	**107,045**	**113,665**	N/A
Total, OPC	**107,045**	**113,665**	N/A
Contingency, OPC	*2,890*	*2,890*	*N/A*
Total, TPC	**3,277,000**	**3,277,000**	N/A
Total, Contingency (TEC+OPC)	*517,452*	*676,837*	*N/A*

Notes:

- *Each subproject will have a validated baseline at the time of each subproject's CD-2 approval.*
- *Construction involves excavation of caverns at SURF, 4,850 ft. below the surface, for technical equipment including particle detectors and cryogenic systems and construction of the housing for the neutrino-production beam line and the near detector.*
- *Technical equipment in the DOE scope, estimated here, will be supplemented by in-kind contributions of additional technical equipment, for the accelerator beam and particle detectors, from non-DOE partners as described in Section 2.*
- *"Other OPC Costs" include execution support costs including electrical power for construction* and equipment installation.

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	1,155,781	251,000	280,000	—	1,476,554	3,163,335
	OPC	105,625	4,000	—	—	4,040	113,665
	TPC	1,261,406	255,000	280,000	—	1,480,594	3,277,000
FY 2026	TEC	1,155,781	251,000	251,000	251,000	1,261,174	3,169,955
	OPC	105,625	—	—	—	1,420	107,045
	TPC	1,261,406	251,000	251,000	251,000	1,262,594	3,277,000

Note:
- *All estimates are preliminary.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2035
Expected Useful Life	20 years
Expected Future Start of D&D of this capital asset	1Q FY 2055

Operations and maintenance funding of this experiment will become part of the existing Fermilab Accelerator Complex Users Facility. Annual related funding estimates include the incremental cost of 20 years of full operation, utilities, maintenance, and repairs with the accelerator beam on. The estimates also include operations and maintenance for the remote site of the large detector. New operations and maintenance estimates were developed in 2022 based on a new study and detailed estimating. Current estimate represents an average annual cost in FY 2022 dollars.

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	22,000	22,000	440,000	440,000
Utilities	6,000	6,000	120,000	120,000
Maintenance and Repair	14,000	14,000	280,000	280,000
Total, Operations and Maintenance	42,000	42,000	840,000	840,000

7. D&D Information

The new area being constructed in this project is replacing existing facilities.

	Square Feet
New area being constructed by this project at FNAL	79,100
New area being constructed by this project at Sanford Underground Research Facility (SURF)	185,700
Area of D&D in this project at FNAL	—

Area at FNAL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	79,100
Area of D&D in this project at other sites	—
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	185,700
Total area eliminated	—

The new facility square footage estimates are based on the current design and updating the calculation to be consistent with DOE's real estate guidance. New facilities information will be identified and reported in accordance with DOE guidance.

8. Acquisition Approach

The Acquisition Strategy, approved as part of CD-1-RR, documents the acquisition approach. DOE is acquiring design, construction, fabrication, and operation of LBNF through the Fermi Forward Discovery Group, LLC (FFDG), the M&O contractor responsible for FNAL. FFDG and FNAL, through the LBNF Project based at FNAL, are responsible to DOE to manage and complete construction of LBNF at both the near and remote site locations. FFDG and FNAL are assigned oversight and management responsibility for execution of the international DUNE research program, to include management of the DOE contributions to DUNE. The basis for this choice and strategy is that:

- FNAL is the site of the only existing neutrino beam facility in the U.S. and, in addition to these facilities, provides a source of existing staff and expertise to be utilized for beamline and detector construction.
- FNAL can best ensure that the design, construction, and installation of key LBNF and DUNE components are coordinated effectively and efficiently with other research activities at FNAL.
- FNAL has a DOE-approved procurement system with established processes and acquisition personnel needed to obtain the necessary components and services to build the scientific hardware, equipment and conventional facilities for the accelerator beamline, and detectors for LBNF and DUNE.
- FNAL has extensive experience in managing complex construction, fabrication, and installation projects involving multiple national laboratories, universities, and other partner institutions, building facilities both on-site and at remote off-site locations.
- FNAL has established a close working relationship with SURF and the SDSTA, the organization that manages and operates the remote site for the far detector in Lead, South Dakota.
- FNAL has extensive experience with management and participation in international projects and international collaborations, including most recently the LHC and CMS projects at CERN, as well as in the increasingly international neutrino experiments and program.

The LBNF/DUNE-US construction project is a federal, state, private and international partnership. Leading the LBNF/DUNE-US Project, FNAL will collaborate and work with many institutions, including other DOE national laboratories (e.g. BNL, LBNL and SLAC), dozens of universities, foreign research institutions, and the SDSTA. FNAL will be responsible for overall project management, Near Site conventional facilities, and the beamline. FNAL will work with SDSTA to complete the conventional facilities construction at the SURF needed to house and outfit the DUNE far detector. With the DUNE collaboration, FNAL is also responsible for technical and resource coordination to support the DUNE far and near detector design and construction. DOE will be providing in-kind contributions to the DUNE collaboration for detector systems, as agreed upon with the international DUNE collaboration.

International participation in the design, construction, and operation of LBNF and DUNE will be essential because the field of High Energy Physics is international by nature; necessary talent and expertise are globally distributed, and DOE does not have the procurement or technical resources to perform all of the required construction and fabrication work. Contributions from other nations will be predominantly through the delivery of components built in their own countries by their own researchers. DOE negotiates agreements in cooperation with the Department of State on a bilateral basis with all contributing nations to specify their expected contributions and the working relationships during the construction and operation of the experiment.

DOE provides funding for the LBNF/DUNE-US Project directly to FNAL and collaborating DOE national laboratories via approved financial plans, and under management control of the LBNF/DUNE-US Project Office at FNAL, which will also manage and control DOE funding to the combination of university subcontracts and direct vendor procurements that are anticipated for the design, fabrication, and installation of LBNF and DUNE technical components. All actions will perform in accordance with DOE approved procurement policies and procedures.

FNAL staff, or by subcontract, temporary staff working directly with FNAL personnel, will perform much of the neutrino beamline component design, fabrication, assembly, and installation. The acquisition approach includes both new procurements based on existing designs, and re-purposed equipment from the Fermilab Accelerator Complex. For some highly specialized components, FNAL will have the Rutherford Appleton Laboratory (RAL) in the United Kingdom design and fabricate the components. RAL is a long-standing FNAL collaborator who has proven experience with such components.

FNAL has chosen the Construction Manager/General Contractor (CM/GC) model to execute the delivery of LBNF conventional facilities at the SURF Far Site. The Laboratory contracted with an architect/engineer (A/E) firm for design of LBNF Far Site conventional facilities at SURF and with a CM/GC subcontractor to manage the construction of LBNF Far Site facilities. FNAL selected this strategy to reduce risk, enhance quality and safety performance, provide a more collaborative approach to construction, and offer the opportunity for reduced cost and shortened construction schedules, via options for the CM/GC to self-perform or competitively bid subcontract award packages. FNAL determined that excavation scope should be openly competed as provided by the subcontract. An excavation subcontract was awarded within budget and the underground excavation was completed in FY 2024.

For the LBNF Near Site conventional facilities at FNAL, the laboratory will subcontract with an A/E firm for design and plan to utilize a traditional design-bid-build construction method supported by additional procurements for preconstruction and construction phase services from a professional construction management firm.

For the LBNF Far Site conventional facilities at SURF, DOE entered into a land lease with SDSTA on May 20, 2016, covering the area on which the DOE-funded facilities housing and supporting the LBNF and DUNE detector will be built. The lease and related realty actions provide the framework for DOE and FNAL to construct federally-funded buildings and facilities on non-federal land, and to establish a long-term (multi-decade) arrangement for DOE and FNAL to use SDSTA space to host the DUNE experiment. Modifications and improvements to the SDSTA infrastructure to directly support the LBNF/DUNE-US project are costed to the project. Repairs and improvements for the overall facility are costed to a cooperative agreement between HEP and SDSTA for general operation of the facility. Protections for DOE's real property interests in these infrastructure investments are acquired through the lease with SDSTA, contracts, and other agreements such as easements. DOE plans for FNAL to have responsibility for managing and operating the LBNF and DUNE far detector and facilities for a useful lifetime of 20 years and may contract with SDSTA for certain day-to-day management and maintenance services. At the end of useful life, federal regulations permit transfer of ownership to SDSTA, which is willing to accept ownership as a condition for the lease. FNAL developed an appropriate decommissioning plan prior to lease signing.

Nuclear Physics

Overview
The Nuclear Physics (NP) program's mission is to explore the nature of matter: understanding how protons and neutrons are formed from elementary particles and how they interact to form elements, observed properties, and phenomena. Addressing this mission requires a broad range of experimental capabilities and theoretical approaches. Best-in-class accelerators at scientific user facilities are used to collide particles at nearly the speed of light, producing short-lived forms of nuclear matter for experimental investigation. Theoretical advances use leadership computing facilities to explore the interactions of quarks and gluons as described by quantum chromodynamics. The program's science output benefits society in numerous fields: energy, commerce, nuclear medicine, and national security.

Highlights of the FY 2026 Request
The NP FY 2026 Request for $767.9 million is a decrease of $57.7 million below the FY 2025 Enacted level. The Request balances support for priorities in forefront fundamental nuclear physics research, including initiatives in artificial intelligence (AI) and quantum information science (QIS), facility operations, and facility construction.

Research
NP is the primary steward of the nation's nuclear physics research portfolio, providing approximately 95 percent of the U.S. investment in this area. The program focuses on the highest priorities in nuclear physics to maintain U.S. leadership by:

- Characterizing the quark-gluon plasma using data from the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC)
- Exploring the fundamental structure of nucleons at the sub-femtometer scale at the Continuous Electron Bean Accelerator Facility (CEBAF) and in preparation for the future Electron-Ion Collider (EIC)
- Probing the limits of nuclear existence and the process for heavy element production in stars at the Facility for Rare Isotope Beams (FRIB) and the Argonne Tandem Linac Accelerator System (ATLAS)
- Discovering if the neutrino is its own anti-particle via the search for neutrino-less double beta decay (NLDBD)
- Advancing forefront methods and techniques in nuclear theory, and interpretation of experimental data
- Curating reliable, accurate Nuclear Data for basic nuclear research and nuclear technologies
- Advancing AI and machine learning (ML) analysis tools to increase the efficiency of nuclear data analyses and to improve the quality of accelerator operations and experimental planning
- Applying key nuclear science expertise for innovation in qubit research and quantum theory, for QIS technologies for future sensors, and for the pursuit of ultraprecise nuclear clocks.

Facility Operations
Funding balances support for user access with the need to ensure safe operations of the NP scientific user facilities, enabling world-class science:

- RHIC will operate up to 1,500 hours to complete the super Pioneering High Energy Nuclear Interaction eXperiment (sPHENIX) science program.
- CEBAF operates 3,300 hours for the highest priority 12 GeV experiments.
- ATLAS operates 5,950 hours for compelling research in nuclear structure and astrophysics.
- FRIB operates 4,000 hours discovering and characterizing nuclei at the extremes of the nuclear chart.

Projects
The Request for Construction and Major Items of Equipment (MIEs) includes:

- Continued support for design and early construction for the EIC, the highest priority for facility construction in the Long Range Plan for Nuclear Physics to maintain U.S. leadership in nuclear physics and accelerator technology.
- No new funding is requested for two ongoing MIEs, the LEGEND-1000 ton scale NLDBD experiment and the High Rigidity Spectrometer at FRIB. These projects will make progress using prior year balances.

Nuclear Physics
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Nuclear Physics				
Medium Energy, Research	51,555	51,455	36,464	-14,991
Medium Energy, Operations	141,930	146,242	151,060	+4,818
Total, Medium Energy Physics	**193,485**	**197,697**	**187,524**	**-10,173**
Heavy Ion, Research	47,454	47,454	37,004	-10,450
Heavy Ion, Operations	187,000	187,000	196,805	+9,805
Heavy Ion, Projects	2,850	2,850	2,850	–
Total, Heavy Ion Physics	**237,304**	**237,304**	**236,659**	**-645**
Low Energy, Research	76,667	76,967	51,243	-25,724
Low Energy, Operations	125,617	134,646	140,003	+5,357
Low Energy, Projects	6,000	5,259	–	-5,259
Total, Low Energy Physics	**208,284**	**216,872**	**191,246**	**-25,626**
Theory, Research	69,927	63,727	42,431	-21,296
Total, Nuclear Theory	**69,927**	**63,727**	**42,431**	**-21,296**
Subtotal, Nuclear Physics	**709,000**	**715,600**	**657,860**	**-57,740**
Construction				
20-SC-52 Electron Ion Collider (EIC), BNL	95,000	110,000	110,000	–
Subtotal, Construction	**95,000**	**110,000**	**110,000**	**–**
Total, Nuclear Physics	**804,000**	**825,600**	**767,860**	**-57,740**

SBIR/STTR funding:
- FY 2024 Enacted: SBIR $7,622,000 and STTR $1,147,000
- FY 2025 Enacted: SBIR $7,622,000 and STTR $1,072,000
- FY 2026 Request: SBIR $5,303,000 and STTR $746,000

Nuclear Physics
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Medium Energy Physics The Request will support CEBAF accelerator complex operations for 3,300 hours. The Request will support the highest priority research, including participation in the SC initiatives for QIS, AI/ML, and Microelectronics.	-10,173
Heavy Ion Physics In anticipation of discontinuing RHIC operations for the construction of the EIC, RHIC will operate up to 1,500 hours to complete the sPHENIX science program. Funding will support the highest priority research in heavy ion nuclear physics at universities and national laboratories, including support for the SC initiatives for QIS and AI/ML. The Request will continue other project costs (OPC) for the EIC, which will enable scientists to complete R&D and the development of scientific instrumentation and accelerator components for the EIC. The Request also will support Established Program to Stimulate Competitive Research (EPSCoR) and early career awards in EPSCoR jurisdictions.	-645
Low Energy Physics The Request will support operations of two low energy user facilities: the ATLAS facility, which operates for 5,950 hours, and FRIB, which will provide beam time for 4,000 hours. The Request will sustain operations of the 88-Inch Cyclotron for a limited in-house nuclear science program focused on the search for element 120 and an electronics irradiation capability. Funding will support the highest priority nuclear structure and astrophysics at universities and national laboratories.	-25,626
Nuclear Theory Funding will support the highest priority theory research efforts at laboratories and universities, the U.S. Nuclear Data Program, specialized Lattice quantum chromodynamics (QCD) computing hardware at Thomas Jefferson National Accelerator Facility (TJNAF), and participation in the Scientific Discovery through Advanced Computing (SciDAC) program. The Request will support initiatives in AI/ML and QIS.	-21,296
Construction The Request will provide funding for the EIC to continue Project Engineering and Design activities and execute long-lead procurements and early construction.	$ —
Total, Nuclear Physics	-57,740

Basic and Applied R&D Coordination

The NP mission supports the pursuit of unique opportunities for R&D integration and coordination with other DOE Program Offices, Federal agencies, and non-Federal entities, including coordination across DOE on AI/ML; across SC and with other agencies on QIS; coordination of neutrino research and international partnerships in accelerators with HEP; on forefront computing resources and technical expertise through the SciDAC projects and Lattice QCD research (ASCR and HEP); cross-section and decay data coordination through the U.S. Nuclear Data Program (Federal Bureau of Investigation [FBI], National Nuclear Security Administration [NNSA], Nuclear Energy [NE], FES and BES); capabilities and techniques to test electronics for radiation sensitivity (NASA and DOD); accelerator research and enhancing U.S.-based supply chains for critical accelerator technologies (HEP); and research in developing neutron, gamma, and particle beam sources with applications in cargo screening (NNSA, DHS, and the FBI).

Program Accomplishments

Leading the Way to Discovery of New SuperHeavy Elements

The discovery of a new element is fundamentally significant for chemistry and physics. Today, the element with the highest number of protons (118) is oganesson. An international team led by Lawrence Berkeley National Laboratory (LBNL) has shown a new path to expanding the nuclear chart to higher proton using beams of titanium ions on actinide (radioactive) targets. The measurement showed that the element livermorium (Lv) with 116 protons can be produced with a titanium-50 beam incident on a plutonium-244 target. This demonstration marks the beginning of a new chapter of superheavy element production and research, setting the stage for concerted efforts within the U.S. to produce nuclei having 120 protons.

Discovery of New Isotopes to Better Understand the Cosmos

Accelerating a uranium beam with unprecedented power at the Facility for Rare Isotope Beams (FRIB) enabled the production and identification of three new isotopes, gallium-88, arsenic-93, and selenium-96, within the first 8 hours of operation with this beam. FRIB has also accelerated a platinum beam, leading an international team to produce and identify five more new isotopes: thulium with masses 182 and 183, ytterbium-186 and 187, and lutetium-190. The identification of these new isotopes requires distinguishing them from hundreds of simultaneously produced isotopes, then characterizing the new isotopes in detail – information important for understanding the elemental fingerprint of the universe.

Nuclear Data Efforts for Future Nuclear Reactors

Molten Chloride Salt Fast Reactors (MCFRs), such as the ones being developed commercially, offer a new path for reliable energy production. It was believed that these reactors, which utilize uranium chloride salt fuel, would require the use of isotopically-enriched chlorine to mitigate absorption of the required neutrons, increasing the cost of each reactor by tens of millions of dollars. A coordinated experiment and modeling effort involve industry, national laboratory, and university researchers showed that enrichment of chlorine would not be necessary, saving cost and advancing the timetable associated with the fielding of an MCFR.

Quantum Computing to Understand Entanglement of Quark Jets

Quantum entanglement is at the heart of the difference between quantum and classical physics: it states that two entangled particles cannot be described as independent even when they are separated by a large distance. Physicists from Stony Brook University and Brookhaven National Laboratory (BNL) have used quantum computing methods to investigate the entanglement of narrow cones, or jets, of elemental particles produced by high-energy quarks. They find that the produced jets are indeed entangled, and this entanglement is significantly affected by the confinement of quarks. Their findings are useful for experiments that seek to establish entanglement experimentally in physics experiments and also demonstrate how to leverage existing computing assets for quantum calculations until more practical quantum computers come along.

Nuclear Physics
Medium Energy Physics

Description

The Medium Energy Physics subprogram focuses primarily on experimental tests of the theory of the strong interaction, known as Quantum Chromodynamics (QCD), aiming to address specific questions including: How does QCD generate the spectrum and structure of conventional and exotic hadrons? How do the mass and spin of the nucleon emerge from the quarks and gluons inside and their dynamics? How are the pressure and shear forces distributed inside the nucleon? How does the quark–gluon structure of the nucleon change when bound in a nucleus? How are hadrons formed from quarks and gluons produced in high-energy collisions?

The research activity supports high priority research at universities and national laboratories and carries out high priority experiments at CEBAF at the Thomas Jefferson National Accelerator Facility (JLab) and elsewhere. Scientists use various experimental approaches to determine the distribution of up, down, and strange quarks, their antiquarks, and gluons within protons and neutrons, as well as clarifying the role of gluons in confining the quarks and antiquarks within hadrons. Experiments that scatter electrons off protons, neutrons, and nuclei are used to elucidate the effects of the quark and gluon spins within nucleons, and the effect of the nuclear medium on the quarks and gluons. The subprogram also supports experimental searches for higher-mass “excited states” and exotic hadrons predicted by QCD, as well as studies of their various production mechanisms and decay properties.

CEBAF operations provide high quality beams of polarized electrons that allow scientists to extract information on the quark and gluon structure of protons and neutrons from measurements of how the electrons scatter when they collide with nuclei. CEBAF also uses highly-polarized electrons to make very challenging precision measurements that may reveal processes that violate a fundamental symmetry of nature, called parity, in order to search for physics beyond what is currently described by the Standard Model of particle physics. These capabilities are unique in the world. Universities and national laboratories conduct complementary, focused experiments that require different capabilities.

A high scientific priority for this community is addressing an outstanding grand challenge question of modern physics: how the fundamental properties of the proton such as its mass and spin are dynamically generated by the extraordinarily strong color fields resulting from dense systems of gluons in nucleons and nuclei. In the future, the Electron-Ion Collider (EIC) will address this science. Scientists and accelerator physicists from the Medium Energy subprogram are strongly engaged and play significant leadership roles in the development of the scientific agenda and implementation of the EIC.

Transformative accelerator research and development (R&D) efforts advance approaches in superconducting radiofrequency (SRF) technology and accelerator science aimed at improving the operations of existing facilities and developing next-generation facilities for nuclear physics. Nuclear physicists participate in activities related to quantum information science (QIS) and quantum computing (QC), in coordination with other SC research programs. NP-specific efforts include R&D on quantum sensors to enable precision measurements, development of quantum sensors based on atomic-nuclear interactions, and development of quantum computing algorithms applied to quantum mechanical systems and NP topical problems. Scientists develop cutting-edge techniques based on artificial intelligence and machine learning (AI/ML) of relevance to nuclear science research and accelerator facility operations. Scientists participate in the SC initiative on microelectronics (R&D), emphasizing unique microelectronics that survive in cryogenic and high radiation environments.

The Request also continues support for honoraria for awards, including the Enrico Fermi Awards and the Ernest Orlando Lawrence Awards.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Medium Energy Physics	**$197,697**	**$187,524**	**-$10,173**
Research	$51,455	$36,464	-$14,991
Funding continues to support core research. Scientists, resident at TJNAF, RHIC, universities, and other national laboratories, participate in high priority experiments to acquire data; develop, implement, and maintain scientific instrumentation; analyze data and publish experimental results; and train students in nuclear science and accelerator science. Funding supports continued analysis of RHIC polarized proton beam data to learn more about the origin of the proton's spin. Funding supports the development of detector design to be used at the EIC and further develop the scientific program. Funding continues to support researchers to pursue transformative accelerator science to improve operations of current and future NP facilities including applications of AI/ML. Research on Microelectronics continues to study detector materials, devices, advances in front-end electronics, and integrated sensor/processor architectures. Scientists conduct research on quantum sensors to enable precision NP measurements, development of quantum sensors based on atomic-nuclear interactions.		The Request will continue to support high priority experiments; develop, implement, and maintain scientific instrumentation; analyze data and publish experimental results; and train students in nuclear and accelerator science. The Request will support continued analysis of RHIC polarized proton beam data to investigate the origin of proton spin and will support the development of the EIC scientific program. The Request will continue transformative accelerator science to improve operations of current and future NP facilities including applications of AI/ML. Research on microelectronics and quantum sensors to enable precision measurements will continue.	The Request will focus investment on the highest priority research that utilizes CEBAF, RHIC data, and other facilities. Funding will increase for AI/ML approaches for NP research.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Operations	$146,242	$151,060	+$4,818
Funding for operations of the CEBAF facility supports the continuation of the high priority experiments in the 12 GeV science program. Funding provides 3,294 operational hours for research, beam development, and beam studies. Funding supports CEBAF operations, including mission readiness of the accelerator, all power and consumables of the site, cryogenics plant, activities to reduce helium consumption, activities to improve accelerator performance and reliability, high priority facility and instrumentation capital equipment, high priority accelerator improvement and GPP projects, and the key computing capabilities for data taking and analysis. Funding supports maintenance of critical core competencies and accelerator scientists, engineers, and technicians, and operations staff. Funding supports targeted facility capital equipment and accelerator improvements to modernize SRF equipment. Lab GPP investments advance the most urgent components of the Campus Strategy for infrastructure. Funding supports the participation of accelerator scientists in accelerator R&D activities, including those for the EIC.		The Request for operations of the CEBAF facility will support high priority experiments in 12 GeV science, providing 3,300 operational hours for research, beam development, and beam studies. The Request will support mission readiness of the CEBAF accelerator including all power and consumables, activities to reduce helium consumption and improve accelerator performance and reliability, high priority capital equipment, accelerator improvement, and key computing capabilities. The Request will support required staff for operations and participation in accelerator and SRF R&D. Lab GPP will advance the most urgent components of the campus strategy for infrastructure.	The Request will increase operations hours while continuing support of the highest priority experiments and activities to improve CEBAF reliability and performance.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

The Heavy Ion Physics subprogram focuses on studies of nuclear matter at extremely high densities and temperatures, directed primarily at answering overarching questions in nuclear physics, including: How do the fundamental interactions between quarks and gluons lead to the perfect fluid behavior of the quark-gluon plasma (QGP)? What are the limits on the fluid behavior of matter? What are the properties of quantum chromodynamic (QCD) matter? What is the correct phase diagram of nuclear matter?

Scientists have used the Relativistic Heavy Ion Collider (RHIC) to pioneer the study of condensed quark-gluon matter at the extreme temperatures, characteristic of the infant universe. With careful measurements, nuclear physicists have been accumulating data using the Solenoid Tracker at RHIC (STAR) detector and the super Pioneering High Energy Nuclear Interaction eXperiment (sPHENIX) detector to gain insights into the processes early in the creation of the universe, and how protons, neutrons, and other parts of normal matter developed from that plasma. Important avenues of investigation are directed at learning more about the physical characteristics of the QGP and discovering whether a critical point exists demonstrating a first order phase transition between normal nuclear matter and the QGP. Scientists working in Heavy Ion physics leverage discovery opportunities in sensing, simulation, and computing with QIS and QC. AI/ML applications are also pursued to optimize operation of the complex accelerators and detectors at RHIC with applications to other user facilities in the NP program.

Collaboration at the Large Hadron Collider (LHC) at CERN provides U.S. researchers the opportunity to investigate states of matter under substantially different initial conditions than those provided by RHIC. Data collected by A Large Ion Collider Experiment (ALICE), the Compact Muon Solenoid (CMS), and ATLAS detectors confirm that the QGP discovered at RHIC is also seen at the higher energy, and comparisons of results from LHC to those from RHIC have led to important new insights.

Understanding how the fundamental properties of the proton such as its mass and spin are dynamically generated is a U.S. nuclear science community high scientific priority. The answer to this question is key to addressing an outstanding grand challenge problem of modern physics: how QCD—the theory of the strong force that explains all strongly interacting matter in terms of quarks interacting via the exchange of gluons—acts in detail to generate the "macroscopic" properties of protons and neutrons. The NSAC Long Range Plan identified the EIC as the highest priority for facility construction and recommended its expeditious completion. BNL is partnering with JLab to design and establish the EIC at BNL. Scientists and accelerator physicists from the Heavy Ion and the Medium Energy sub-programs are partnering to advance the EIC, both playing significant leadership roles in the development of the scientific agenda and implementation of the EIC.

Over the course of the construction and implementation of the EIC, RHIC operations funding will decrease as scientific staff, engineers and technicians move from RHIC operations to the EIC project. These individuals represent the scientific and technical workforce that are essential to the operations of RHIC, and eventually the EIC. RHIC accelerator scientists have critical core competencies in collider operations that cannot easily be replaced; their support is embedded in the EIC total project cost, and they represent the core facility operations force of RHIC and the EIC. Throughout the EIC project, the temporary reprioritization of funds from the collider facility operations budget to the construction budget will effectively offset funds needed to implement the EIC, enabling a cost-effective path forward to the implementation of this world-leading facility.

Completion of the RHIC science program is expected in FY 2026. RHIC injector complex operations will continue to maintain readiness for EIC operations and to allow for symbiotic, parallel, cost-effective operations of the Brookhaven Linac Isotope Producer Facility (BLIP) supported by the DOE Isotope Program to produce research and commercial isotopes critically needed by the Nation, and of the NASA Space Radiation Laboratory Program for the study of space radiation effects applicable to human space flight as well as electronics.

EPSCoR will focus on implementation awards for development of research capacity and infrastructure for NP topics in EPSCoR jurisdictions.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Heavy Ion Physics	**$237,304**	**$236,659**	**-$645**
Research	$47,454	$37,004	-$10,450
Funding supports scientists resident at RHIC, universities, and other national laboratories to develop, fabricate, implement, and maintain scientific instrumentation; participate in experimental runs to acquire data; analyze data and publish experimental results; develop scientific plans and instrumentation for the EIC; and train students in nuclear science. U.S. scientists participate in the high priority heavy ion efforts and instrumentation upgrades at the international ALICE, CMS, and ATLAS LHC experiments. Funding supports accelerator R&D relevant to NP programmatic needs. Research activities support the recompetition/renewal of the NQISRCs, and AI/ML aimed at applications of artificial neural networks to nuclear physics research and the optimization of accelerator performance. Funding supports EPSCoR implementation grants and early career awards.		The Request will continue to support heavy ion research at universities and national laboratories for high priority experiments; to develop, implement, and maintain scientific instrumentation; to analyze data and publish experimental results; to contribute to the future EIC science program; and to train students in nuclear and accelerator science. Support will continue for participation and instrumentation upgrades for international experiments (ALICE, CMS, and ATLAS LHC). The Request will continue transformative accelerator science for current and future NP facilities, including applications of AI/ML. Research will continue for QIS and EPSCoR grants and early career awards.	Funding will focus on the highest priority heavy ion and QIS research. Funding will increase for AI/ML approaches for NP research.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Operations	$187,000	$196,805	+$9,805
Funding supports RHIC operations at 3,264 hours. Funding supports the RHIC accelerator complex, including mission readiness and development of the experimental halls and instrumentation, mission readiness of the suite of accelerators, all power and consumables of the site, cryogenics plant, activities to reduce helium consumption, high priority facility and instrumentation capital equipment, high priority accelerator improvement projects, and computing capabilities for data taking and analysis. Support provides critical core competencies and accelerator scientists, engineers, and technicians, for collider operations. Accelerator scientists conduct research aimed at improving the operations of the RHIC accelerator complex.		The Request will support RHIC operations at 1,500 hours to complete the science program with sPHENIX and support the RHIC injector complex including high priority facility and instrumentation capital equipment, high priority accelerator improvement projects, and computing capabilities for analysis.	Funding for operations will aim to complete the RHIC science program and maintain the RHIC injector complex that will eventually support the EIC. Funding will continue to support the reprioritization effort to support EIC.
Projects	$2,850	$2,850	$ —
EIC OPC funds supports continued design efforts as well as research and development to increase technical readiness as the project prepares for CD-2.		EIC OPC funds will support the research and development that mitigates technical risk for design of accelerator and detector subsystems.	No change.

Note:

- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

The Nuclear Theory subprogram includes activities in Nuclear Theory, Nuclear Data, Nuclear Theory Computing, and the AI and QIS initiatives.

The Nuclear Theory activity provides theoretical support to interpret the wide range of data obtained from the experimental nuclear science subprograms and to advance new ideas and hypotheses for future experimental investigations. A major theme of theoretical nuclear physics research is understanding the mechanisms and effects of quark confinement and deconfinement. A quantitative description of these phenomena through quantum chromodynamics (QCD) is one of this subprogram's greatest intellectual challenges. New theoretical and computational tools are also under development to describe nuclear many-body phenomena; these approaches will likely impact applications in condensed matter physics and other areas of the physical sciences. Theoretical nuclear astrophysics research includes efforts to understand the origins of the elements in the cosmos and what the nature of the neutrino may reveal about the evolution of the early universe. This subprogram supports collaborations within the university and national laboratory communities to address highest priority topics in nuclear theory that merit concentrated, team-based theoretical efforts.

The Nuclear Data activity maintains the U.S. Nuclear Data Program (USNDP), targets high-priority nuclear data needs of relevance to the NP mission, and leads an interagency working group including the NNSA, NE, FES, DOE IP, and other federal agencies to coordinate targeted experimental efforts. The USNDP provides current, accurate, and authoritative data to basic and applied areas of nuclear science and engineering, maintaining public access to extensive nuclear physics databases of national and international importance and supporting approximately five million nuclear data retrievals annually. Research addresses gaps in nuclear data through targeted experiments and development/use of theoretical models. The National Nuclear Data Center (NNDC) at BNL manages the USNDP. The NNDC is designated as an SC Public Reusable Research (PuRe) Data Resource, a designation commensurate with high standards of data management, resource operation, and scientific impact.

The Nuclear Theory Computing activity leverages lattice QCD calculations that are critical for understanding and interpreting many of the experimental results from RHIC, LHC, and CEBAF. NP supports lattice QCD computing with investment in dedicated computational resources at TJNAF. The activity supports SciDAC, a collaborative program with ASCR that partners NP scientists and computer experts to address major scientific challenges that require capabilities of supercomputer facilities.

Nuclear theorists are active in quantum information science (QIS) and quantum computing, through R&D on quantum sensors to enable precision measurements, development of quantum sensors based on atomic-nuclear interactions, R&D on nuclear physics techniques to enhance qubit coherence times, and development of quantum computing algorithms applied to quantum mechanical systems and NP topical problems. In partnership with other SC programs, NP continues its role in jointly stewarding NQISRCs that focus on building the fundamental tools necessary for the U.S. leadership in QIS.

The Request provides growing support for the development of cutting-edge techniques to accelerate nuclear science by incorporating next generation AI/ML at the nexus of experiment, simulation, and theory that cross multiple energy scales.

Nuclear Physics
Nuclear Theory

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Nuclear Theory	**$63,727**	**$42,431**	**-$21,296**
Research	$63,727	$42,431	-$21,296
Funding supports high priority QIS efforts. LQCD computing investments continue at TJNAF. Funding supports high priority theoretical research at universities and national laboratories for the interpretation of experimental results obtained at NP facilities, and the exploration of new ideas and hypotheses that identify potential areas for future experimental investigations. Theorists focus on applying QCD to a wide range of problems from nucleon structure and hadron spectroscopy, through the force between nucleons, to the structure of light nuclei. Advanced dynamic calculations to describe relativistic nuclear collisions and nuclear structure and reactions continues to focus on activities related to the research program at the upgraded 12 GeV CEBAF facility, the research program at FRIB, and ongoing and planned RHIC experiments. Funding supports the fourth year of SciDAC-5 grants, as well as the third year of theory topical collaborations. Funding will target investments in an initiative to develop cutting-edge AI/ML techniques of relevance to nuclear science research, and accelerator facility operations. Within available resources, NP is prioritizing transitioning ECP researchers, software, and technologies into core research efforts and other DOE priority research areas as ECP concludes.		The Request will support high priority theoretical research at universities and national laboratories. Theorists will focus on applying QCD to nucleon structure and hadron spectroscopy, the force between nucleons, and the structure of light nuclei. Advanced dynamic calculations to describe relativistic nuclear collisions and nuclear structure and reactions will continue. The Request will support the fifth year of SciDAC grants, the fourth year of theory topical collaborations, and high priority QIS efforts. Target investments will develop cutting-edge AI/ML techniques of relevance to nuclear science research.	Investments will focus on the highest priority research in nuclear theory, with expanded support for AI/ML.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Funding continues the expanded USNDP efforts to collect, evaluate, and disseminate nuclear physics data for basic nuclear research and for applied nuclear technologies and their development.	The Request will continue USNDP efforts to collect, evaluate, and disseminate nuclear physics data for basic nuclear research and for applied nuclear technologies.	USNDP will target areas most impactful to nuclear science and interagency partners.

Note:
- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Nuclear Physics
Low Energy Physics

Description
The Low Energy Physics subprogram includes activities in Nuclear Structure and Nuclear Astrophysics and Fundamental Symmetries.

Questions associated with nuclear structure include: What is the nature of the nuclear force that binds protons and neutrons into stable nuclei and rare isotopes? What are the limits of nuclear existence? What is the nature of neutron stars? How does matter behave at the most extreme densities in the universe? Relevant nuclear astrophysics questions are: What makes the sun shine? What are the origins of the elements in the cosmos? What are the nuclear reactions that drive stars and stellar explosions? NP research activities address these questions primarily using beams of stable and rare isotopes to develop a comprehensive description of nuclei and reveal new nuclear phenomena.

The ATLAS facility at the Argonne National Laboratory (ANL) is an SC scientific user facility and is the world's premiere facility for stable beams, providing high-quality beams of all stable elements up to uranium and selected short-lived nuclei beams using the Neutron-generator Upgrade to the Californium Rare Ion Breeder Upgrade (nuCARIBU) ion source. Increasing ATLAS capabilities via a Multi-User Upgrade are underway to address user demand. FRIB at Michigan State University (MSU), an SC scientific user facility since FY 2020, provides beams of rare isotopes to test the limits of nuclear existence and advance understanding of the atomic nucleus and the evolution of the cosmos. FRIB's scientific reach will be enhanced with the implementation of the Gamma-Ray Tracking Array (GRETA) and the High Rigidity Spectrometer (HRS). This subprogram supports operations of the LBNL 88-Inch Cyclotron for an in-house program studying the properties of newly discovered elements as well as conducting searches for new super-heavy elements. DOD and NASA exploit capabilities at the 88-Inch Cyclotron to develop radiation-resistant electronics for their missions. In addition, smaller university-based accelerator facilities are supported through this program to address specific research areas.

Questions related to fundamental symmetries of nature addressed in low energy nuclear physics experiments include: What is the origin of the matter–antimatter imbalance in the universe? Are neutrinos their own antiparticles, and how do they acquire mass? Are there more forces than the four we know about? Are there undiscovered, light, weakly-interacting particles? NP research addresses these questions through precision studies using neutron and electron beams and decays of nuclei, including beta decay, double-beta decay, and the search for neutrino-less double beta decay (NLDBD). NP is the steward of neutrino mass measurements and the search for NLDBD. NP has funded neutrino experiments, playing critical roles in partnerships with NSF and in successful international experiments that include U.S. scientific leadership. This subprogram supports experiments probing electric dipole moments of the neutron and atoms that would provide evidence for the violation of time reversal invariance and shed light on the matter/anti-matter imbalance in the universe.

The NSAC LRP recommended as the highest priority for new experiment construction that the U.S. lead an international consortium that will undertake a NLDBD campaign. The observation of NLDBD would have profound consequences for understanding the physical universe. NP, including this subprogram, has invested in R&D on candidate technologies for next–generation ton-scale NLDBD experiments. In the near-term, within the NLDBD program, NP will focus on implementing the Large Enriched Germanium Experiment for Neutrinoless Double Beta Decay one tonne (LEGEND-1000) project, in collaboration with international partners. LEGEND-1000 will deploy germanium-76 isotope incorporated into an array of solid-state detectors to reach a NLDBD lifetime limit of 10^{28} years within a planned ten-year measurement window.

Specific efforts include R&D on quantum sensors to enable precision measurements, development of quantum sensors based on atomic-nuclear interactions, and development of quantum computing algorithms applied to quantum mechanical systems and NP topical problems. Scientists develop cutting-edge techniques based on artificial intelligence and machine learning (AI/ML) of relevance to nuclear science research and accelerator facility operations.

Nuclear Physics
Low Energy Physics

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Low Energy Physics	**$216,872**	**$191,246**	**-$25,626**
Research	$76,967	$51,243	-$25,724
Funding supports high priority university and laboratory nuclear structure and nuclear astrophysics efforts at ATLAS and FRIB. Scientists participate in the characterization of recently discovered elements and search for new ones. Research will continue at the university-based Centers of Excellence at TUNL, CENPA, and TAMU. Scientists utilize AI/ML that can promote automated platforms to improve machine performance and reliability and advance detector design and data processing. High priority research in NLDBD continues. Funding continues support for U.S. participation in the operations of the international KATRIN experiment.		The Request will support high priority university and laboratory nuclear structure and nuclear astrophysics efforts. Scientists will participate in the characterization of recently discovered elements and search for new ones. Scientists utilize AI/ML that can promote automated platforms to improve machine performance and reliability and advance detector design and data processing. High priority research in NLDBD and fundamental symmetries will continue with a strategic mix of efforts.	Investment will focus on the highest priority research, including experiments at ATLAS and FRIB, and precision studies with neutron and electron beams. Funding will expand AI/ML research.
Operations	$134,646	$140,003	+$5,357
ATLAS will operate for 5,952 hours. Funding supports the operations, staff, maintenance, and high priority accelerator improvement projects and capital equipment for the facility and scientific instrumentation, including the development of a multi-user capability. Funding also supports operations at FRIB for 3,713 hours (89 percent of optimal funding) to execute the FRIB scientific program. Funding sustains operations of the 88-Inch Cyclotron for high priority experiments studying newly discovered elements.		ATLAS will operate for 5,950 hours and FRIB will operate for 4,000 hours. The Request will fund operations, staff, maintenance, as well as the implementation of new detector and accelerator capabilities at both facilities. The Request will sustain operations of the 88-Inch Cyclotron with focus on newly-discovered heavy elements.	The Request will increase operating hours while continuing support for the highest priority experiments at FRIB, ATLAS, and the 88-Inch Cyclotron.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Projects	$5,259	$ —	-$5,259
Funding continues support for the NLDBD MIE and the HRS research project.		The Request does not provide additional funding for the NLDBD MIE and the HRS research project.	Progress will continue with prior year funds on HRS and NLDBD focused on LEGEND-1000 in the near term.

Note:

- *Funding for the subprogram above includes 3.65 percent of research and development (R&D) funding for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, excluding facility operations.*

Description

This subprogram supports line-item construction for NP, including engineering, design, and construction. OPCs are funded in the relevant subprograms.

20-SC-52, Electron Ion Collider EIC, BNL

The FY 2026 Request, $110 million, will continue the construction effort for the EIC, which will be located at BNL. The estimated TPC range for the EIC project at CD-1, Approve Alternative Selection and Cost Range, is $1.7 billion to $2.8 billion. BNL has teamed with TJNAF to lead the development and implementation of the EIC. The EIC scope includes an electron injector, rapid cycling synchrotron, an electron storage ring, modifications to one of the two RHIC ion rings, one interaction region with a detector, support buildings, and other infrastructure. The project has attracted international collaboration and contributions. On February 7, 2024, the State of New York agreed to contribute $100 million for the construction of buildings to house equipment and technical infrastructure supporting the EIC accelerator and detector.

The EIC project will increasingly rely on RHIC scientists, engineers, and technicians as RHIC activities ramp down. This workforce has critical core competencies in collider operations essential to RHIC now and eventually to EIC operations. They cannot easily be replaced. The temporary reprioritization of funds from the collider facility operations budget to the construction budget will enable a cost-effective path forward to the implementation of this world-leading facility.

The EIC will maintain U.S. leadership in nuclear physics and accelerator technology and will address an outstanding question on how the fundamental properties of the proton, such as its mass and spin, are dynamically generated by the extraordinarily strong color fields resulting from dense systems of gluons in nucleons and nuclei, which has been a high priority for the U.S. nuclear science community for decades. The answer to this question is key to addressing a grand challenge problem of modern physics: how quantum chromodynamics—the theory of the strong force, which explains all strongly interacting matter in terms of quarks interacting via the exchange of gluons—acts to generate the "macroscopic" properties of protons and neutrons. The NSAC LRP recommends "…the expeditious completion of the EIC as the highest priority for facility construction."

A National Academies study, charged to independently assess the impact, uniqueness, and merit of the science that would be enabled by U.S. construction of an electron-ion collider, gave a strong endorsement to a U.S.-based EIC, and recognized its critical role in maintaining U.S. leadership in nuclear science and accelerator R&D. Scientists and accelerator physicists from both the Medium Energy and Heavy Ion subprograms are actively engaged in the development of the scientific agenda, design of the facility, and development of scientific instrumentation for the proposed EIC scope. Critical Decision-0 (CD-0), Approve Mission Need, was received on December 19, 2019, followed by CD-1, Approve Alternative Selection and Cost Range, on June 29, 2021, and CD-3A, Approve Long Lead Procurements, on March 28, 2024.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$110,000**	**$110,000**	**$ —**
20-SC-52 Electron Ion Collider (EIC), BNL	$110,000	$110,000	$ —
TEC Funding supports engineering and design to reduce technical risk after completion of the conceptual design and limited long lead procurements. RHIC operations includes a “reprioritization” of expert workforce from the RHIC facilities operations budget to support the EIC OPC and TEC activities.		The Request will continue to advance engineering and design and initiate construction. RHIC operations includes a “reprioritization” of expert workforce from the RHIC facilities operations budget to support the EIC OPC and TEC request.	Funding will continue to support engineering and design efforts and early construction activities with the completion of the RHIC science program.

Nuclear Physics
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	18,048	14,861	12,048	-2,813
Minor Construction Activities						
General Plant Projects	N/A	N/A	1,642	1,642	1,642	–
Accelerator Improvement Projects	N/A	N/A	5,211	2,675	5,211	+2,536
Total, Capital Operating Expenses	**N/A**	**N/A**	**24,901**	**19,178**	**18,901**	**-277**

Capital Equipment

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Equipment						
Low Energy Physics						
High Rigidity Spectrometer	122,241	42,080	3,000	3,259	–	-3,259
Ton-Scale Neutrinoless Double Beta Decay (NLDBD) MIE	413,660	10,800	3,000	2,000	–	-2,000
Total, Non-MIE Capital Equipment	N/A	N/A	12,048	9,602	12,048	+2,446
Total, Capital Equipment	**N/A**	**N/A**	**18,048**	**14,861**	**12,048**	**-2,813**

Notes:

- *The Capital Equipment table includes MIEs with a Total Estimated Cost (TEC) > $10M.*
- *The High Rigidity Spectrometer (HRS) is not an MIE, but a research project supported on a cooperative agreement with Michigan State University.*
- *The current estimated TEC for the NLDBD MIE is $410,660,000. With the focus of this MIE on the LEGEND-1000 project and a planned CD-1 review in 1Q FY 2026, revisions to the TEC are likely. In FY 2024 and FY 2025, $3,000,000 and $2,000,000, respectively, were redirected to OPC funding not reflected in this table.*

Minor Construction Activities

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
General Plant Projects (GPP)						
Total GPPs $5M or less	N/A	N/A	1,642	1,642	1,642	–
Total, General Plant Projects (GPP)	**N/A**	**N/A**	**1,642**	**1,642**	**1,642**	**–**
Accelerator Improvement Projects (AIP)						
Total AIPs $5M or less	N/A	N/A	5,211	2,675	5,211	+2,536
Total, Accelerator Improvement Projects (AIP)	**N/A**	**N/A**	**5,211**	**2,675**	**5,211**	**+2,536**
Total, Minor Construction Activities	**N/A**	**N/A**	**6,853**	**4,317**	**6,853**	**+2,536**

Notes:

- *GPP activities $5M and less include design and construction for additions and/or improvements to land, buildings, replacements or addition to roads, and general area improvements. AIP activities $5M and less include minor construction at an existing accelerator facility.*

Nuclear Physics
Major Items of Equipment Description(s)

Low Energy Physics: Nuclear Structure and Nuclear Astrophysics Research Project:

High Rigidity Spectrometer (HRS) Research Project

The HRS will enhance the scientific impact of the FRIB fast beam science program by providing luminosity gain factors up to one hundred for neutron-rich isotopes, with the largest gains for the most neutron-rich species. The HRS will allow experiments with beams of rare isotopes at the maximum production rates for fragmentation or in-flight fission. The NSAC LRP recognized that the HRS will push the study of unstable nuclei toward the driplines, increasing the scientific reach of FRIB. The HRS is funded through a cooperative agreement with MSU and is not a capital asset (MIE). HRS received CD-0 approval in November 2018, and CD-1 in September 2020, with a TPC range of $85,000,000 to $111,400,000. The performance baseline for the High Transmission Beam Line (HTBL) subproject of HRS was approved in March 2025 with a TPC of $49,700,000 and CD-4 in Q2 FY 2030. The FY 2026 Request does not include new funding for the HRS. Prior year funds will support the construction of the HTBL as well as the management team, coordination of collaboration activities, and preliminary engineering and design work for the Spectrometer Section (SPS) subproject of HRS towards future critical decision points.

Low Energy Physics: Fundamental Symmetries MIEs:

Ton-Scale Neutrino-less Double Beta Decay (NLDBD) Program MIE

The Ton-Scale NLDBD Program, implemented by deploying experiments instrumenting a large volume of a specially selected isotope to detect neutrino-less nuclear beta decays where within a single nucleus, two neutrons decay into two protons and two electrons with no neutrinos emitted, directly supports the NP mission to explore all forms of nuclear matter. NLDBD can only occur if neutrinos are their own anti-particles and the observation of “lepton number violation” in such neutrino-less beta decay events would have profound consequences for present understanding of the physical universe. The goal of the ton-scale program is to reach a lifetime limit of 10^{28} years with high confidence within a measurement window of five to ten years. NLDBD received CD-0 approval in November 2018 with a TPC range of $215,000,000 to $250,000,000. Leading up to FY 2025, three different technology approaches were considered in the Ton-Scale NLDBD program. NP informed the leaders of the three technology approaches in December 2024 that only the LEGEND-1000 project, making use of germanium-76 isotope incorporated in an array of solid-state detectors, would be pursued in the near term. The FY 2026 Request does not include new funding for LEGEND-1000. Management activities and preparations for establishing the cost range and evaluation of alternatives are supported by prior year funds.

Nuclear Physics
Construction Projects Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
20-SC-52, Electron Ion Collider (EIC), BNL						
Total Estimated Cost (TEC)	2,493,500	204,240	95,000	110,000	110,000	-
Other Project Cost (OPC)	306,500	89,450	2,850	2,850	2,850	-
Total Project Cost (TPC)	**2,800,000**	**293,690**	**97,850**	**112,850**	**112,850**	**-**
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	95,000	110,000	110,000	-
Other Project Cost (OPC)	N/A	N/A	2,850	2,850	2,850	-
Total Project Cost (TPC)	N/A	N/A	97,850	112,850	112,850	-

Nuclear Physics
Scientific User Facility Operations

The treatment of user facilities is distinguished between two types: TYPE A facilities that offer users resources dependent on a single, large-scale machine; TYPE B facilities that offer users a suite of resources that is not dependent on a single, large-scale machine.

(dollars in thousands)

	FY 2024 Enacted	FY 2024 Current	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Scientific User Facilities - Type A					
Relativistic Heavy Ion Collider	**187,000**	**186,042**	**187,000**	**196,805**	**+9,805**
Number of Users	1,050	1,083	990	1,000	+10
Achieved Operating Hours	–	3,106	–	–	–
Planned Operating Hours	2,303	2,303	3,264	1,500	-1,764
Unscheduled Down Time Hours	–	758	–	–	–
Continuous Electron Beam Accelerator Facility	**141,930**	**142,038**	**146,242**	**151,060**	**+4,818**
Number of Users	1,900	1,668	1,650	1,650	–
Achieved Operating Hours	–	3,808	–	–	–
Planned Operating Hours	3,243	3,243	3,294	3,300	+6
Unscheduled Down Time Hours	–	1,207	–	–	–
Facility for Rare Isotope Beams	**96,266**	**96,266**	**102,336**	**106,406**	**+4,070**
Number of Users	1,000	995	900	1,050	+150
Achieved Operating Hours	–	4,006	–	–	–
Planned Operating Hours	3,570	3,570	3,713	4,000	+287
Unscheduled Down Time Hours	–	236	–	–	–
Argonne Tandem Linac Accelerator System	**24,351**	**24,351**	**25,110**	**26,110**	**+1,000**
Number of Users	300	437	430	450	+20
Achieved Operating Hours	–	6,154	–	–	–
Planned Operating Hours	5,803	5,803	5,952	5,950	-2
Unscheduled Down Time Hours	–	291	–	–	–
Total, Facilities	**449,547**	**448,697**	**460,688**	**480,381**	**+19,693**
Number of Users	4,250	4,183	3,970	4,150	+180
Achieved Operating Hours	–	17,074	–	–	–
Planned Operating Hours	14,919	14,919	16,223	14,750	-1,473
Unscheduled Down Time Hours	–	2,492	–	–	–

Notes:
- *Achieved Operating Hours and Unscheduled Downtime Hours will only be reflected in the Congressional budget cycle which provides actuals.*

Nuclear Physics
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	845	790	743	-47
Number of Postdoctoral Associates (FTEs)	365	312	220	-92
Number of Graduate Students (FTEs)	520	440	302	-138
Number of Other Scientific Employment (FTEs)	1,028	1,044	989	-55
Total Scientific Employment (FTEs)	**2,758**	**2,586**	**2,254**	**-332**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals, and other support staff.*

20-SC-52 Electron Ion Collider (EIC), BNL
Brookhaven National Laboratory, BNL
Project is for Design and Construction

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

Summary

The EIC project will acquire facilities, infrastructure, systems, and equipment that will enable scientists to investigate the basic building blocks of nuclei and how quarks and gluons, the particles inside neutrons and protons, interact dynamically via the strong force to generate the fundamental properties of neutrons and protons, such as mass and spin. The FY 2026 Request for the EIC is $110,000,000 of TEC funding and $2,850,000 of OPC funding. The current TPC range is $1,700,000,000 to $2,800,000,000. The Critical Decision (CD)-1, Approve Alternative Selection and Cost Range, attained on June 29, 2021, included a TPC range with an upper bound of $2,800,000,000.

Significant Changes

The EIC project was initiated in FY 2020. The project most recent Critical Decision (CD) is CD-3A, Approve Long-Lead_Procurement, received on June March 28, 2024. The estimated completion date (CD-4) is 1Q FY 2036 and includes schedule contingency validated by peer review. The most recent Federal review completed in January 2025 confirmed the need for continued elaboration of the scope to define the subprojects strategy intended to leverage different levels of design maturity and improve the project's affordability. The project estimates that the first subproject CD-2, Approve Performance Baseline, could be in Q2 FY 2026.

In FY 2025, the EIC team focused on preliminary design of the infrastructure, collider machine, and detector instrumentation while preparing for a second set of long-lead procurements. Research and development to increase technical readiness for certain detector and technical scope and fostering relations with potential in-kind contributors continued. The team began executing a list of long-lead procurements approved at CD-3A. FY 2026 activities include completing planning and design for conventional infrastructure and technical systems, executing approved long-lead procurements, pursuing agreements with potential in-kind contributors, and preparing the first subproject performance baseline. FY 2026 funding will support constructability adjustments, to validate technical assumptions and to reduce project risk.

The project does not have an assigned Federal Project Director (FPD). Per DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets, in the absence of an appointed FPD, the program manager fulfills the roles and responsibilities of the FPD.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	12/19/19	01/12/21	6/29/2021	2Q FY 2026	3Q FY 2025	2Q FY 2027	1Q FY 2036

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2026	TBD	3/28/2024	2Q FY 2026

CD-3A – Approve Long-Lead Procurements, for specialty materials procurement, including electrical infrastructure, magnets, refrigerators for the satellite cryogenics plant, and components for the injector, radio frequency power amplifier, and the detector.
CD-3B – Approve Long-Lead Procurements, for transportation, inspection, and refurbishment of excess magnets from Argonne National Laboratory and additional materials for the accelerator and detector.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	256,000	1,870,000	2,126,000	292,450	292,450	2,418,450
FY 2026	262,000	2,231,500	2,493,500	306,500	306,500	2,800,000

Note:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*
- *In FY 2025, the CD-1 point estimate was used as the basis for this table. Beginning in FY 2026, the upper bound of the CD-1 TPC range was the basis for this table.*

2. Project Scope and Justification

Scope

The scope of this project is to design and build the EIC at BNL that will fulfill the scientific gap as identified in the 2023 NSAC LRP. BNL is partnering with TJNAF in the implementation of the EIC. The EIC will have performance parameters that include a high beam polarization of greater than 70 percent from both electrons and light ions, and the capability to accommodate ion beams from deuterons to the heaviest stable nuclei. The EIC will also have variable center of mass energies from 29 to 100 GeV and upgradable to 140 GeV, high collision luminosity from 10^{33} -10^{34} $cm^{-2}s^{-1}$, one detector and one interaction region at project completion, and the capacity to accommodate a second interaction region and a second detector.

The scope also includes a new electron injection system and storage ring while taking full advantage of the existing infrastructure by modifying the existing hadron facility of the RHIC infrastructure at BNL.

The electron system will include a highly polarized room temperature photo-electron gun and a 3 GeV electron linac injector. It will include a transfer line that brings the electrons into the storage ring at the energy of 5, 10, and 18 GeV that will be installed in a new tunnel adjacent to the existing 2.4-mile circular RHIC tunnel.

Modifications to the existing hadron system include the injection, transfer line and storage ring to increase beam energy to 275 GeV. It will include a strong-hadron-cooling system to reduce and maintain the hadron beam emittance to the level needed to operate with the anticipated luminosity of 10^{33} -10^{34} $cm^{-2}s^{-1}$.

The interaction region will have superconducting final focusing magnets, crab cavities, and spin rotators to provide longitudinally polarized beams for collisions, where the outgoing particles will be collected by one detector.

An enhanced 2 K liquid helium cryogenic plant is provided for the superconducting radiofrequency cavities, with enhanced water-cooling capacity and cooling towers and chillers to stabilize the environment in the existing tunnel. Civil construction will also include electrical systems, service buildings, and access roads.

It is anticipated that non-DOE funding sources such as international collaborators and the State of New York, will contribute $250 million to the EIC Project ($100 million from New York state, and $150 million from international collaborators). The timeframe for commitments by non-DOE contributors will vary throughout the life of the project and become more certain as planning for the project progresses. New York state committed to its contribution on February 7, 2024. All non-DOE funding sources will be incorporated into the project through the change control process once baselined.

Justification

The last four NSAC LRP reports have supported the EIC. The current NSAC LRP recommends the EIC as the highest priority for new facility construction. Consistent with that vision, in 2016 NP commissioned a National Academies of Sciences, Engineering, and Medicine study by an independent panel of experts to assess the uniqueness and scientific merit of such a facility. The report, released in July 2018, strongly supports the scientific case for building a U.S. based EIC, documenting that an EIC will advance the understanding of the origins of nucleon mass, the origin of the spin properties of nucleons, and the behavior of gluons.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets.*

Key Performance Parameters (KPPs)

The KPPs are preliminary and may change prior to setting the performance baseline at CD-2. The Threshold KPPs represent the minimum acceptable performance that the project must achieve for success. The Objective KPPs represent the project performance stretch goal. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Approve Project Completion.

Performance Measure	Threshold	Objective
Center-of-Mass	Center-of-mass energy measured in the range of 20 GeV- 100 GeV.	Center-of-mass energy measured in the range of 20 GeV- 140 GeV.
Accelerator	Accelerator installed and capable of delivering beams of protons and a heavy nucleus such as Au.	Ability to deliver a versatile choice of beams from protons and light ions to heavy ions such as Au.
Detector	Detector installed and subsystems tested with cosmic rays.	Inelastic scattering events in the e-p and e-A collisions measured in Detector.
Polarization	Hadron beam polarization of > 50 percent and electron beam polarization of > 40 percent measured at E_{cm} = 100 GeV.	Hadron beam polarization of > 60 percent and electron beam polarization of > 50 percent measured at E_{cm} = 100 GeV.
Luminosity	Luminosity for e-p collisions measured up to 1.5×10^{32} cm^{-2} s^{-1}.	Luminosity for e-p collisions measured up to 1.0×10^{33} cm^{-2} s^{-1}.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	76,000	76,000	55,131	5,362
Prior Years - IRA Supp.	20,000	20,000	—	—
FY 2024	76,000	76,000	77,707	9,872
FY 2025	50,000	50,000	69,162	4,766
FY 2026	40,000	40,000	40,000	—
Total, Design (TEC)	**262,000**	**262,000**	**242,000**	**20,000**
Construction (TEC)				
Prior Years - IRA Supp.	108,240	108,240	—	—
FY 2024	19,000	19,000	—	20,000
FY 2025	60,000	60,000	75,000	15,000
FY 2026	70,000	70,000	60,000	58,240
Outyears	1,974,260	1,974,260	1,988,260	15,000
Total, Construction (TEC)	**2,231,500**	**2,231,500**	**2,123,260**	**108,240**
Total Estimated Cost (TEC)				
Prior Years	76,000	76,000	55,131	5,362
Prior Years - IRA Supp.	128,240	128,240	—	—
FY 2024	95,000	95,000	77,707	29,872
FY 2025	110,000	110,000	144,162	19,766
FY 2026	110,000	110,000	100,000	58,240
Outyears	1,974,260	1,974,260	1,988,260	15,000
Total, Total Estimated Cost (TEC)	**2,493,500**	**2,493,500**	**2,365,260**	**128,240**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	79,450	79,450	65,302	8,164
Prior Years - IRA Supp.	10,000	10,000	–	–
FY 2024	2,850	2,850	12,932	1,751
FY 2025	2,850	2,850	6,000	85
FY 2026	2,850	2,850	3,000	–
Outyears	208,500	208,500	209,266	–

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Total, Other Project Cost (OPC)	306,500	306,500	296,500	10,000

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	155,450	155,450	120,433	13,526
Prior Years - IRA Supp.	138,240	138,240	–	–
FY 2024	97,850	97,850	90,639	31,623
FY 2025	112,850	112,850	150,162	19,851
FY 2026	112,850	112,850	103,000	58,240
Outyears	2,182,760	2,182,760	2,197,526	15,000
Total, TPC	2,800,000	2,800,000	2,661,760	138,240

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	178,000	173,000	N/A
Design - Contingency	84,000	83,000	N/A
Total, Design (TEC)	**262,000**	**256,000**	N/A
Construction	1,624,500	1,262,000	N/A
Construction - Contingency	607,000	608,000	N/A
Total, Construction (TEC)	**2,231,500**	**1,870,000**	N/A
Total, TEC	**2,493,500**	**2,126,000**	N/A
Contingency, TEC	*691,000*	*691,000*	*N/A*
Other Project Cost (OPC)			
R&D	86,500	84,150	N/A
Conceptual Design	11,000	11,000	N/A
Other OPC Costs	209,000	197,300	N/A
Total, Except D&D (OPC)	**306,500**	**292,450**	N/A
Total, OPC	**306,500**	**292,450**	N/A
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	2,800,000	2,418,450	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total, Contingency (TEC+OPC)	*691,000*	*691,000*	*N/A*

Note:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*
- *In FY 2025, the CD-1 point estimate was used as the basis for this table. Beginning in FY 2026, the upper bound of the CD-1 TPC range was the basis for this table.*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	204,240	95,000	110,000	—	1,716,760	2,126,000
	OPC	89,450	2,850	2,850	—	197,300	292,450
	TPC	293,690	97,850	112,850	—	1,914,060	2,418,450
FY 2026	TEC	204,240	95,000	110,000	110,000	1,974,260	2,493,500
	OPC	89,450	2,850	2,850	2,850	208,500	306,500
	TPC	293,690	97,850	112,850	112,850	2,182,760	2,800,000

Note:
- *In FY 2025, the CD-1 point estimate was used as the basis for this table. Beginning in FY 2026, the upper bound of the CD-1 TPC range was the basis for this table.*

6. Related Operations and Maintenance Funding Requirements

Over the course of the acquisition of the EIC, experienced RHIC scientists, engineers, and technicians will assume EIC project responsibilities. A gradual transition will balance the need for the scientific experts to continue to support RHIC while ramping up the EIC project. These individuals represent the scientific and technical workforce that are essential to the operations of a complex facility like RHIC and eventually, the EIC. They have critical core competencies in collider operations that cannot easily be replaced, and they represent the core facility operations force of RHIC and the EIC. In the FY 2026 Request, RHIC Operations includes a "reprioritization" of the expert workforce from the RHIC facility operations budget to support the project under the EIC OPC and TEC request. The temporary reprioritization of funds from the facility operations budget to the construction budget will reduce the amount of "new funds" needed to implement the EIC, enabling a cost-effective path forward to the implementation of this world-leading facility. As the EIC nears CD-4 when the machine will be restarted, the scientists, engineers and technicians that are needed to operate the EIC will be transferred back to the facility operations budget.

Start of Operation or Beneficial Occupancy	1Q FY 2036
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2086

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations, Maintenance and Repair	167,000	167,000	13,500,000	13,500,000

7. D&D Information

As part of the upgrade and renovation of the existing accelerator facilities, up to 175,000 square feet of new industrial space will be built as service buildings to house mechanical and electrical equipment. Construction will also include a new tunnel to house the electron injection and rapid cycling synchrotron. The new area will not replace existing facilities.

	Square Feet
New area being constructed by this project at BNL	175,000
Area of D&D in this project at BNL	0
Area at BNL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Area of D&D in this project at other sites	N/A
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Total area eliminated	0

8. Acquisition Approach

SC selected BNL as the site for the EIC on January 9, 2020. NP approved the Acquisition Strategy in conjunction with CD-1. DOE will utilize the expertise of the Management and Operating contractors at BNL and TJNAF to manage the project including the design, fabrication, monitoring cost and schedule, and delivering the technical performance specified in the KPPs. A certified Earned Value Management System based on those that already exist at both laboratories and will evaluate project progress and ensure consistency with DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process. SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the EIC project.

Isotope R&D and Production

Overview

The Office of Isotope R&D and Production (IRP), also known as the DOE Isotope Program (DOE IP), is essential for maintaining American leadership in isotope production, which directly impacts our national security, scientific progress, medical advancements, and industrial competitiveness. The program's mission is to ensure American dominance in isotope production through a multi-faceted strategy that includes securing a reliable domestic supply, fortifying critical infrastructure, achieving U.S. science supremacy, and ensuring American isotope independence.

Isotopes produced by the IRP are strategically important to the Nation, serving as essential components across diverse and critical sectors. They are indispensable for advancing medical diagnostics and treatments, strengthening national security, propelling advanced manufacturing, revolutionizing quantum information science (QIS), supporting semiconductor manufacturing, facilitating space exploration, driving industrial applications, enabling groundbreaking scientific discoveries, enhancing communications, advancing biological research, and fueling other crucial technological advancements.

Currently, domestic capacity to fully satisfy market demand for these essential isotopes is lacking, creating strategic vulnerabilities due to reliance on nations identified as sensitive. The IRP often stands as the sole, or one of a select few, global producers, positioning the U.S. as a crucial provider of essential commodities both domestically and globally. To continue this leadership role, the IRP champions research in nuclear and radiochemistry, chemical separations, accelerator and reactor physics, and innovative isotope enrichment techniques. These efforts ensure that the U.S. is first to market with new isotope products and maintains a reliable production of priority radioactive and enriched stable isotopes.

To produce isotopes, the IRP strategically manages the irradiation of targets, utilizing particle accelerators and nuclear research reactors across national laboratories and domestic universities. Following irradiation, these targets undergo specialized chemical processing within dedicated radiological or nuclear facilities, equipped with sophisticated equipment, to extract radioisotopes of critical interest. In addition to the direct production of these isotopes, the IRP also recovers radioisotopes from legacy waste streams, used nuclear fuel, and existing inventories, achieving the dual benefit of reducing waste volumes while generating valuable products.

A significant aspect of managing these resources includes overseeing the national repository of stable isotopes, a legacy of the Manhattan Project's calutrons. The limited nature of this inventory increases the United States' reliance on foreign suppliers, primarily Russia, for crucial materials. The IRP is dedicated to developing modern stable isotope enrichment capabilities, revitalizing domestic manufacturing, replenishing critical inventories, and fostering U.S. economic resilience, prosperity, competitiveness, and self-reliance. This initiative aligns with the Administration's goals for a secure and robust domestic supply chain. Furthermore, the IRP serves as the steward of national isotope inventories beyond DOE's legacy repository, including helium-3 (He-3), vital for a multitude of applications including cryogenics, quantum information science, fusion energy research, and national security.

To drive America to the forefront of global isotope dominance, the IRP drives a world-leading research program focused on breakthrough isotope production, enrichment, and chemical separation technologies. The program's isotope manufacturing and R&D activities yield significant collateral benefits through training and workforce development. These efforts cultivate future domestic expertise in nuclear medicine, accelerator science, nuclear engineering, nuclear physics, isotope enrichment, and radiochemistry – disciplines vital not only to isotope production and processing but also to basic and applied nuclear and radiochemical science. In particular, research and production activities develop and employ techniques and platform technologies in artificial intelligence (AI), machine learning (ML), autonomization, microelectronics, robotics, and advanced manufacturing.

As a Mission Essential Function for the DOE Office of Science, the IRP maintains continuous operations of both the inventories and production facilities to effectively mitigate disruptions in isotope supply chains during national emergencies. Revenue generated from customer sales directly supports the production and distribution of isotopes, as well as related technical services. Isotopes sold to commercial customers and allied foreign partners are priced at full-cost recovery or market price (whichever is higher), fostering sustainable program operations. To further incentivize innovation and scientific advancements, isotope pricing for domestic research is strategically reduced. Furthermore, the Office works closely with industry partners to provide a steady availability of isotopes, fostering their economic stability and growth, with a focus on commercialization of isotope production within the domestic private sector, promoting innovation and strengthening the national supply chain.

Highlights of the FY 2026 Request

The IRP FY 2026 Request for $162.3 million represents a decrease of $7.3 million below the FY 2025 Enacted level. This budget integrates three core components: research, operations, and targeted line-item construction projects to address ongoing disruptions in high-impact isotope supply chains for critical national applications and transformative technologies. These technologies include medical treatments, national security needs, semiconductor and microelectronics manufacturing, quantum computing, advanced fission and fusion reactors, nuclear batteries, and radioisotope power sources.

The research portfolio will prioritize core research activities, emphasizing secure domestic supply chains for isotopes vital to national security and Administration priorities, such as cancer diagnosis and treatment, fusion energy, microelectronics, quantum computing, and biopreparedness. Increased support will be directed towards high-priority research in artificial intelligence and machine learning to improve efficiencies and automation in isotope science and advanced manufacturing. The request also includes increased support for research to advance the production of isotopes for quantum computing. Continued investments in microelectronics aim to strengthen the onshoring of isotope supply chains critical for semiconductor and microelectronics manufacturing and quality control.

Operations for isotope production facilities are supported, ensuring essential scientists and engineers can address gaps in isotope supply, prioritized based on impact to human life, national defense, and the Nation’s economy. Investments will support targeted modernization and refurbishment activities to increase safe and reliable operations across production sites. Support for the University Isotope Network is maintained for medical, research, and "boutique" radioisotopes, which are more cost-effectively produced outside national labs. Support continues for new capabilities introduced in FY 2025. These include the Stable Isotope Production Facility MIE, the Medical Isotope Research Producer Facility (MIRP), the Facility for Rare Isotope Beams (FRIB) Isotope Harvesting, and new electromagnetic ion separators. Staffing is maintained at the National Isotope Development Center (NIDC) to assess market needs and address the increasing interfaces with the stakeholder community. The program will continue efforts to establish a heavy water inventory and address high-risk isotopes, including helium-3, strontium-90, carbon-14, iridium-192, krypton-85 and promethium-147. It also addresses increasing the production of promethium-147 and increasing inventories of heavy curium from the Mark 18-A used nuclear fuel rods for use as target material in the production of californium-252.

The FY 2026 Request maintains funding at $45.9 million in Total Estimated Cost (TEC) to the Stable Isotope Production and Research Center (SIPRC). SIPRC will expand the nation’s capability to enrich stable isotopes for medical, industrial, and research applications, mitigating U.S. dependence on sensitive countries. The Radioisotope Processing Facility (RPF) advances preliminary engineering design efforts after a planned CD-1 approval in FY 2025; RPF will address a lack of available radiochemical processing equipment to mitigate U.S. dependency on sensitive foreign supply chains of radioisotopes and modernize/expand existing capabilities.

Isotope R&D and Production
Funding

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
	(dollars in thousands)			
Isotope R&D and Production				
Isotopes, Research	40,302	36,365	25,827	-10,538
Isotopes, Operations	59,491	80,371	83,603	+3,232
Subtotal, Isotope R&D and Production	**99,793**	**116,736**	**109,430**	**-7,306**
Construction				
20-SC-51 U.S. Stable Isotope Production and Research Center (SIPRC), ORNL	20,900	45,900	45,900	–
24-SC-92 Clinical Alpha Radionuclide Producer (CARP), BNL	1,000	–	–	–
24-SC-91 Radioisotope Processing Facility, ORNL	8,500	7,000	7,000	–
Subtotal, Construction	**30,400**	**52,900**	**52,900**	**–**
Total, Isotope R&D and Production	**130,193**	**169,636**	**162,330**	**-7,306**

Note:
- *The FY 2024 Enacted IRP total does not include foreign aid supplement funding.*

Basic and Applied R&D Coordination

Effective coordination and integration are crucial to ensure the availability of critical isotopes for federal missions, industrial applications, and academic research. These efforts are essential for various federal agencies, including the National Aeronautics and Space Administration (NASA), the Department of Defense (DoD), the Office of the Director of National Intelligence (ODNI), the National Institute of Standards and Technology (NIST), the Federal Bureau of Investigations (FBI), the Department of Agriculture, the Department of Homeland Security (DHS), and the National Science Foundation (NSF). The IRP conducts a biennial Workshop on Federal Isotope Supply and Demand to anticipate and address evolving needs, gathering five-year projections from all federal agencies.

The IRP maintains coordination and communication through participation in Federal and Interagency Working Groups, OSTP Subcommittees, National Security Council meetings, and White House Small Group and Inter Policy Committees. Additionally, the IRP leads the Interagency Group on He-3 to determine annual federal allocations from reserves. The IRP also collaborates with other DOE Offices on domestic supply chains of valuable isotopes, such as americium-241, He-3, heavy curium, strontium-90, promethium-147, and krypton-85, noting that Russia is often the only other producer of these isotopes.

Isotope R&D and Production

Description

IRP strategically integrates three core components: research, operations, and targeted line-item construction projects.

Research

Research activities are the bedrock of IRP, driving both fundamental discoveries and applied solutions. Funding supports core research groups at national laboratories and universities, fostering innovation in isotope production and related technologies. This encompasses stable and radioisotopes, competitive research opportunities, SC research initiatives, maintenance of core competencies in staff and equipment at university facilities, individual university research projects, and comprehensive workforce development. Core research focuses on identifying and developing new production pathways and enhancing the efficiency, reliability, and cost-effectiveness of existing processes, ultimately ensuring a stable, affordable, and accessible supply of critical isotopes for diverse applications.

IRP supports core research groups at Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL), Los Alamos National Laboratory (LANL), Oak Ridge National Laboratory (ORNL), and Pacific Northwest National Laboratory (PNNL) to conduct innovative research for novel or advanced production and chemical separation techniques for critical isotopes. Core research support is also provided to the University Isotope Network (UIN) institutions, which are essential for strengthening domestic supply chains and fostering national research competitiveness while playing a key role in workforce development. The UIN is currently comprised of the University of Washington (UW) Medical Cyclotron Facility, the University of Missouri Research Reactor (MURR), FRIB Isotope Harvesting at Michigan State University (MSU), University of Alabama-Birmingham (UAB), University of Wisconsin-Madison (UWM), and Texas A&M University (TAMU). These universities have unique capabilities: UW and TAMU operate multi-particle cyclotrons, highlighted by the development of full-scale production of the alpha-emitter astatine-211 for cutting-edge cancer therapy, and the UW cyclotron distributes a variety of isotopes and provides crucial target fabrication expertise for the UIN. MURR boasts the highest flux university research reactor in the United States and recognized expertise in current Good Manufacturing Practices (cGMP) protocols, making it invaluable for DOE IP's production and processing of critical isotopes such as lutetium-177 for cancer therapy research, gadolinium-153 for brachytherapy, nuclear medicine imaging, and SPECT myocardial perfusion imaging, and terbium-161 for cancer treatment. The UAB cyclotron features four beamlines and associated target stations to produce a variety of radioisotopes, as well as specialized hot cells for preparation of human-use and preclinical radiopharmaceuticals. At Michigan State University, the innovative FRIB Isotope Harvesting project repurposes unwanted waste from nuclear physics research into valuable research assets.

A key priority for IRP is fostering a strong national core competency in stable isotope enrichment. Enriched stable isotopes are foundational for numerous applications, including the production of all radioisotopes, which are vital in medicine, industry, and research. The production of each enriched stable isotope requires an intense research campaign. The program provides core research funding for stable isotopes to ORNL and supports machine design optimized for production of isotopes of interest for quantum computing as part of the SC QIS Initiative. Similarly, support through the SC initiatives also promotes growth in radioisotope development. Participation in the Microelectronics initiative enables production of isotopes needed for semiconductors and microelectronics manufacturing, particularly for critical defense applications (e.g., krypton-85 for electronics testing, deuterium for performance).

The IRP's competitive research funding supports universities and national laboratories, specifically research to develop novel isotopes of interest to U.S. stakeholders and establish secure domestic isotope supply chains. For example, IRP is working to develop technology to detritiate legacy heavy water at Savannah River National Laboratory (SRNL). Other examples of competitive research topics include the production of isotopes for next-generation advanced fission reactors and fusion reactors, innovative medical isotopes, new sources of helium-3, rare isotopes for nuclear forensics, critical nuclear data measurements, radioisotope enrichment technology, advanced targetry, modular automated systems, robotics, and the application of machine learning and artificial intelligence to isotope production.

Another high priority research area is the development of transformative medical isotopes for enhanced disease diagnosis and treatment, with the ultimate goal of reducing cancer mortality. There is escalating global interest in alpha and beta emitters for revolutionary cancer and infectious disease therapy and diagnostics. The IRP is often the sole global source for many of these isotopes or leading the way in innovative research and manufacturing to make them available. A key priority is expanding radiochemical processing infrastructure to meet growing U.S. demand for alpha-emitters, including actinium-225 (Ac-225)

IRP supports training and development opportunities for students and post-docs to foster a vibrant workforce for isotope production and to advance workforce capabilities. Support for AI/ML enables growth in areas to facilitate more effective techniques for highly cumbersome isotope production processes, and to promote modern solutions to increase efficiencies and opportunities.

IRP sponsors workshops at professional society meetings to disseminate advances in isotope availability, research & development, and production. It invests in the Nation's future nuclear chemistry and biomedical researchers through support for the Nuclear Chemistry Summer School (NCSS) program. The NCSS, jointly supported with SC's Basic Energy Sciences (BES) and Nuclear Physics (NP) programs, consists of an intensive six-week program of formal accredited lectures on the fundamentals of nuclear science, radiochemistry, and their applications in related fields, supplemented by laboratory practicums focusing on state-of-the-art instrumentation and technology used routinely in basic and applied nuclear science.

Facility Operations

The IRP supports activities at National Laboratories related to reactor, accelerator, and enrichment facilities. This support encompasses expert staff for managing, operating, and maintaining facilities and equipment for isotope production and enrichment. Strategic investments ensure safe, cost-effective, and reliable operations. The program also supports equipment for chemical processing (e.g., hot cells and glove boxes), pre-operations of stable isotope equipment, inventory management and dispensing, advanced manufacturing capabilities, operations support and assembly, and the National Isotope Development Center (NIDC).

The IRP network of facilities produces a diverse range of isotopes:

- Accelerators: The Isotope Production Facility (IPF) at LANL, the Brookhaven Linac Isotope Producer (BLIP) facility at BNL, and the Low Energy Accelerator Facility (LEAF) at ANL are key assets. The IPF and BLIP, both proton accelerators, provide continuous year-round availability of medical radioisotopes. The IPF operates in conjunction with the National Nuclear Security Administration (NNSA) Los Alamos Neutron Science Center (LANSCE), while BLIP operates with the Relativistic Heavy Ion Collider, which will transition to the Electron Ion Collider. BNL also operates the MIRP cyclotron for specialized medical isotopes and isotopes for fundamental research. ANL's LEAF, the program's only electron accelerator, provides unique pathways for producing essential medical radioisotopes.

- Research Reactors: The IRP leverages the capabilities of three research reactors: the High Flux Isotope Reactor (HFIR) at ORNL, the Advanced Test Reactor (ATR) at INL, and the University of Missouri Research Reactor (MURR). These reactors contribute to isotope production, and related chemical processing and handling equipment is supported at each site.

- Chemical Processing: Processing capabilities are supported at PNNL for isotopes like strontium-90, radium-226, krypton-85, and lead-212. At INL, the ATR ensures a reliable domestic supply of cobalt-60. At the Y-12 National Security Complex, the IRP supports the preparation and packaging of lithium isotopes and uranium-235, while americium-241 is recovered from NNSA plutonium processes at LANL. Helium-3 is extracted from NNSA-owned tritium beds at the Savannah River Site, and the radioisotope separator at INL enriches radioisotopes for nuclear forensics.

- Enrichment Technologies: Individual electromagnetic ion separators are assembled and operated at

ORNL. Thermal diffusion enrichment capabilities are operated at PNNL. IRP-supported research demonstrated the feasibility of new Electromagnetic Isotope Separation (EMIS) and gas centrifuge (GC) technologies and re-established a prototype general enriched stable isotope production capability in the U.S. The Stable Isotope Production Facility (SIPF) Major Item of Equipment (MIE) at ORNL established the first full-scale GC cascade to enrich stable isotopes. The implementation of SIPF is beginning transition to routine operations to produce enriched xenon-129 in FY 2026.

The NIDC, located at ORNL, manages IRP business operations, including sales, contract negotiation, marketing assessments, public outreach, quality control, packaging, and transportation. It facilitates regular and frequent interfaces between IRP and industrial, academic, and medical communities to ensure that strategies are evidence-based and informed by stakeholder interactions. In particular, the IRP biennially canvasses the broad federal community for isotope demands to align priorities with evidence-based program evaluations.

The IRP provides over 250 stable isotopes from inventory and produces approximately 80-100 radioisotopes in short supply for the Nation. Some examples of how these isotopes impact America:

- Cancer therapy and imaging diagnostics: actinium-225, actinium-227, astatine-211, cerium-134, scandium-47, scandium-44, holmium-166m, gadolinium-153, tungsten-188, lutetium-177, strontium-89, strontium-90, tin-117m, vanadium-48, manganese-52, manganese-54, gold-199, terbium-161, cobalt-55, and cobalt-60
- Cancer and infectious disease therapy and research: bismuth-213, lead-212, lead-203, astatine-211, copper-67, thorium-227, thorium-228, radium-223, and radium-224
- Pharmaceutical and agrochemical applications: carbon-14
- Feedstock for isotopes that treat prostate cancer: ytterbium-176, radium-226
- Nuclear forensics: neptunium-236
- Explosives detection and nuclear batteries: nickel-63
- Neutron detectors for homeland security applications and fusion research: lithium-6
- Cryogenics and radiation detection: helium-3
- Industrial radiography: iridium-192, selenium-75
- Nuclear reactor start-up, oil and gas exploration and production well logging: californium-252
- Quantum computing research, medical standards, and industrial sources: barium-133
- Microelectronics manufacturing and quality control: krypton-85
- Nuclear batteries and power sources: strontium-90, promethium-147, americium-241, and thulium-170
- Use as targets for discovery of new super heavy elements: berkelium-249, americium-243, uranium-238, plutonium-242, plutonium-244, californium-249, californium-251, einsteinium-254, and curium-248
- Heavy element chemistry research: fermium-257
- Oceanography and climate modeling: silicon-32
- Quantum memory: ytterbium-171

Developing an economically and technically viable commercial market for an isotope can take decades. The IRP remains committed to working closely with industry to commercialize promising technologies and promote the growth of independent domestic producers, ensuring a seamless transition that does not disrupt isotope supply or hinder ongoing research. Once domestic commercial production is established, IRP ceases production to avoid competition with the private sector, as was historically illustrated by strontium-82 for cardiac heart imaging and germanium-68 for medical diagnostics.

<u>Projects</u>
IRP is strategically executing two line-item construction projects to strengthen U.S. isotope supply chains and reduce dependence on sensitive foreign sources. The Stable Isotope Production and Research Center (SIPRC) project will re-establish large-scale stable isotope enrichment in the United States, positioning the nation to compete effectively with Russia and China. The Radioisotope Processing Facility (RPF) will address the critical need for modernized nuclear and radiochemistry capabilities and eliminate U.S. reliance on Russia for high-impact radioisotopes, while simultaneously modernizing and expanding existing capabilities.

Isotope R&D and Production

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Isotope R&D and Production	**$169,636**	**$162,330**	**-$7,306**
Isotopes, Research	$36,365	$25,827	-$10,538
Core research supports the highest impact R&D activities at universities and national laboratories to strengthen the Nation's scientific and technical strengths. These activities drive fundamental scientific discovery and applied solutions. Competitive research focuses on establishing robust domestic supply chains to mitigate disruptions caused by geopolitical events. The UIN, comprising six universities, is leveraged to produce unique isotopes and promote workforce development. Research efforts dedicated to isotopes for quantum computing continue, along with participation in SC initiatives (BRaVE and Microelectronics). Funding supports the Nuclear Chemistry Summer School and participation in the SC Early Career Awards Program.		The Request will maintain support for the highest priority R&D activities at national laboratories, focused on urgently establishing domestic supply chains to establish U.S. independence and mitigate disruptions caused by geopolitical events. Competitive research at domestic universities will be prioritized based on alignment with Administration priorities and available funding. The UIN will continue to produce high-priority research, "boutique" radioisotopes, and isotopes to address urgent domestic needs The recently completed FRIB Isotope Harvesting Project will achieve routine operations. Funding will sustain efforts to develop isotopes for quantum computing and to strengthen the domestic supply chain for microelectronics manufacturing, and support advances in AI/ML to enhance the efficiency of isotope production processes. Funding will be applied to ramp up the recovery of heavy curium from the Mark 18-A targets.	Support for AI/ML technologies will drive the development of automated equipment and chemical processing techniques, for more effective isotope production. Support for workforce development from RENEW and FAIR initiatives, as well as support for BRAVE, is being strategically redirected to higher priority R&D efforts in alignment with Administration priorities.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Isotopes, Operations	$80,371	$83,603	+$3,232
Funding supports facility operations at all production and processing sites enabling the Program to address isotope supply chains gaps and ensure domestic sources for critical isotopes. Funding continues to support the implementation and operations EMIS and the development of other enrichment core competencies. The newly refurbished cyclotron at BNL begins steps for transitions to routine operations. Strategic investments target high priority single point failures at the production sites, as well as deferred maintenance.		The Request will support facility operations at all production facilities and processing sites with an emphasis on addressing gaps in high priority isotope supply chains. Prioritized investments will support targeted modernization and refurbishment activities to enhance operational safety, robustness, and reliability. The Request sustains support for the MIRP Facility, which produces and processes isotopes used for cancer treatments and fundamental research, and new units of EMIS to enrich stable isotopes in short supply as they transition to routine operations. Staffing will be maintained at NIDC to manage growing interfaces with stakeholders.	Increased operations funding will continue to empower isotope production supply chains, stimulate innovation, and ensure a stable supply of these critical materials to fuel breakthroughs in medicine, technology, and scientific research. The increased funding will bolster critical supply chains for isotope production, ensuring growing a stable and reliable supply of urgently needed materials.

Isotope R&D and Production
Construction

Description

The Isotope Research & Development and Production Program (IRP), also known as the DOE Isotope Program (DOE IP), collaborates with federal agencies and industry to ensure American isotope independence and mitigate disruptions in critical isotope supply chains. To support this, IRP invests in new capabilities through construction projects to meet U.S. demand and decrease reliance on geopolitically sensitive countries. These new facilities will enable American self-reliance with innovative R&D, increased processing capability, and expanded production of critical isotopes, including those not available elsewhere. The construction projects represent a significant portion of the overall IRP budget.

IRP strategically executes two line-item construction projects:

24-SC-91, Radioisotope Processing Facility (RPF)

The RPF at ORNL is critical to mitigating radioisotope dependence on geopolitically sensitive countries and meeting U.S. demand for isotopes essential to national defense, space exploration, energy security, and medical applications. To bolster domestic supply chains and enable innovative R&D, it is critical to expand U.S. radioisotope chemical processing and development capacity. The RPF is planned as a Hazard Category 2 nuclear facility outfitted with specialized equipment able to process the higher specific activity targets that are irradiated in a reactor, such as HFIR. Current chemical processing capabilities are aged and at capacity, limiting the ability of the U.S. to onshore isotope supply chains and meet U.S. demand. RPF is designed for flexibility by incorporating modular components scaled to specific production needs, which enables reconfiguration to meet evolving radioisotope needs without costly facility modifications. The project received CD-0, Approve Mission Need, approval on April 29, 2021. The total cost range is now projected at $510,000,000 to $900,000,000, reflecting an enhanced understanding of design parameters and nuclear safety protocols achieved during the conceptual design phase. This, combined with evolving market costs associated with specialized radiochemical equipment, has led to adjustments in both budget and timeline to maintain optimal alignment with mission objectives. The RPF will address a lack of available radiochemical processing equipment to mitigate U.S. dependency on sensitive foreign supply chains of radioisotopes and modernize/expand existing capabilities. As part of the preparations to achieve CD-1, Approve Alternative Selection and Cost Range, planned for FY 2026, the project is assessing the impacts to estimated costs and schedule from available funding, inflation, and supply chain constraints since project initiation.

20-SC-51, U.S. Stable Isotope Production and Research Center (SIPRC)

The Stable Isotope Production and Research Center (SIPRC) will reinstate versatile, large-scale stable isotope enrichment capacity in the United States. Russia is the major producer of most stable isotopes and China is a rapidly emerging leader. Once constructed, SIPRC will provide stable isotopes that are catalysts for American industry, medicine, research, and national security. The current capacity within the U.S. is insufficient to meet the Nation's growing demands and the current inventory of stable isotopes is being depleted. SIPRC will launch the Nation's capability to enrich stable isotopes by expanding gas centrifuge and electromagnetic isotope separation (EMIS) capabilities. SIPRC received CD-1, Approve Alternative Selection and Cost Range, and Subproject 1 CD-3A, Approve Long Lead Procurement, approvals on November 4, 2021. The project received approval for Subproject 1 CD-3B, Approve Long Lead Procurement, on July 19, 2023. Subproject 1, Facility and EMIS, received approval for CD-2, Approve Performance Baseline as well as CD-3, Approve Start of Construction, on March 15, 2024. The Total Project Cost (TPC) point estimate is $325,000,000 with a preliminary TPC range of $187,000,000 to $338,000,000, approved at CD-1.

Isotope R&D and Production
Construction

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$52,900**	**$52,900**	**$ —**
24-SC-91, Radioisotope Processing Facility (RPF)	$7,000	$7,000	$ —
Funding supports TEC of the RPF at ORNL. RPF will address a lack of available radiochemical processing infrastructure within the DOE IP complex for reactor target processing which inhibits production of critical isotopes. RPF will mitigate U.S. dependence on foreign radioisotope supply chains.		The Request will support TEC of the RPF at ORNL. RPF will address a lack of available radiochemical processing infrastructure for reactor target processing which inhibits production of critical isotopes. RPF will mitigate U.S. dependence on foreign radioisotope supply chains.	No change in funding.
20-SC-51, U.S. Stable Isotope Production and Research Center (SIPRC)	$45,900	$45,900	$ —
Funding continues design and construction of the U.S. SIPRC at ORNL, according to project plans, to provide large scale stable isotope production capacity for the Nation and mitigate U.S. dependence on foreign capabilities.		Funding will continue design and construction of the U.S. SIPRC at ORNL according to project plans, to re-establish large scale stable isotope production capacity for the Nation and mitigate U.S. dependence on foreign capabilities.	No change in funding.

Isotope R&D and Production
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Capital Equipment	N/A	N/A	8,082	8,082	7,002	-1,080
Total, Capital Operating Expenses	N/A	N/A	8,082	8,082	7,002	-1,080

Isotope R&D and Production
Construction Projects Summary

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
24-SC-91, Radioisotope Processing Facility (RPF), ORNL						
Total Estimated Cost (TEC)	834,000	-	8,500	7,000	7,000	-
Other Project Cost (OPC)	65,406	14,600	-	-	-	-
Total Project Cost (TPC)	**899,406**	**14,600**	**8,500**	**7,000**	**7,000**	**-**
24-SC-92, Clinical Alpha Radionuclide Producer (CARP), BNL						
Total Estimated Cost (TEC)	1,000	-	1,000	-	-	-
Other Project Cost (OPC)	2,085	585	1,500	-	-	-
Total Project Cost (TPC)	**3,085**	**585**	**2,500**	**-**	**-**	**-**
20-SC-51, U.S. Stable Isotope Production and Research Center (SIPRC), ORNL						
Total Estimated Cost (TEC)	289,800	111,000	20,900	45,900	45,900	-
Other Project Cost (OPC)	5,600	3,200	-	-	-	-
Total Project Cost (TPC)	**295,400**	**114,200**	**20,900**	**45,900**	**45,900**	**-**
Total, Construction						
Total Estimated Cost (TEC)	**N/A**	**N/A**	**30,400**	**52,900**	**52,900**	**-**
Other Project Cost (OPC)	**N/A**	**N/A**	**1,500**	**-**	**-**	**-**
Total Project Cost (TPC)	**N/A**	**N/A**	**31,900**	**52,900**	**52,900**	**-**

Notes:

- *The Radioisotope Processing Facility (RPF) point estimate is $640,000,000; the estimated TPC is displayed at the upper TPC range of $899,406,000 because RPF is not yet baselined. The complete estimated TPC (based on upper TPC range) does not include $594,000 in OPC funding included in the Nuclear Physics program for prior years. The complete estimated cost of the TPC (upper range) for RPF, combining the Nuclear Physics and Isotope R&D and Production funding, is $900,000,000. This project is not baselined and the TPC estimates are currently being re-evaluated to consider available funding, supply chain challenges, and inflation since initiation.*
- *The preliminary TPC for the U.S. Stable Isotope Production and Research Center (SIPRC) of $295,400,000 does not include $29,600,000 ($24,000,000 TEC and $5,600,000 OPC) included in the Nuclear Physics program for prior years. The complete preliminary total for SIPRC, combining the Nuclear Physics and Isotope R&D and Production funding, is $325,000,000. For SIPRC, Subproject 1 is baselined; Subproject 2 and Subproject 3 are not yet baselined*
- *The Clinical Alpha Radioisotope Producer (CARP) point estimate is $74,000,000; the preliminary TPC is displayed at the upper TPC range of $80,000,000 because CARP is not yet baselined. The TPC estimates are currently being re-evaluated to consider available funding, supply chain challenges, and inflation since initiation.*

Isotope R&D and Production
Scientific Employment

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Number of Permanent Ph.Ds (FTEs)	42	55	52	-3
Number of Postdoctoral Associates (FTEs)	29	27	20	-7
Number of Graduate Students (FTEs)	32	26	20	-6
Number of Other Scientific Employment (FTEs)	124	240	231	-9
Total Scientific Employment (FTEs)	**227**	**348**	**323**	**-25**

Note:
- *Other Scientific Employment (FTEs) includes technicians, engineers, computer professionals, and other support staff.*

24-SC-91, Radioisotope Processing Facility (RPF)
Oak Ridge National Laboratory, ORNL
Project is for Design and Construction

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

Summary
The FY 2026 Request for the Radioisotope Processing Facility (RPF) is $7,000,000 of Total Estimated Cost (TEC) funding. The CD-1 preliminary Total Project Cost (TPC) point estimate is planned at $640,000,000 with a TPC range of $510,000,000 to $900,000,000.

Significant Changes
This project data sheet (PDS) is an update of the FY 2025 PDS; this project is not a new start in FY 2026. The most recent DOE Order 413.3B approved CD is CD-0, Approve Mission Need, which was approved on April 29, 2021. The project is working to achieve CD-1/3A, Approve Alternative Selection and Cost Range, planned for FY 2026.

Other Project Cost (OPC) activities related to conceptual design and research and development come to completion in FY 2025. FY 2023 Enacted Appropriation and the Inflation Reduction Act (IRA) fully funded activities that will finalize the conceptual design of the facility, modular hot cell units, and radiochemical equipment in preparation for CD-1. The
FY 2026 Request will provide support for initiating preliminary engineering design for both the facility and the innovative modular hot cell approach once the project attains CD-1 approval. In addition, the design activities will incorporate the need to ensure the production of key radioisotopes as critical legacy nuclear facilities approach their end of life. The cost range, schedule, and technical scope has been, and will continue to be, thoroughly assessed and validated through evidence-based independent peer review in FY 2025 to consider impacts of supply chain constraints and design maturity that have increased the project cost and schedule.

A Federal Project Director (FPD) with certification Level I has been assigned to RPF.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	4/29/21	4Q FY 2025	1Q FY 2026	2Q FY 2030	2Q FY 2030	2Q FY 2030	2Q FY 2038

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2026	2Q FY 2030	4Q FY 2027	4Q FY 2028

CD-3A – Approve Long-Lead Procurements (Early Site Preparation)
CD-3B – Approve Long-Lead Procurements (Modular Hot Cell Fabrication)

Project Cost History

This project has a preliminary point estimate of $640,000,000 and a corresponding TPC range of $510,000,000 to $900,000,000; the PDS is written to the upper limit of the TPC range as the project is not baselined. No construction, excluding approved long-lead procurement, will be performed until the project performance baseline has been validated and CD-3 has been approved.

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	38,300	536,700	575,000	40,000	40,000	615,000
FY 2026	79,000	755,000	834,000	66,000	66,000	900,000

Notes:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*
- *Since project is at CD-0, the funding estimates correlate to the upper end of the estimated TPC range.*

2. Project Scope and Justification

Scope

The scope of this project includes design and construction of a new Hazard Category 2 radioisotope processing facility, with an approximately 60,000 square feet footprint, and the specialized equipment for chemically processing radioisotopes, with particular focus on irradiated reactor targets. RPF will be a purely technical facility (i.e., minimal office and staff amenities) dedicated to research and operations and located on the Oak Ridge National Laboratory (ORNL) main campus. The design is planned to support up to eight new radioisotope processing bays and be equipped with sufficient hot cells grouped to support new product lines and research and development activities intended to scale production to meet U.S. demand. Facility design concepts will include separate bays needed to support reconfigurable heavy shielding for transloading of irradiated targets and waste handling and storage of radioactive materials. The facility will be designed to incorporate other operations required to successfully produce isotopes such as staging and repair of manipulators and other equipment as well as the supporting infrastructure necessary for efficient operations such as cranes to assist in moving casks within the facility. The facility design will address how current Good Manufacturing Practices (cGMP) compliance will be assured. Construction of the proposed facility will also integrate safety-by-design, quality-by-design, and safeguards-by-design standards to ensure safe and efficient future operations.

Justification

RPF is critical to the Nation and to IRP. Radioisotopes are essential to ensure American isotope independence for key energy, medical, space, environmental, and national security applications and for basic research. Currently, radioisotope chemical processing capacity at appropriate hazard category facilities, and outfitted with specialized equipment such as hot cells, glove boxes and supporting laboratories, is the limiting factor for increasing domestic radioisotope production and establishing U.S. independence from foreign supplies of reactor produced isotopes. The Nation is currently not poised to meet U.S. demand in radioisotopes. RPF is designed for flexibility by incorporating modular components scaled to specific production needs which can be reconfigured to meet evolving radioisotope needs without costly facility modifications. Without additional radiochemical processing capabilities for isotope separations, especially in proximity to the HFIR at Oak Ridge National Lab, the United States will remain dependent on isotope supply chains from geopolitically sensitive countries such as Russia, putting high priority applications critical to American industry, scientific and technical strength, medicine, and national security at risk. RPF will provide radioisotope chemical processing capacity to meet the near-and long-term needs of the nation, therefore promoting U.S. economic growth and resilience, as well as reducing dependence on foreign supply.

The project is being conducted in accordance with the project management requirements in DOE Order

413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and all appropriate project management requirements will be met.

Key Performance Parameters (KPPs)
Preliminary Key Performance Parameters (KPPs) are defined at CD-1 and may change as each subproject continues towards CD-2, Approve Performance Baseline. CD-1 approval is expected later in 2025. At CD-2 approval, the KPPs will be baselined. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Design/construct building	TBD	TBD
Instrumentation design/development	TBD	TBD

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
FY 2024	8,500	8,500	—
FY 2025	7,000	7,000	—
FY 2026	7,000	7,000	18,000
Outyears	56,500	56,500	61,000
Total, Design (TEC)	**79,000**	**79,000**	**79,000**
Construction (TEC)			
Outyears	755,000	755,000	755,000
Total, Construction (TEC)	**755,000**	**755,000**	**755,000**
Total Estimated Cost (TEC)			
FY 2024	8,500	8,500	—
FY 2025	7,000	7,000	—
FY 2026	7,000	7,000	18,000
Outyears	811,500	811,500	816,000
Total, Total Estimated Cost (TEC)	**834,000**	**834,000**	**834,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	4,594	4,594	3,450	5,419
Prior Years - IRA Supp.	10,600	10,600	–	–

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
FY 2024	–	–	–	2,759
FY 2025	–	–	–	1,200
FY 2026	–	–	1,144	1,222
Outyears	50,806	50,806	50,806	–
Total, Other Project Cost (OPC)	**66,000**	**66,000**	**55,400**	**10,600**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	4,594	4,594	3,450	5,419
Prior Years - IRA Supp.	10,600	10,600	–	–
FY 2024	8,500	8,500	–	2,759
FY 2025	7,000	7,000	–	1,200
FY 2026	7,000	7,000	19,144	1,222
Outyears	862,306	862,306	866,806	–
Total, TPC	900,000	900,000	889,400	10,600

Note:
- *Since project is still at CD-0, the funding estimates in the tables above correlate to the upper end of the estimated TPC range.*

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	59,000	27,000	N/A
Design - Contingency	20,000	11,300	N/A
Total, Design (TEC)	**79,000**	**38,300**	N/A
Construction	500,000	370,000	N/A
Construction - Contingency	255,000	166,700	N/A
Total, Construction (TEC)	**755,000**	**536,700**	N/A
Total, TEC	**834,000**	**575,000**	N/A
Contingency, TEC	*275,000*	*178,000*	*N/A*

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Other Project Cost (OPC)			
Conceptual Design	15,194	12,194	N/A
Start-up	33,000	17,806	N/A
OPC - Contingency	17,806	10,000	N/A
Total, Except D&D (OPC)	**66,000**	**40,000**	N/A
Total, OPC	**66,000**	**40,000**	N/A
Contingency, OPC	*17,806*	*10,000*	*N/A*
Total, TPC	**900,000**	**615,000**	N/A
Total, Contingency (TEC+OPC)	***292,806***	***188,000***	***N/A***

Note:
- *Since project is at CD-0, the funding estimates correlate to the upper end of the estimated TPC range.*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	—	8,500	2,000	—	564,500	575,000
	OPC	15,194	—	—	—	24,806	40,000
	TPC	15,194	8,500	2,000	—	589,306	615,000
FY 2026	TEC	—	8,500	7,000	7,000	811,500	834,000
	OPC	15,194	—	—	—	50,806	66,000
	TPC	15,194	8,500	7,000	7,000	862,306	900,000

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2Q FY 2038
Expected Useful Life	—
Expected Future Start of D&D of this capital asset	—

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	N/A	TBD	N/A	TBD
Utilities	N/A	TBD	N/A	TBD
Maintenance and Repair	N/A	TBD	N/A	TBD
Total, Operations and Maintenance	N/A	TBD	N/A	TBD

7. D&D Information

	Square Feet
New area being constructed by this project at ORNL	~60,000
Area of existing facility(ies) being replaced..........	0
Area of any additional D&D space to meet the "one-for-one" requirement..........	0

8. Acquisition Approach

The ORNL Management and Operating (M&O) contractor, UT Battelle, will perform the acquisition for this project, overseen by the DOE Oak Ridge National Laboratory Site Office. The M&O contractor will consider various acquisition approaches and project delivery methods prior to achieving CD-1 and will be responsible for awarding and administering all subcontracts related to this project. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the project.

20-SC-51, U.S. Stable Isotope Production and Research Center (SIPRC)
Oak Ridge National Laboratory, ORNL
Project is for Design and Construction

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

Summary

The FY 2026 Request for the U.S. Stable Isotope Production and Research Center (SIPRC) is $45,900,000 of Total Estimated Cost (TEC) funding. The current Total Project Cost (TPC) point estimate is $325,000,000 with a preliminary TPC range of $187,000,000 to $338,000,000.

Significant Changes

This project data sheet (PDS) is an update of the FY 2025 PDS; the project is not a new start in FY 2026. The most recent DOE Order 413.3B approved Critical Decisions (CD) for SIPRC is CD-1, "Approve Alternative Selection and Cost Range", approved on November 4, 2021. Additionally, the most recent CD approvals for SIPRC Subproject 1 (SP1) are CD-3B, "Approve Long-Lead Procurements" approved on July 19, 2023; and CD-2/3, "Approve Performance Baseline and Approve Start of Construction" approved on March 15, 2024, which authorized the start of SP1 construction-related activities. The project is working towards the next critical milestone, CD-2/3; SP3 anticipated in 2Q FY 2027 and SP2 in 3Q FY 2027.

The Inflation Reduction Act (IRA) funding received in FY 2022 supported the award of the phased SIPRC facility conventional construction contract at the end of FY 2024 and mitigated schedule risks. The FY 2026 Request continues support for construction activities that include completing funding for the phased conventional construction award as well as the procurement of EMIS equipment based on known designs of technologies developed under previous efforts. Due to a change in market demand for the isotope molybdenum, the technical design of the gas centrifuges in Subproject 2 (SP2) has changed to a flexible cascade design intended to produce Xenon or other similar isotopes. The change is not expected to impact the total project costs or the completion date for SP1, however the schedule of SP2 and Subproject 3 (SP3), which will leverage the updated design, is expected to be extended by approximately one year. A Key Performance Parameter will be modified to reflect the change in isotope for operational demonstration for SP2. The technical approach, cost, and schedule of SP2, as well as an annual evaluation of the progress of the SIPRC project, was assessed through evidence-based peer review in early FY 2025 and will be revalidated prior to SP2 and SP3 CD-2/3.

A Federal Project Director (FPD) with certification Level III and a Deputy Federal Project Director have been assigned to the SIPRC.

Critical Milestone History

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
SIPRC Project	1/4/19	2/26/21	11/4/21	2Q FY 2026	2Q FY 2026	2Q FY 2026	3Q FY2033
SIPRC SP1 - Facility and EMIS	1/4/19	2/26/21	11/4/21	3/15/24	3/15/24	3/15/24	4Q FY2030
SIPRC SP2 - Gas Centrifuge Cascade	1/4/19	2/26/21	11/4/21	3Q FY 2027	3Q FY 2027	3Q FY 2027	3Q FY 2033
SIPRC SP3 - Test Cascade Infrastructure	1/4/19	2/26/21	11/4/21	2Q FY 2027	2Q FY 2027	2Q FY 2027	4Q FY 2032

Notes:
- *Dates shown in the SIPRC Project row in table above correspond to the latest subproject date (broken out by subproject in rows below).*
- *The estimated schedules shown are preliminary.*

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

	Performance Baseline Validation	CD-3A	CD-3B	CD-3C
SIPRC Project	3Q FY 2027	11/4/21	7/19/23	–
SIPRC SP1 - Facility and EMIS	3/15/24	11/4/21	7/19/23	–
SIPRC SP2 - Gas Centrifuge Cascade	3Q FY 2027	N/A	N/A	2Q FY 2026
SIPRC SP3 - Test Cascade Infrastructure	2Q FY 2027	N/A	N/A	N/A

Note:
- *Dates shown in the SIPRC Project row in table above correspond to the latest subproject date (broken out by subproject below). Dates shown for CD-3C are anticipated.*

CD-3A for Subproject 1 – Approve Long-Lead Procurements (EMIS components and Facility Site Preparation)
CD-3B for Subproject 1 – Approve Long-Lead Procurements (Additional EMIS components)
CD-3C for Subproject 2 – Approve Long-Lead Procurements (Additional GC components)

<u>Project Cost History</u>
The overall SIPRC project is at CD-1, with a preliminary point estimate inclusive of SP1, SP2, and SP3, of $325,000,000 and Total Project Cost (TPC) range of $187,000,000 to $338,000,000. No construction, excluding for approved long-lead procurement, will be performed until the project performance baseline has been validated and CD-3 has been approved. SP1, Facility and EMIS, is at CD-2/3, with a baseline estimate of $231,500,000.

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	31,000	282,800	313,800	11,200	11,200	325,000
FY 2026	30,300	283,500	313,800	11,200	11,200	325,000

2. Project Scope and Justification

<u>Scope</u>
The scope of this project includes the design and construction of an approximately 64,000 square feet facility, and the associated instrumentation and equipment needed to re-establish large-scale enriched stable isotope production in the United States. Multiple electromagnetic isotope separator systems (EMIS) and a gas

centrifuge cascade will be designed and installed in the new facility which will also include adequate space for test stands, prototype systems development, and future additional machines. The laboratory considered the optimal number of production systems for each type of technology as part of the alternatives analysis for CD-1. SIPRC will be a technical facility (i.e., minimal office and staff amenities) located on the Oak Ridge National Laboratory (ORNL) main campus. Gas centrifuges and electromagnetic separators are based on existing designs leveraging prior projects and R&D supported by the DOE Isotope Program (DOE IP).

Justification

SIPRC is essential to the Nation and to SC's Office of Isotope R&D and Production. The facility will expand the only broad U.S. stable isotope production capability to enable multiple production campaigns of enriched stable isotopes. SIPRC will use innovative technology to foster American isotope independence, ensure domestic supply chains of critical stable isotopes and nurture domestic core competencies in enrichment technologies using centrifuges, electromagnetic ion separators and other enrichment technologies. SIPRC will produce stable isotopes that are catalysts for American industry and are essential for health, research, semiconductor, and national security applications. SIPRC mitigates U.S. dependencies on sensitive foreign countries, a critical need magnified by geopolitical instability. The current capacity within the U.S. is insufficient to meet the Nation's growing demands and the stable isotope inventory is being depleted. The SIPRC project will provide a modern facility and transformative technology to address our Nation's stable isotope needs in an operationally efficient manner.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and all appropriate project management requirements will be met.

Key Performance Parameters (KPPs)

Preliminary Key Performance Parameters (KPPs) are defined at CD-1 and may change as each subproject continues towards CD-2, "Approve Performance Baseline". CD-1 approval was received November 4, 2021. SP1 KPPs are baselined; at SP2 and SP3 CD-2 approval, those KPPs will be baselined. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Summary of preliminary KPPs is indicated below.

Performance Measure	Threshold	Objective
Design/construct building	SP1 – Facility and EMIS: Beneficial occupancy of the facility obtained.	SP1 – Facility and EMIS: Beneficial occupancy of the facility obtained.
Instrumentation design/development	SP1 – Facility and EMIS: Ninety percent (90 percent) of the EMIS machines complete a functional operability demonstration of individual EMIS machines running with gas for 4 hours.	SP1 – Facility and EMIS: One hundred percent (100 percent) of the EMIS machines complete a functional operability demonstration of individual EMIS machines running with gas for 4 hours.

Performance Measure	Threshold	Objective
	SP2 – Gas Centrifuge Cascade: a. The SIPRC project will complete the validation and verification (V&V) of the controls system with the completed documentation of the process. b. The SIPRC project will complete documented system leak tests with results meeting the requirements laid out in the systems requirements documents. c. The SIPRC project will complete a mechanical operability test of the completed production GCIS cascade.	SP2 – Gas Centrifuge Cascade: The SIPRC project will complete a Xenon gas test of the constructed cascade. Evidence of completion will be the report on the results of the gas test.
	SP3 – Test Cascade Infrastructure: a. The SIPRC project will complete the V&V of the controls system with the completed documentation of the process. b. The SIPRC project will complete documented system leak tests with results meeting the requirements laid out in the systems requirements documents.	SP3 – Test Cascade Infrastructure: The SIPRC project will successfully complete an operability test of the TCI's feed and withdrawal system using a defined gas. The system must be able to flow gas at the planned flow rate range per the systems requirements document and withdraw the gas from the system piping into cold traps. Evidence of completion will be a report on the results of this test.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	27,000	27,000	11,706
FY 2024	—	—	2,955
FY 2025	3,300	3,300	7,000
FY 2026	—	—	4,000
Outyears	—	—	4,639
Total, Design (TEC)	**30,300**	**30,300**	**30,300**
Construction (TEC)			
Prior Years	33,000	33,000	9,977
Prior Years - IRA Supp.	75,000	75,000	—
FY 2024	20,900	20,900	11,946

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
FY 2025	42,600	42,600	90,000
FY 2026	45,900	45,900	70,000
Outyears	66,100	66,100	101,577
Total, Construction (TEC)	**283,500**	**283,500**	**283,500**
Total Estimated Cost (TEC)			
Prior Years	60,000	60,000	21,683
Prior Years - IRA Supp.	75,000	75,000	—
FY 2024	20,900	20,900	14,901
FY 2025	45,900	45,900	97,000
FY 2026	45,900	45,900	74,000
Outyears	66,100	66,100	106,216
Total, Total Estimated Cost (TEC)	**313,800**	**313,800**	**313,800**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	8,800	8,800	4,900
FY 2024	–	–	2,535
Outyears	2,400	2,400	3,765
Total, Other Project Cost (OPC)	**11,200**	**11,200**	**11,200**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	68,800	68,800	26,583
Prior Years - IRA Supp.	75,000	75,000	–
FY 2024	20,900	20,900	17,436
FY 2025	45,900	45,900	97,000
FY 2026	45,900	45,900	74,000
Outyears	68,500	68,500	109,981
Total, TPC	325,000	325,000	325,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	26,800	25,000	N/A
Design - Contingency	3,500	6,000	N/A
Total, Design (TEC)	**30,300**	**31,000**	N/A
Construction	217,300	232,000	N/A
Construction - Contingency	66,200	50,800	N/A
Total, Construction (TEC)	**283,500**	**282,800**	N/A
Total, TEC	**313,800**	**313,800**	N/A
Contingency, TEC	*69,700*	*56,800*	*N/A*
Other Project Cost (OPC)			
Conceptual Design	8,800	8,800	N/A
Start-up	1,700	1,500	N/A
OPC - Contingency	700	900	N/A
Total, Except D&D (OPC)	**11,200**	**11,200**	N/A
Total, OPC	**11,200**	**11,200**	N/A
Contingency, OPC	*700*	*900*	*N/A*
Total, TPC	**325,000**	**325,000**	N/A
Total, Contingency (TEC+OPC)	*70,400*	*57,700*	*N/A*

5. Schedule of Appropriations Requests[a]

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	135,000	20,900	45,900	—	112,000	313,800
	OPC	8,800	—	—	—	2,400	11,200
	TPC	143,800	20,900	45,900	—	114,400	325,000
FY 2026	TEC	135,000	20,900	45,900	45,900	66,100	313,800
	OPC	8,800	—	—	—	2,400	11,200
	TPC	143,800	20,900	45,900	45,900	68,500	325,000

[a] The project does not have CD-2 approval; FY 2025 schedules and costs are estimates consistent with the updated preliminary point estimate.

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	3Q FY2033
Expected Useful Life	30 years
Expected Future Start of D&D of this capital asset	3Q FY2063

Note:
- *Start of Operations reflects the initiation of phased implementation of operations for the EMIS units.*

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	33,295	33,295	1,106,807	1,106,807
Utilities	4,053	4,053	133,735	133,735
Maintenance and Repair	2,992	2,992	90,458	90,458
Total, Operations and Maintenance	40,340	40,340	1,331,000	1,331,000

Note:
- *Life Cycle Costs includes escalation.*

7. D&D Information

	Square Feet
New area being constructed by this project at ORNL	64,000
Area of existing facility(ies) being replaced	0
Area of any additional D&D space to meet the “one-for-one” requirement	0

The new area being constructed in this project is not replacing existing facilities. Any existing space that is freed up from consolidating activities into SIPRC will likely be repurposed.

8. Acquisition Approach

The ORNL Management and Operating (M&O) contractor, UT Battelle, will perform the acquisition for this project, overseen by the DOE Oak Ridge National Laboratory Site Office. The M&O contractor will be responsible for awarding and administering all subcontracts related to this project. SC will evaluate the M&O contractor’s performance through the annual laboratory performance appraisal process.

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the project.

Isotope Production and Distribution Program Fund

Overview

The Department of Energy's (DOE) Isotope Production and Distribution Program Fund provides a revolving account for the DOE Isotope Program (DOE IP) to facilitate the beneficial production of critical isotopes to strengthen the Nation and cultivate robust domestic supply chains to support federal missions, enable emerging technology, and advance the Nation's economic prosperity and technical competitiveness. The DOE Isotope Program is funded through two primary sources: appropriations allocated to the Office of Isotope R&D and Production (IRP) and revenue generated from isotope sales via a revolving account. When both of these funding sources are considered in conjunction, they constitute the DOE Isotope Program. The DOE IP produces and sells radioactive and stable isotopes, byproducts, surplus materials, and related isotope services to federal agencies, universities, industry, and foreign entities. A key objective of the DOE IP is to enhance the Nation's self-reliance in isotope supply chains, especially those from geopolitically sensitive countries.

Supporting DOE IP, the National Isotope Development Center (NIDC) serves the core function of managing contractual obligations with customers, marketing, and isotope production coordination.The Department supplies isotopes and related services to the Nation under the authority of the Atomic Energy Act of 1954, which specifies the role of the U.S. Government in isotope distribution. The Isotope Production and Distribution Program Fund was established by the 1990 Energy and Water Development Appropriations Act (Public Law 101-101) and amended by the 1995 Energy and Water Development Appropriations Act (Public Law 103-316). Funding for this revolving fund is enabled by annual appropriations from the Science appropriation account, through IRP program, and collections from isotope sales; both are essential to maintain the availability of critical isotopes. Isotopes sold to commercial customers are priced to recognize the full value of production or the market price, whichever is higher. Research isotopes are sold at a reduced price to ensure that the high priority research remains accessible, and that IRP can support the development of new industrial discoveries that benefit the United States. The revolving fund allows continuous and smooth operations of isotope production, sales, and distribution independent of the federal budget cycle and fluctuating sales revenue. It also enables the DOE IP to operate adeptly during times of national importance.

Annual appropriations in the DOE IP program facilitate payments into the revolving fund to sustain effective facility operations, including the support of accomplished scientists and engineers needed to produce and process isotopes, and the maintenance and enhancement of isotope facilities and capabilities to ensure reliable production and provide novel isotopes in high demand. In addition, appropriated funds provide support for R&D activities associated with the development of new production and processing techniques for isotopes and workforce development in isotope production and chemical processing. Appropriated funding also supports construction funds for ongoing line-item projects. Customer revenues offset the costs of producing, dispensing, packaging, and shipping isotopes. About 90 percent of the total resources in the revolving fund are used for operations, maintenance, isotope production, and R&D for new isotope production techniques, with approximately 10 percent available for process improvements, unanticipated changes in revenue, manufacturing equipment, capability and infrastructure upgrades, and capital equipment such as assay equipment, glove boxes, and shipping containers needed to ensure on-time deliveries.

In FY 2025, an estimated total of $237.6 million will be deposited into the revolving fund from the funds appropriated to the IRP budget and from NIDC-collected revenues. This consists of the FY 2025 Enacted level of $169.6 million, plus anticipated collections by NIDC of $68 million to recover costs related to isotope production and isotope services. In FY 2025, the DOE IP expects to sell over 135 different radioactive and stable isotopes to a broad range of research and commercial customers, including major pharmaceutical companies, industrial stakeholders, and researchers at hospitals, national laboratories, other federal agencies, universities, and private companies.

Highlights of the FY 2026 Request

In FY 2026, the Department anticipates continued robust growth in isotope demand, including alpha and beta emitters for novel cancer therapy and medical diagnostics; stable isotopes to enable high-discovery science, emerging technologies in medicine and national security; isotopes for quantum information science; and isotopes for fusion energy; nuclear batteries, semiconductor manufacturing, and power supplies. The Program continues to focus on strengthening U.S. independence from Russian isotope supply chains and enabling the DOE IP to be proactive and target high-risk supply chains effectively to ensure that the U.S. has access to isotopes for discovery science, essential industrial applications, Administration priorities, and to combat cancer.

The IRP's FY 2026 Request is $162.3 million, a decrease of $7.3 million below the FY 2025 Enacted level. In FY 2026, we also anticipate additional collections by NIDC to recover costs related to isotope production and isotope services. Revolving fund resources will be used to strategically address the following priorities in the program:

- Cultivate world-leading core competencies for isotope production to address gaps in supply chains and the provision of innovative, rare isotopes for high priority applications.
- Support facilities with a high degree of effective operations so that they can operate safely, reliably, and efficiently to respond to a crisis and fill gaps in isotope supply chains.
- Introduce novel and critical isotopes to the Nation through cutting-edge research and advanced manufacturing to facilitate emerging technology and applications (medicine, quantum computing, nuclear batteries), promoting U.S. economic prosperity and technical strengths.
- Enhance U.S. self-reliance in foreign supply chains and promote domestic production capabilities with technology transfer.
- Advance and expand transformative, domestic stable isotope enrichment capabilities.
- Improve isotope processing capabilities to address a lack of radiochemical processing capacity limiting the availability of new isotopes, mitigating single point failures to increase the Nation's preparedness for reacting to global supply chain disruptions.
- Address targeted, high priority critical equipment needs to increase operational reliability of facilities by addressing single point failures, increasing spare components, and replacing obsolete equipment.

Workforce Development for Teachers and Scientists

Overview

The Workforce Development for Teachers and Scientists (WDTS) program's mission is to ensure that the Department of Energy (DOE) has a sustained pipeline for the science, technology, engineering, and mathematics (STEM) workforce. Accomplishing this mission depends on continued support for undergraduate internships, graduate thesis research opportunities, and visiting faculty research appointments; administration of the Albert Einstein Distinguished Educator Fellowship for K–12 STEM teachers for the federal government; annual, nationwide middle and high school science competitions culminating in the National Science Bowl® finals in Washington, D.C; and pathway programs to connect more students to training opportunities at DOE national laboratories. These activities support the development of the next generation of scientists, engineers, and technical professionals to address challenges in energy, environment, and national security.

WDTS activities rely significantly on long-standing partnerships with DOE's 17 national laboratories, which employ more than 30,000 individuals with STEM backgrounds. The DOE laboratory system provides access to leading scientific expertise, world-class scientific user facilities, capabilities, and resources, and large-scale, multidisciplinary, interdisciplinary, and transdisciplinary research programs unavailable in universities or industry. WDTS leverages these assets to provide authentic hands-on research and discovery learning opportunities for students and educators in support of the DOE workforce development mission.

Highlights of the FY 2026 Request

The WDTS FY 2026 Request of $25.0 million is a decrease of $6 million below the FY 2025 Enacted level. The FY 2026 Request prioritizes funding for workforce training programs that attract and train students and educators for STEM learning and authentic research experiences at DOE laboratories. The Request continues support for undergraduate internships, graduate thesis research, and visiting faculty program to help sustain a skilled workforce pipeline. The Request continues support for the technology infrastructure modernization and evaluation activity, which is critically important for sustaining the workforce training programs. It also prioritizes support for the DOE National Science Bowl®, a signature STEM competition testing middle and high school students' knowledge in science and mathematics. By encouraging and preparing students to pursue STEM careers, these programs address the DOE's STEM mission critical workforce pipeline needs required to advance science innovation and energy, environment, and national security.

Workforce Development for Teachers and Scientists
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Workforce Development for Teachers and Scientists				
Science Undergraduate Laboratory Internship (SULI)	15,300	15,300	10,200	-5,100
Community College Internship Program (CCI)	2,000	2,000	2,000	–
Visiting Faculty Program (VFP)	2,100	2,100	2,000	-100
Office of Science Graduate Student Research (SCGSR) Program	5,000	5,000	5,000	–
Reaching a New Energy Sciences Workforce (RENEW)	9,000	–	–	–
Internships and Visiting Faculty Activities at DOE Labs	33,400	24,400	19,200	-5,200
Albert Einstein Distinguished Educator Fellowship	1,200	1,200	1,100	-100
National Science Bowl	3,100	3,100	3,100	–
Technology Development and On-Line Application	700	700	500	-200
Evaluation	300	300	300	–
Outreach	1,300	1,300	800	-500
Total, Workforce Development for Teachers and Scientists	40,000	31,000	25,000	-6,000

Program Accomplishments

Science Undergraduate Laboratory Internship (SULI) — In FY 2024, WDTS supported approximately 1,163 placements. Among the participants, more than 98 percent reported positive impacts to their educational and career goals, more than 96 percent would consider a career at DOE national laboratories, and 98 percent would recommend SULI to their peers. As in prior years, participants continue to make notable contributions to research projects as evidenced by co-authorship in peer reviewed journals, patents, and/or presentations at scientific meetings.

Community College Internship Program (CCI) — In FY 2024, WDTS supported 167 placements for students from community colleges. Among the participants, 100 percent would recommend CCI to their peers and 98 percent reported positive impacts to their educational and career goals. Additionally, 100 percent of participants reported that they would consider a job or career at DOE national laboratories.

Visiting Faculty Program (VFP) — In FY 2024, WDTS supported a total of 126 faculty and 29 student VFP placements. All VFP Faculty participants reported a positive impact on their careers, and all expressed interest in continuing their research collaboration. All participants would recommend VFP to their peers.

Office of Science Graduate Student Research (SCGSR) Program — The two solicitations from FY 2024 resulted in a total of 141 new awards. The SCGSR program continued to expand its recruitment efforts to attract more graduate applicants to strengthen the U.S. energy scientific workforce. In FY 2024, SC implemented a pilot for providing supplemental funding for active SCGSR awardees to have international research collaboration experience at CERN, the European Organization for Nuclear Research.

WDTS Pathway Programs for Students and Educators — To help prepare K-12 students and attract more undergraduate students, WDTS has developed innovative pathway programs for students and educators with hands-on research experience and exposure to scientific and technical careers at DOE national laboratories. In 2024, 11 WDTS Pathway Summer Schools for over 200 high school and early undergraduate students were implemented in collaboration with 9 laboratories and 7 WDTS Pathway Summer Institutes were established to support more than 80 Educators from middle/high schools and community colleges with 5 laboratories. The scientific topics of the pathway programs are Artificial Intelligence, Machine Learning, Data Science, Quantum Information Science, Battery Science, Electrochemistry, Catalysis, High Performance Computing, and Fusion Energy Science.

Albert Einstein Distinguished Educator Fellowship (AEF) — In FY 2024, one WDTS-sponsored AEF participant held a WDTS office appointment and five received placements in Congressional offices. Ten other teachers were sponsored by the following Federal agencies: Library of Congress, Department of Defense, Department of Homeland Security, U.S. Geological Survey, National Aeronautics and Space Administration, and National Science Foundation. The AEF Program continues to equip teachers with access to a national network of education leaders and programs, a better understanding of the challenges and possibilities in STEM education, and a renewed passion for making a significant contribution to the educational community.

National Science Bowl®(NSB) — In FY 2024, more than 3,500 middle school students (from 425 schools) and 6,000 high school students (from 795 schools) participated in 115 regional competitions. Forty-nine U.S. States, the District of Columbia, and Puerto Rico were represented at regionals. More than 2,000 volunteers also participated in the local and national competitions. In April 2024, 47 middle school teams and 68 high school teams competed in the National Science Bowl® Championship Finals at the National Conference Center in Leesburg, Virginia, which featured a live web-streaming broadcast of the event to a broad public audience. The NSB continued to inspire young students nationwide to continue striving for high levels of academic success and to follow their passions in STEM, and hopefully, to consider a career to support the DOE mission.

Technology Development and On-Line Application — In FY 2024, the upgrade of the online platform continued and the transition of the online application modules for individual programs is mostly complete. The upgrade will significantly increase cybersecurity and modernization of online technology supporting all WDTS programs. WDTS has completed the upgrade development for system integration with responsive design for SULI, CCI, VFP, and SCGSR. The upgrade incorporated mobile-friendly designs for these programs to reduce barriers for students and educators from a wide range of institutions, schools, backgrounds, and communities. WDTS also added major features to the mentor resource center to better support mentors at DOE national laboratories. Modules using data analysis and visualization capability continue to be developed and have demonstrated their usefulness in producing annual program data summary reports to all host DOE national laboratories, compiling data for WDTS evaluation projects, and producing information to address inquiries from internal and external stakeholders.

Evaluation — In FY 2024, WDTS, in collaboration with ORISE, continued building a comprehensive evaluation portfolio to support evidence-based management of workforce development programs and initiatives in WDTS and SC. The program completed a set of evaluation projects based on pre- and post-survey of program participants, including assessing how undergraduate internships affected participants on their STEM skills/knowledge, education plan, career goals, and outcome analysis of where they are. The program also completed a study of mentoring based on newly completed mentor surveys, which provided insights on support needed for mentors at DOE national laboratories. WDTS started preparation for a longitudinal evaluation study of the impacts of WDTS-sponsored undergraduate internship programs at DOE national laboratories, including submission of a Paperwork Reduction Act application for OMB approval.

Outreach — In FY 2024, in collaboration with ORISE, DOE laboratories, and institutions of higher education, WDTS supported and co-hosted a series of virtual events (Application Assistance Workshops, IGNITE Off, Internship Abstract Competition, Virtual Internship Fair, Virtual Intern Panel and Networking, and Virtual Graduate Student Recruitment Fair) to actively engage students and faculty at all levels and to attract them to apply to workforce training opportunities. In addition to virtual events, WDTS conducted in-person workshops and panels at professional society conferences. In response to the WDTS annual proposal call, DOE national laboratories have developed a comprehensive set of outreach activities. They focus on: expanding model outreach practices, such as "mini-semesters" over winter break and training past participants to serve as WDTS program "ambassadors" on social media and at in-person events at their home institutions; engaging faculty and administrators from community colleges as champions for WDTS programs by connecting them with world-class expertise, unique lab capabilities and facilities; promoting best practices for mentoring; and raising awareness of DOE, SC, and WDTS opportunities to broad audiences.

Workforce Development for Teachers and Scientists

Description

Activities at the DOE Laboratories

WDTS supports activities such as the SULI, CCI, VFP, and SCGSR programs, and innovative pathways. One of the primary goals of these programs is to prepare students to enter STEM careers that are especially relevant to the DOE mission. By providing hands-on research experiences at DOE laboratories under the direction of scientist/engineer mentors, these activities provide workforce training opportunities for participants to engage in authentic research and discovery learning. WDTS activities are aligned with the Administration's goals for preparing a highly skilled future U.S. workforce.

SULI places students from two- and four-year undergraduate institutions as paid interns in science and engineering research activities at DOE laboratories, working with laboratory staff scientists and engineer mentors on projects related to ongoing research programs. Appointments are for ten weeks during the summer term and 16 weeks during the fall and spring terms.

CCI places community college students as paid interns in technological activities at DOE laboratories, working under the supervision of a laboratory technician or researcher mentor. CCI provides dedicated technical training for community college students who are interested in technical careers and provides a pathway for those who plan to pursue further educational objectives beyond community college.

The VFP goal was to increase the competitiveness of faculty members at U.S. institutions of higher education impacting many undergraduate students, including all HBCUs, to expand the reach of Office of Science. The VFP offers dual-track opportunities for both enhancing research capacity and innovating STEM teaching and learning at faculty members' home institutions through extended research collaboration with DOE national laboratories. Appointments are for 10 weeks in the summer.

SCGSR's goal is to prepare graduate students for STEM careers critically important to the SC mission by providing graduate thesis research opportunities at DOE laboratories. The SCGSR program provides supplemental awards for graduate students to pursue part of their graduate thesis research at a DOE laboratory or facility in areas that address scientific challenges central to the SC mission, including convergence topics of interest to multiple SC research programs. U.S. graduate students pursuing Ph.D. degrees in physics, chemistry, materials sciences, non-medical biology, mathematics, computer or computational sciences, or specific areas of environmental sciences aligned with the SC mission, are eligible for research awards to conduct part of their graduate thesis research at a DOE laboratory or facility in collaboration with a DOE laboratory scientist. Research award terms range from three months to one year.

Recognizing the impact of STEM talent pool on a highly skilled future DOE workforce, WDTS works with DOE national laboratories to develop innovative pathway programs for students and educators with hands-on science experience and exposure to scientific and technical careers at DOE national laboratories. WDTS Pathway Summer Schools (PSSs) engage early and establish continuous connection through multiple touch points with high school students, recent high school graduates, and lower-division undergraduate students for better STEM learning and entries to STEM careers later. WDTS Pathway Summer Institutes connects STEM educators from middle or high schools and community colleges to DOE national laboratories with authentic research and professional development opportunities. Through the STEM educators, the program reaches many students to enhance STEM learning and encourage careers in science discovery and innovation to support DOE mission.

Albert Einstein Distinguished Educator Fellowship

The Albert Einstein Distinguished Educator Fellowship Act of 1994 charges DOE with administering a fellowship program for elementary and secondary school mathematics and science teachers that focuses on bringing teachers' real-world expertise to government to help inform federal STEM education programs. Selected teachers spend 11 months in a Federal agency or a Congressional office. WDTS manages the Albert Einstein

Distinguished Educator Fellowship Program for the Federal government. SC sponsors placement opportunities in WDTS and in Congressional offices. Other Federal agencies sponsor placement opportunities in their own offices. Participating agencies include the National Science Foundation, National Aeronautics and Space Administration, the Library of Congress, the Department of Defense, the U.S. Geological Survey, and the Department of Homeland Security. The Fellows provide educational expertise, years of teaching experience, and personal insights to these offices to advance Federal science, mathematics, and technology education programs.

National Science Bowl®

The DOE National Science Bowl® is a nationwide academic competition testing students' knowledge in all areas of mathematics and science, including energy. High school and middle school students are quizzed in a fast-paced, question-and-answer format. Approximately 340,000 students have participated in the National Science Bowl® throughout its 34-year history, and it is one of the Nation's largest science competitions. WDTS manages the National Science Bowl® and sponsors the National Science Bowl® finals competition. Regional competitions rely upon volunteers, and numerous local organizations, both public and private, support them.

Technology Development and On-Line Application

This activity modernizes on-line systems used to manage application solicitations, review applications, and facilitate data collection, curation, and compilation to support evaluation for WDTS programs. The Request continues to support a project to develop, build, and launch new online application and program support systems, with evolving new elements that improve accessibility to applicants, advance program oversight and assessment by WDTS program staff, and allow more efficient management and execution of programs by DOE laboratory staff.

Evaluation

This activity supports work to assess whether WDTS programs meet established goals. This is accomplished through triennial reviews of its program performers, of WDTS itself, and of program performance. These reviews involve peer reviews and Federal Advisory Committee-commissioned Committee of Visitors reviews. In addition, as an important part of assessing STEM workforce training programs, the activity supports efforts to measure short-term program outcomes and assess longer-term program impact. The supported activities include the compilation and analysis of data and other materials, including pre- and post-participation surveys, participant deliverables, notable outcomes (publications, presentations, patents, etc.), and longitudinal participant tracking/outcome analysis. WDTS is also tracking and reporting how its programs, and activities at DOE labs and SC scientific user facilities, fulfill program goals and objectives. In 2023 and 2024, an outcome analysis of over 3,000 SULI participants during 2004 and 2011 was conducted. Between 11 to 17 years post-appointment, over 95% of the SULI alumni have obtained at least a bachelor's degree, about 66% graduate degrees, about 71% remain in STEM fields or occupations, with 56% in industry, 13% universities, and about 5% DOE. In 2024, an outcome analysis of 423 SCGSR alumni who graduated in 2021 or earlier shows nearly 100% doctoral degree completion in STEM fields with 24% employment in DOE national laboratories, 41% industry, and 26% universities. The evaluation studies provide evidence to show the effectiveness of the WDTS programs. Continued efforts will be made to leverage the evaluation to ensure program effectiveness and management excellence.

Outreach

WDTS engages in outreach activities, some in cooperation with other DOE program offices and select federal agencies, to widely publicize its opportunities. The WDTS website (https://science.osti.gov/wdts) is the most widely used tool for prospective program participants to obtain information about WDTS, and it provides a gateway to accessing online applications for the WDTS programs. To help increase the applicant pool, WDTS conducts outreach via multiple venues with consistent brand messaging, such as hosting panels for and giving presentations to various stakeholder groups, sharing information with professional societies, and using virtual platforms to host internship and career fairs. WDTS leverages SC's social media resources to amplify the program opportunities to a broad range of stakeholders. WDTS annually solicits proposals from DOE host laboratories and facilities to develop and execute outreach activities aimed at recruiting more applicants for

WDTS laboratory-based programs, and to encourage WDTS program participants to pursue careers supporting the SC and DOE mission, including staffing needs at DOE national laboratories. The Laboratory Equipment Donation Program (LEDP) is operated under Outreach and provides excess laboratory equipment to STEM faculty at accredited post-secondary educational institutions. Through the General Services Administration Energy Asset Disposal System, DOE sites identify excess equipment, and colleges and universities can then search for equipment of interest and apply via the website. The equipment is free, but the receiving institutions pay for shipping costs.

Workforce Development for Teachers and Scientists

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Workforce Development for Teachers and Scientists	$31,000	$25,000	-$6,000
Activities at the DOE Laboratories	*$24,400*	*$19,200*	*-$5,200*
Science Undergraduate Laboratory Internship (SULI)	*$15,300*	*$10,200*	*-$5,100*
Funding for SULI supports approximately 1008 students.		The Request for SULI will support approximately 672 students.	The funding will support 336 fewer students.
Community College Internship Program (CCI)	*$2,000*	*$2,000*	*$ —*
Funding for CCI supports approximately 174 students.		The Request for CCI will support approximately 174 students.	No change in funding.
Visiting Faculty Program (VFP)	*$2,100*	*$2,000*	*-$100*
Funding for VFP supports approximately 66 faculty and 32 students.		The Request for the VFP will support approximately 63 faculty and 30 students.	The funding will support 3 fewer faculty members and 2 fewer students.
Office of Science Graduate Student Research (SCGSR) Program	*$5,000*	*$5,000*	*$ —*
Funding for SCGSR supports approximately 168 graduate students.		The Request for the SCGSR program will support approximately 145 graduate students. The Request supports an international research collaboration allowance to provide opportunities for SCGSR awardees to access unique international expertise and/or instrumentation and gain hands-on experience conducting research in an international environment.	No change in funding.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Albert Einstein Distinguished Educator Fellowship	$1,200	$1,100	-$100
Funding supports 5 Fellows due to increased cost for hosting Fellows and administrating programs.		The Request will support 4 Fellows due to increased cost for hosting Fellows and administrating programs.	The funding will support 1 fewer Fellow.
National Science Bowl®	$3,100	$3,100	$ —
Funding supports the National Finals and provide central management of over 110 virtual and in-person regional events, involving more than 14,000 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.		The Request will support the National Finals and provide central management of over 110 virtual and in-person regional events, involving more than 14,000 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.	No change in funding.
Technology Development and On-Line Application	$700	$500	-$200
Funding continues development and operation of the on-line systems and supports new development to meet the evolving needs of the programs. The online application and review system is the backbone infrastructure for the application, review, laboratory placement, award/participation management, outreach, and evaluation of WDTS workforce training programs at DOE national laboratories.		The Request will continue development and operation of the on-line systems and support new development to meet the evolving needs of the programs. The online application and review system is the backbone infrastructure for the application, review, laboratory placement, award/participation management, outreach, and evaluation of WDTS workforce training programs at DOE national laboratories.	The reduced funding level will limit the new feature development for the online system.
Evaluation	$300	$300	$ —
Funding supports a comprehensive evaluation portfolio with short- and longer-term projects for assessing WDTS program performance and producing knowledge to inform evidence-based management and evaluation practice.		The Request will support a comprehensive evaluation portfolio with short- and long-term projects for assessing WDTS program performance and producing knowledge to inform evidence-based management and evaluation practice.	No change in funding.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Outreach	$1,300	$800	-$500
Funding supports outreach activity proposal solicitations from DOE host labs and facilities WDTS will maintain support of recruitment of STEM students to DOE research and development workforce mission-relevant fields of study, and particularly to fields related to SC research programs. Support will continue for the LEDP program.		The Request will support outreach activity proposal solicitations from DOE host labs and facilities. WDTS will maintain support of recruitment of STEM students to DOE research and development workforce mission-relevant fields of study, aligned with DOE and SC priorities. Support will continue for the LEDP program.	The reduced funding level will support fewer proposals.

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Science Laboratories Infrastructure

Overview

The Science Laboratories Infrastructure (SLI) program's mission is to support scientific and technological innovation at the Office of Science (SC) National Laboratories by funding enabling infrastructure that fosters safe, efficient, reliable, and resilient operations to increase American competitive advantage. The SLI program's main priorities are to transform and modernize SC's enabling physical assets (including major utility systems), while providing new modern facilities that enable innovative scientific discoveries at velocity and scale. The SLI program funds line-item construction projects; General Plant Projects (GPP) (minor construction less than $34 million); Payments in Lieu of Taxes (PILT) to local communities around the Argonne, Brookhaven, and Oak Ridge National Laboratories (ANL, BNL, and ORNL); nuclear operations at ORNL; landlord responsibilities across the Oak Ridge Reservation; and the Laboratory Operations Apprenticeship program.

SC manages an infrastructure portfolio worth nearly $32 billion, across 10 national laboratories, with nearly 24 million gross square feet (gsf) within almost 1,600 government-owned buildings and trailers serviced by over 1,300 miles of utilities. SC assets at the national laboratories include major research and user facilities, laboratory and office buildings, support facilities, and a vast network of utilities and other support facilities that form the backbone of each site. Delivering the SC mission requires significant stewardship of research facilities and the renovation and replacement of enabling infrastructure, including buildings and support infrastructure.

SC laboratories conduct annual assessments of the condition, utilization, and mission readiness of their buildings and support infrastructure. In FY 2023, the assessments rated 42 percent of the general-purpose buildings substandard or inadequate to meet mission needs. In addition, 67 percent of the utility systems were rated as substandard or inadequate while 35 percent of the remaining support infrastructure was rated as substandard or inadequate. The substandard and inadequate condition of facilities results in operational inefficiencies, reduced resiliency and reliability, unplanned outages, costly repairs, and elevated safety risks. In collaboration with SC programs and the laboratories, the SLI program plans and executes modernization and revitalization projects to manage risks and reduce the impacts of these deficiencies on the SC mission.

SC and the laboratories integrate the assessment results with scientific mission needs through the development of comprehensive Campus Strategies during the bi-annual laboratory planning process. To support current and future capabilities and infrastructure, each laboratory's Campus Strategy[a] identifies activities and infrastructure investments, such as line-item construction and GPPs, as part of asset life-cycle management. SC leadership uses these Campus Strategies, and its own evaluation of infrastructure needs, to inform the SLI budget requests.

In FY 2024, SC invested nearly $832 million in maintenance, repair, and construction to sustain and enhance its general-purpose infrastructure. These investments stemmed from a variety of funding sources, including Federal appropriations for line-item construction, GPPs, laboratory overhead funding of Institutional GPPs (IGPPs), and maintenance and repair activities. The SLI investments in line-item construction and GPPs provide the critical backbone of laboratory operations and are key elements of this overall investment strategy.

Highlights of the FY 2026 Request

The SLI FY 2026 Request of $210.4 million is a decrease of $50.4 million below the FY 2025 Enacted level. The FY 2026 Request continues to focus on improving infrastructure across the SC national laboratory complex and supports ongoing construction projects:

1. Princeton Plasma Innovation Center at Princeton Plasma Physics Laboratory (PPPL);
2. Critical Infrastructure Recovery & Renewal at Princeton Plasma Physics Laboratory (PPPL);
3. CEBAF Renovation and Expansion project at Thomas Jefferson National Accelerator Facility (TJNAF);
4. Argonne Utilities Upgrade project at Argonne National Laboratory (ANL);
5. Linear Assets Modernization Project at Lawrence Berkeley National Laboratory (LBNL);
6. Critical Utilities Infrastructure Revitalization Project at SLAC National Accelerator Laboratory (SLAC); and

[a] https://science.osti.gov/-/media/lp/pdf/laboratory-planning-process/FY-2022-ALPs-for-Web.pdf

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7. Utilities Infrastructure Project at Fermi National Accelerator Laboratory (FNAL).

The FY 2026 Request will provide final funding for the Princeton Plasma Innovation Center at PPPL and the CEBAF Renovation and Expansion project at TJNAF.

These ongoing line-item projects modernize the enabling infrastructure that is in the poorest condition and present the highest risk and cost to operations. These projects will replace, upgrade, and improve utility systems and facilities to improve resilience and provide new laboratory space with the necessary performance capabilities to support SC's evolving mission.

SLI annually evaluates enabling infrastructure needs for all laboratories. The FY 2026 Request also includes funding for GPPs, which are an essential component of our infrastructure modernization portfolio. GPPs address urgent, targeted, and high risk enabling infrastructure and utility needs across SC laboratories and facilities such as building HVAC systems, chilled water plants, electrical systems components (switches/transformers), fire safety, emergency generators, site security improvements, office/laboratory modernization, etc. GPPs are the most expedient resource for avoiding unplanned and disruptive interruptions, costly emergency repairs, damage to our highly sophisticated science tools, as well as for increasing resilience, correcting inadequate/unsafe working conditions, and eliminating inefficient and costly operations that impede research activities. SLI evaluates GPP proposals using annual assessment results and multiple criteria including mission impact, readiness, cost savings (including energy and water), resilience, and reliability. The minor construction threshold of $34 million makes the use of GPPs the appropriate pathway for addressing more of the critical revitalization and emergency repair needs.

The FY 2026 Request will continue to support the Laboratory Operations Apprenticeship. Recognizing that the highly specialized skills and training needed to maintain and operate unique complex machines need a dedicated pipeline, SC is supporting the Laboratory Operatrions Apprenticeship program, which began in 2024. SC will rely on PPPL's experience running a United States Department of Labor (DOL)-registered apprenticeship program to meet the growing needs of fusion energy and engineering craft skills and will incorporate additional SC Labs to support a new generation of technicians, developing skills that apply to laboratory operations, as well as growing leading edge technology sectors critical to our national priorities.

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Science Laboratories Infrastructure
Funding

	(dollars in thousands)			
	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Science Laboratories Infrastructure				
Payment In Lieu of Taxes (PILT)	5,004	5,119	5,119	–
OR Landlord	6,910	7,032	7,032	–
Facilities and Infrastructure	18,530	42,692	42,692	–
KG12 - Laboratory Operations Apprenticeship	3,000	3,000	3,000	–
Oak Ridge Nuclear Operations	46,000	46,000	46,000	–
Subtotal, Science Laboratories Infrastructure	**79,444**	**103,843**	**103,843**	–
Construction				
21-SC-71 Princeton Plasma Innovation Center (PPIC), PPPL	15,000	30,000	34,600	+4,600
21-SC-72 Critical Infrastructure Recovery & Renewal (CIRR), PPPL	10,000	10,000	9,400	-600
21-SC-73 Ames Infrastructure Modernization (AIM)	8,000	–	–	–
20-SC-72 Seismic and Safety Modernization (SSM), LBNL	35,000	23,000	–	-23,000
20-SC-73 CEBAF Renovation and Expansion (CEBAF), TJNAF	11,000	11,000	26,000	+15,000
20-SC-77 Argonne Utilities Upgrade (AU2), ANL	8,007	3,000	1,500	-1,500
20-SC-78 Linear Assets Modernization Project (LAMP), LBNL	18,900	25,000	13,100	-11,900
20-SC-79 Critical Utilities Infrastructure Revitalization (CUIR), SLAC	30,000	20,000	10,000	-10,000
20-SC-80 Utilities Infrastructure Project (UIP), FNAL	35,000	35,000	12,000	-23,000
19-SC-74 - BioEPIC, LBNL	38,000	–	–	–
Subtotal, Construction	**208,907**	**157,000**	**106,600**	**-50,400**
Total, Science Laboratories Infrastructure	**288,351**	**260,843**	**210,443**	**-50,400**

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Science Laboratories Infrastructure
Explanation of Major Changes

	(dollars in thousands) FY 2026 Request vs FY 2025 Enacted
Construction	-50,400
Funding supports seven ongoing line-item projects at ANL, FNAL, LBNL, PPPL, SLAC, and TJNAF, including two in their final year of funding.	
Total, Science Laboratories Infrastructure	-50,400

Program Accomplishments
Line-Item Construction Projects
Since FY 2006, the SLI program invested $1.4 billion to successfully complete 20 mission-enabling line-item construction projects that provided state-of-the-art science user support facilities, renovated, and repurposed aged facilities, upgraded inadequate core infrastructure and systems, and removed excess facilities. These investments began nearly 20 years ago with an SC decision to modernize infrastructure across the SC-stewarded laboratory complex. With these investments, the SLI program constructed approximately 1.4 million gsf of new and modernized existing space. As a result, an estimated 3,200 laboratory users and researchers now occupy newly constructed and/or modernized buildings that better support scientific and technological innovation in a collaborative environment. SLI has been recognized with 14 DOE Secretary's Achievement Awards for its contributions to the SC mission.

GPP upgrades across SC Laboratories
From FY 2016 through FY 2025 SLI has funded nearly $341 million in 54 laboratory core infrastructure improvement projects including electrical and utility improvements, building renovations, safety upgrades, resilience and other site improvement projects. Examples of FY 2025 SLI GPP investments in core infrastructure include the 4000 Area 2.4kv to 13.8 kV Upgrade at ORNL, Reactive Power Compensation at SLAC, Building 680 Upgrade Entrance Portal at BNL, Substation 549 Transformer Upgrades at ANL, and Bldg. 450 Chillers Upgrade - Phase 2 at ANL.

Science Laboratories Infrastructure
Infrastructure Support

Description

The Infrastructure Support subprogram invests in enabling infrastructure and specific laboratory operations. The Facilities and Infrastructure activity is critical for upgrading and replacing enabling infrastructure systems (e.g., utility systems, site-wide services, and general-purpose facilities) to improve reliability, resilience, efficiency, and performance, as well as to address emerging needs or end-of-life requirements. This subprogram also supports nuclear operations at ORNL, stewardship-type needs (e.g., roads and grounds maintenance) across the Oak Ridge Reservation, the Laboratory Operations Apprenticeship program, and Payments In Lieu of Taxes (PILT).

Facilities and Infrastructure

This activity supports urgent and emerging core infrastructure needs that are most efficiently addressed through minor construction investments (general plant projects of less than $34 million). SC laboratories conduct annual condition assessments of their core infrastructure to determine the investment needs for these basic systems that form the backbone of their campuses. SLI uses these assessments to maintain and update an integrated list of critical core infrastructure investment priorities across all 10 laboratories. Projects are rigorously evaluated for mission criticality and readiness, cost savings (including energy and water cost savings), remediation of environmental, safety, and health issues, resilience, and reliability. The highest priority projects are selected for funding based on the totality of these criteria and availability of funds.

Oak Ridge Nuclear Operations

This activity supports critical DOE nuclear operations required to safely operate ORNL's non-reactor nuclear facilities (i.e., Buildings 7920, 7930, 3525, and 3025E) and associated support facilities. These facilities support a variety of users including SC programs, the National Nuclear Security Administration, the Office of Nuclear Energy (NE), and other federal agencies. This funding provides general operations support, maintenance and repair of hot cells and supporting systems and ensures compliance with safety standards and procedures.

OR Landlord

This activity supports landlord responsibilities, including infrastructure, for the 24,000-acre Oak Ridge Reservation and DOE facilities in the city of Oak Ridge, Tennessee. The funding supports maintenance of roads, grounds, other infrastructure, and support and improvement of environmental protection, safety, and health.

Payment In Lieu of Taxes (PILT)

This activity supports SC stewardship responsibilities for PILT. The Department is authorized to provide discretionary payments to state and local government authorities for real property that is not subject to taxation because it is owned by the United States Federal Government and operated by the Department. Under this authorization, PILT is provided to communities around ANL, BNL, and ORNL to compensate for lost tax revenues for land removed from local tax rolls. PILT payments are negotiated between the Department and local governments based on land values and tax rates.

Laboratory Operations Apprenticeship

This activity continues to support the Laboratory Operations Apprenticeship program. The apprenticeship program is focused on preparing and training the next generation of diverse highly skilled trade and craft employees, to replace the critical aging and retiring workforce required to enable American energy and technological advantage.

Science Laboratories Infrastructure
Infrastructure Support

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Infrastructure Support $103,843	**$103,843**	**$ —**
Facilities and Infrastructure $42,692	$42,692	$ —
Funding continues to support the highest priority enabling infrastructure needs across the SC complex. Projects over $5 million being considered are: Substation 549 Transformer Upgrades at ANL, Building 680 Upgrade Entrance Portal at BNL, Bethel Valley Central Campus 4000 Area 2.4kv to 13.8 kV Upgrade at ORNL, and Reactive Power Compensation at SLAC.	The Request will continue to support the highest priority enabling infrastructure needs across the SC complex. Projects over $5 million being considered are: Building 510 Upgrade Electrical Substation - Phase I at BNL, Water Supply Tank 82 and Electrical Pump Upgrade at LBNL, 3410 Central Utility Plant (CUP) Cooling Tower Upgrade at PNNL, and Electrical Rehabilitation - 12kV Cable Replacement - Region 4 at SLAC.	The funding will support at least seven new GPPs at multiple laboratories, addressing some of the highest risks and needs for operations.
Oak Ridge Nuclear Operations $46,000	$46,000	$ —
Funding supports the general operations of ORNL's non-reactor nuclear facilities by the Office of Science.	The Request will support the general operations and maintenance of ORNL's non-reactor nuclear facilities by the Office of Science.	Funding will continue to support critical activities needed to operate and maintain the non-reactor nuclear facilities at ORNL.
OR Landlord $7,032	$7,032	$ —
Funding continues to support landlord responsibilities across the Oak Ridge Reservation and in Oak Ridge. Activities include maintenance of roads, grounds, other infrastructure, and support and improvement of environmental protection, safety, and health.	The Request will continue to support landlord responsibilities across the Oak Ridge Reservation and in Oak Ridge. Activities include maintenance of roads, grounds, other infrastructure, and support and improvement of environmental protection, safety, and health.	Funding will support OR landlord requirements.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Payment In Lieu of Taxes (PILT) $5,119	$5,119	$ —
Funding supports PILT payments to communities around ANL, BNL, and ORNL.	The Request will provide funding for PILT payments to communities around ANL, BNL, and ORNL.	Funding will support the anticipated PILT requirements.
Laboratory Operations Apprenticeship $3,000	$3,000	$ —
Funding supports a program for technician- and craft-level apprenticeships in the SC complex.	The Request will support a program for technician- and craft-level apprenticeships in the SC complex.	Funding will continue development of the Laboratory Operations Apprenticeship program.

Science Laboratories Infrastructure
Construction

Description

The Science Laboratories Infrastructure (SLI) Line-Item program mission is to support scientific and technological innovation at the Office of Science (SC) laboratories by modernizing enabling infrastructure and fostering effective operations at required velocity and scale. SLI's construction projects are focused on infrastructure necessary to execute priority operations. The SLI program's main objectives are to modernize SC's physical assets and facilities through new construction, replacements, upgrades, and renovations that increase operational effectiveness and enable cutting edge scientific discovery and application.

The FY 2026 Request includes funding for seven ongoing line-item construction projects:

1. Princeton Plasma Innovation Center at PPPL;
2. Critical Infrastructure Recovery & Renewal at PPPL;
3. CEBAF Renovation and Expansion at TJNAF;
4. Argonne Utilities Upgrade at ANL;
5. Linear Assets Modernization Project at LBNL;
6. Critical Utilities Infrastructure Revitalization at SLAC; and
7. Utilities Infrastructure Project at FNAL.

This Request includes no new line-item construction projects.

<u>21-SC-71, Princeton Plasma Innovation Center, PPPL</u>

The Princeton Plasma Innovation Center (PPIC) will provide a multi-purpose facility to PPPL to provide medium bay research labs for diagnostics and fabrication, office space, and remote collaboration capabilities in support of Fusion Energy Sciences (FES), Advanced Scientific Computing Research (ASCR), and Basic Energy Sciences (BES) programs.

Per direction from SC on April 29, 2025, PPIC is to be delegated to the Laboratory Director. Prior to the delegation, PPIC received DOE Order 413.3B Critical Decision (CD)-2/3, Approve Performance Baseline and Start of Construction, on October 17, 2024. The project anticipates project completion in 4th quarter FY2029 subject to the M&O contractor's plan for project execution. The current TEC for this project is $107,500,000 and the Total Project Cost (TPC) is $109,700,000.

<u>21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL</u>

The Critical Infrastructure Recovery & Renewal (CIRR) project at PPPL will revitalize critical infrastructure that supports the PPPL campus. Upgrades that may be completed as part of the CIRR project include: the electrical distribution system; standby power; chilled water generation and distribution; underground distribution networks; HVAC systems; and communication systems.

CIRR was delegated to the Laboratory Director on April 29, 2025. Prior to the delegation, CIRR received DOE Order 413.3B CD-3A approval, Approve Long-Lead Procurements and Site Preparation Activities, on April 24, 2025. Future project milestones will be finalized in accordance with PPPL's plan for project execution. The current preliminary TEC range for this project is $80,100,000 to $96,000,000. The preliminary TPC range for this project is $81,800,000 to $97,700,000. The preliminary TEC point estimate is $87,300,000 and the TPC point estimate for this project is $89,000,000.

<u>20-SC-73, CEBAF Renovation and Expansion, TJNAF</u>

The CEBAF Renovation and Expansion (CRE) project will renovate existing space and provide new research, administrative, and support service space to enable mission execution. The CEBAF center at TJNAF is currently experiencing frequent failures in their utility systems; with the completion of the ARC facility transfer to SC, renovation of the ARC and CEBAF facilities to consolidate and accommodate operational as well as visitor/educational functions effectively will enhance mission execution.

CRE was delegated to the Laboratory Director on April 29, 2025. Prior to the delegation, CRE received DOE Order 413.3B CD-1 approval, Approve Alternative Selection and Cost Range, on March 18, 2020. Future project milestones will be finalized in accordance with the M&O contractor's plan for project execution. This project has a preliminary TEC range of $46,600,000 to $99,500,000 and a preliminary TPC range of $69,300,000 to $102,800,000. The preliminary TEC point estimate for this project is $87,000,000 and the preliminary TPC point estimate for this project is $90,300,000.

<u>20-SC-77, Argonne Utilities Upgrade, ANL</u>
The Argonne Utilities Upgrade (AU2) project at ANL will revitalize and selectively upgrade ANL's existing major utility systems to increase the reliability, capability, and safety of ANL's infrastructure to meet the DOE's mission. The project will focus on systems such as steam, water, sanitary sewer, chilled water, and electrical systems.

AU2 was delegated to the Laboratory Director on April 29, 2025. Prior to the delegation, AU2 received DOE Order 413.3B CD-3A approval, Approve Site Preparation Activities, on September 14, 2023. Future project milestones will be finalized in accordance with the M&O contractor's plan for project execution. The preliminary TEC range for this project is $172,000,000 to $290,250,000. The preliminary TPC range for this project is $173,000,000 to $291,250,000. The preliminary TEC point estimate is $215,000,000 and the TPC point estimate for this project is $216,000,000.

<u>20-SC-78, Linear Assets Modernization Project, LBNL</u>
The Linear Assets Modernization Project (LAMP) at LBNL will upgrade high priority utility systems to increase the reliability, capability, resiliency, and safety of LBNL's infrastructure to meet the DOE's mission. The project will upgrade utility systems including, but not limited to, domestic water, natural gas, storm drain, sanitary sewer, electrical, and communications.

LAMP was delegated to the Laboratory Director on April 29, 2025. Prior to the delegation, LAMP received DOE Order 413.3B CD-1 approval, Approve Alternative Selection and Cost Range, on April 13, 2022. Future project milestones will be finalized in accordance with the M&O contractor's plan for project execution. The preliminary TEC range for this project is $164,000,000 to $376,000,000. The preliminary TPC range for this project is $170,000,000 to $386,000,000. The preliminary TEC is $236,000,000 and the preliminary TPC estimate for this project is $242,000,000.

<u>20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC</u>
The Critical Utilities Infrastructure Revitalization (CUIR) project's primary objective is to close enabling infrastructure gaps to support multi-program science enablers by increasing reliability, resiliency, and service capacity in electrical, mechanical, and civil systems site-wide. The CUIR project will address the critical campus-wide utility and infrastructure deficiencies by replacing, repairing, and modernizing the highest risk water/fire protection, sanitary sewer, storm drain, electrical, and cooling water system deficiencies.

CUIR was delegated to the Laboratory Director on April 29, 2025. Prior to the delegation, CUIR received DOE Order 413.3B CD-3A approval, Approve Long-Lead Procurement and Early Site Preparation, on May 8, 2023. Future project milestones will be finalized in accordance with the M&O contractor's plan for project execution. The preliminary TEC range for this project is $160,000,000 to $306,000,000. The preliminary TPC range for this project is $165,000,000 to $311,000,000. The preliminary TEC estimate is $204,000,000 and the preliminary TPC estimate for this project is $208,500,000.

<u>20-SC-80, Utilities Infrastructure Project, FNAL</u>
The Utilities Infrastructure Project (UIP) at FNAL will modernize the highest risk to major utility systems across the FNAL campus. Specifically, this project will upgrade the industrial cooling water system, potable water distribution system, sanitary sewer and storm collection systems, natural gas distribution system, electrical distribution system, and the Central Utility Building. Selected portions of the systems at highest risk of failure. In addition, component upgrades will also increase capacity, reliability, and personnel safety across critical services.

UIP received its most recent DOE Order 413.3B Critical Decision (CD) approval, CD-3, Approve Long Lead Procurement, on December 6, 2024. The last of three subprojects anticipates approval of CD-2, Approve Performance Baseline, in the third quarter of FY 2029. This project is pre-CD-2; therefore, schedule estimates are subject to change. The preliminary TEC range for this project is $248,000,000 to $403,000,000 and the preliminary TPC range of $252,000,000 to $411,000,000. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC estimate is $310,000,000 and the preliminary TPC estimate for this project $314,000,000.

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Construction	**$157,000**	**$106,600**	**-$50,400**
21-SC-71, Princeton Plasma Innovation Center, PPPL	$30,000	$34,600	+$4,600
Funding supports the continuation of construction activities.		The Request will provide final funding for this project and support construction activities.	Final funding in FY 2026 will support construction activities.
21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL	$10,000	$9,400	-$600
Funding supports the continuation of construction activities.		The Request will support construction activities.	Funding will support construction activities.
20-SC-72, Seismic and Safety Modernization, LBNL	$23,000	$ —	-$23,000
The Enacted budget provides final funding for this project and supports construction activities.		No Funding is requested.	No funding is requested.
20-SC-73, CEBAF Renovation and Expansion, TJNAF	$11,000	$26,000	+$15,000
Funding supports construction activities.		The Request will support construction activities.	Final funding in FY 2026 will support construction activities.
20-SC-77, Argonne Utilities Upgrade, ANL	$3,000	$1,500	-$1,500
Funding supports construction activities.		The Request will support construction activities.	Funding will support construction activities.
20-SC-78, Linear Assets Modernization Project, LBNL	$25,000	$13,100	-$11,900
Funding supports construction activities.		The Request will support construction activities.	Funding will support construction activities.
20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC	$20,000	$10,000	-$10,000
Funding supports construction activities.		The Request will support construction activities.	Funding will support construction activities.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
20-SC-80, Utilities Infrastructure Project, FNAL $35,000	$12,000	-$23,000
Funding supports construction activities.	The Request will support construction activities.	Funding will support construction activities.

Note:
- *Other Project Costs (OPC) are funded through laboratory overhead.*

Science Laboratories Infrastructure
Capital Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Capital Operating Expenses						
Minor Construction Activities						
General Plant Projects	N/A	N/A	18,530	42,692	42,692	–
Total, Capital Operating Expenses	**N/A**	**N/A**	**18,530**	**42,692**	**42,692**	**–**

Minor Construction Activities

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
General Plant Projects (GPP)						
GPPs (greater than $5M and $34M or less)						
Substation 549 Transformer Upgrades	9,791	–	–	9,791	–	-9,791
Building 680, Upgrade Entrance Portal at BNL	11,200	–	–	11,200	–	-11,200
Bethel Valley Central Campus 4000 Area 2.4kv to 13.8 kV Upgrade at ORNL	9,690	–	–	9,690	–	-9,690
Reactive Power Compensation at SLAC	7,765	–	–	7,765	–	-7,765
B/510 Upgrade Electrical Substation - Phase I	7,000	–	–	–	7,000	+7,000
Water Supply Tank 82 and Electric Pump Upgrade	8,000	–	–	–	8,000	+8,000
3410 Central Utility Plant (CUP) Cooling Tower Upgrade at PNNL	8,100	–	–	–	8,100	+8,100
Electrical Rehabilitation - 12kV Cable Replacement - Region 4 at SLAC	5,194	–	–	–	5,194	+5,194
Chiller Replacement (Building. 450) at ANL	6,530	–	6,530	–	–	–
HVAC Upgrade Life Sciences Laboratory (Bldg.331) at PNNL	6,000	–	6,000	–	–	–
Electrical Component Replacement 88 Inch Cyclotron User (Bldg B88) at LBNL	5,815	–	5,815	–	–	–
Total GPPs (greater than $5M and $34M or less)	N/A	N/A	18,345	38,446	28,294	-10,152

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Total GPPs $5M or less	N/A	N/A	185	4,246	14,398	+10,152
Total, General Plant Projects (GPP)	**N/A**	**N/A**	**18,530**	**42,692**	**42,692**	**–**
Total, Minor Construction Activities	**N/A**	**N/A**	**18,530**	**42,692**	**42,692**	**–**

Note:

- *GPP activities $5M and less include design and construction for additions and/or improvements to land, buildings, replacements or addition to roads, and general area improvements. AIP activities $5M and less include minor construction at an existing accelerator facility.*

	Total	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs. FY 2025 Enacted ($ Change)
Institutional General Plant Projects (IGPP)					
IGPPs (greater than or equal to $5M and less than $30M)					
B725 SDCC 1.2 MW Power & Cooling Upgrades, BNL	12,900	12,900			-
B77 CNC Machine Replacement, LBNL	6,600	6,600			-
Sitewide Retaining Wall Improvements, LBNL	9,500	9,500			-
B62 High Bay Renovation, LBNL	9,500	9,500			-
Modular HPC Data Center, LBNL	31,500	31,500			-
Vehicle Charging Stations Installation, ORNL	6,500	6,500			-
Improve Melton Valley Campus South Access and Parking , ORNL	7,400	7,400			-
Renovate B4500N Library, ORNL	9,200	9,200			-
Replace 4521 Cooling Tower, ORNL	9,600	9,600			-
Improve Bethel Valley Campus Parking, ORNL	7,000	7,000			-
Modernize B7600 (EGCR) Campus Utility, ORNL	9,200	9,200			-
Replace Bethel Valley Campus Vehicle Bridge, ORNL	6,000	6,000			-
Secure Physical Sciences, PNNL	28,000	28,000			-
General Purpose Lab, PNNL	24,000	24,000			-
B86 HVAC Modernization, LBNL	16,000		16,000		(16,000)
B66 4th Floor Lab Upgrades, LBNL	30,000		30,000		(30,000)
B84 Heating Electrification, LBNL	15,000		15,000		(15,000)
Shuttle Shelter Modernization, LBNL	5,000		5,000		(5,000)
Fire Alarm Panel Replacements, LBNL	10,000		10,000		(10,000)
B80 HVAC Modernization, LBNL	15,000		15,000		(15,000)
SW-A8 Power Resiliency, LBNL	25,000		25,000		(25,000)
B62 Lab Renovation, LBNL	6,000		6,000		(6,000)
B55 Lab Renovation, LBNL	10,000		10,000		(10,000)
Modernize Bldg., 4508 , ORNL	11,900		11,900		(11,900)
Improve 7667 Low level Waste Site, ORNL	11,000		11,000		(11,000)
Improve 7603 Basement and 7608 Vault, ORNL	11,000		11,000		(11,000)
Construct Bethel Valley Support Facility, ORNL	12,000		12,000		(12,000)
Construct Melton Valley Campus Support Facility, ORNL	11,000		11,000		(11,000)
Secure Computational and Data Sciences, PNNL	32,000		32,000		(32,000)
Shipping and Receiving Replacement, PNNL	15,000		15,000		(15,000)
PSL Lab Renovation, PNNL	14,000		14,000		(14,000)
Physical Access Control System Upgrade, PNNL	10,000		10,000		(10,000)
318 HVAC Upgrade, PNNL	8,500		8,500		(8,500)
Richland North Central Infrastructure, PNNL	7,000		7,000		(7,000)
Canal Water Improvements, ANL	7,300			7,300	7,300
Site-Wide Power Upgrade, BNL	34,000			34,000	34,000
Install Fire Pump Houses at 13J and 68 Water Tanks, LBNL	12,000			12,000	12,000
B2 Chiller Upgrade and Chilled Water Piping Improvements, LBNL	20,000			20,000	20,000
B77 Boiler Electrification, LBNL	30,000			30,000	30,000

Construct Multiprogram Office Building , ORNL	11,000			11,000	11,000
Modernize 4500N Wing 1, ORNL	12,000			12,000	12,000
Modernize 2000/3000 Area Utilities, ORNL	9,600			9,600	9,600
Modernize Mechanical Utilities in East Campus, ORNL	12,000			12,000	12,000
Material Science and Laboratory Analysis, PNNL	29,750			29,750	29,750
Richland South Campus Shop, PNNL	20,000			20,000	20,000
331 Research Support Office, PNNL	12,500			12,500	12,500
325WSPAD Upgrade, PNNL	8,000			8,000	8,000
Replacement of 50S 12kV Switchgear, SLAC	6,600			6,600	6,600
Total IGPPs (greater than or equal to $5M and less than $30M)	677,050	176,900	275,400	224,750	(50,650)
Total IGPPs less than $5M	86,575	29,694	32,813	24,068	(8,745)
Total, Institutional General Plant Projects (IGPP)	**763,625**	**206,594**	**308,213**	**248,818**	**(59,395)**

Note:

- *Institutional General Plant Projects (IGPPs) are indirect funded minor construction activities that are general institutional in nature and address general purpose, site-wide needs.*

Science Laboratories Infrastructure
Construction Projects Summary

(dollars in thousands)

	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
21-SC-71, Princeton Plasma Innovation Center (PPIC), PPPL						
Total Estimated Cost (TEC)	107,500	27,900	15,000	30,000	34,600	+4,600
Other Project Cost (OPC)	2,200	1,923	–	–	–	–
Total Project Cost (TPC)	**109,700**	**29,823**	**15,000**	**30,000**	**34,600**	**+4,600**
21-SC-72, Critical Infrastructure Recovery & Renewal (CIRR), PPPL						
Total Estimated Cost (TEC)	87,300	6,150	10,000	10,000	9,400	-600
Other Project Cost (OPC)	1,700	1,392	–	–	–	–
Total Project Cost (TPC)	**89,000**	**7,542**	**10,000**	**10,000**	**9,400**	**-600**
21-SC-73, Ames Infrastructure Modernization (AIM)						
Total Estimated Cost (TEC)	30,000	22,000	8,000	–	–	–
Other Project Cost (OPC)	1,000	507	–	–	–	–
Total Project Cost (TPC)	**31,000**	**22,507**	**8,000**	**–**	**–**	**–**
20-SC-72, Seismic and Safety Modernization (SSM), LBNL						
Total Estimated Cost (TEC)	136,000	83,000	35,000	18,000	–	-18,000
Other Project Cost (OPC)	4,000	3,561	–	–	–	–
Total Project Cost (TPC)	**140,000**	**86,561**	**35,000**	**18,000**	**–**	**-18,000**
20-SC-73, CEBAF Renovation and Expansion (CEBAF), TJNAF						
Total Estimated Cost (TEC)	87,000	39,000	11,000	11,000	26,000	+15,000
Other Project Cost (OPC)	3,300	1,492	–	–	–	–
Total Project Cost (TPC)	**90,300**	**40,492**	**11,000**	**11,000**	**26,000**	**+15,000**
20-SC-77, Argonne Utilities Upgrade (AU2), ANL						
Total Estimated Cost (TEC)	215,000	19,000	8,007	3,000	1,500	-1,500
Other Project Cost (OPC)	1,000	1,000	–	–	–	–
Total Project Cost (TPC)	**216,000**	**20,000**	**8,007**	**3,000**	**1,500**	**-1,500**
20-SC-78, Linear Assets Modernization Project (LAMP), LBNL						
Total Estimated Cost (TEC)	236,000	34,825	18,900	25,000	13,100	-11,900
Other Project Cost (OPC)	6,000	3,263	–	–	–	–
Total Project Cost (TPC)	**242,000**	**38,088**	**18,900**	**25,000**	**13,100**	**-11,900**
20-SC-79, Critical Utilities Infrastructure Revitalization (CUIR), SLAC						

	(dollars in thousands)					
	Total	Prior Years	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Total Estimated Cost (TEC)	204,000	34,925	30,000	20,000	10,000	-10,000
Other Project Cost (OPC)	4,500	2,683	100	250	250	–
Total Project Cost (TPC)	**208,500**	**37,608**	**30,100**	**20,250**	**10,250**	**-10,000**
20-SC-80, Utilities Infrastructure Project (UIP), FNAL						
Total Estimated Cost (TEC)	310,000	31,500	35,000	35,000	12,000	-23,000
Other Project Cost (OPC)	4,000	2,050	–	–	–	–
Total Project Cost (TPC)	**314,000**	**33,550**	**35,000**	**35,000**	**12,000**	**-23,000**
19-SC-74, BioEPIC, LBNL						
Total Estimated Cost (TEC)	165,000	127,000	38,000	–	–	–
Other Project Cost (OPC)	1,536	1,536	–	–	–	–
Total Project Cost (TPC)	**166,536**	**128,536**	**38,000**	–	–	–
Total, Construction						
Total Estimated Cost (TEC)	N/A	N/A	208,907	152,000	106,600	-45,400
Other Project Cost (OPC)	N/A	N/A	100	250	250	–
Total Project Cost (TPC)	N/A	N/A	209,007	152,250	106,850	-45,400

21-SC-71, Princeton Plasma Innovation Center, PPPL
Princeton Plasma Physics Laboratory, PPPL
Project is for Design and Construction

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

<u>Summary</u>
The FY 2026 Request for the Princeton Plasma Innovation Center (PPIC) project is$34,600,000 of Total Estimated Cost (TEC) funding. The TEC for this project is $107,500,000 and the Total Project Cost (TPC) for this project is $109,700,000.

On April 29, 2025, PPIC was delegated to Laboratory Director. Prior to that delegation, the project received DOE Order 413.3B Critical Decision (CD)-2/3, Approve Performance Baseline and Start of Construction, on October 17, 2024.

<u>Significant Changes</u>
This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and is not a new start for FY 2026. FY 2026 funds will support construction activities after the appropriate CD approvals.

<u>Critical Milestone History</u>

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	9/9/19	8/25/20	1/22/21	10/17/24	5/16/24	10/17/24	8/30/29

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	10/17/24	6/26/24

CD-3A – Long Lead Procurements and Site Preparation Activities

<u>Project Cost History</u>

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	12,000	95,500	107,500	2,200	2,200	109,700
FY 2026	13,500	94,000	107,500	2,200	2,200	109,700

Notes:
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

The Princeton Plasma Innovation Center (PPIC) is envisioned as an approximately 71,000 gross square feet (gsf) multi-story office, reflecting office space based on future of work changes, and laboratory building at Princeton Plasma Physics Laboratory (PPPL) to serve as a single new multi-use facility that will house space for offices, medium bay research labs for diagnostics and fabrication, remote experiment participation and collaboration, and research support. Having procured long-lead equipment (e.g., mechanical equipment, electrical equipment, structural steel, etc.) and performing site preparation (e.g., installation of geothermal wells) approved via CD-3A, should improve the schedule and reduce the impacts of cost escalation.

Justification

To advance the plasma science and fusion frontier in support of the DOE mission, PPPL requires new or enhanced facilities and infrastructure to foster innovation to make fusion energy a practical reality and further U.S. economic competitiveness. The primary SC program relevant to the PPIC project is FES, and the primary core capability is Plasma and Fusion Energy Sciences. The missions of SC's ASCR and BES programs are also relevant mission needs for the PPIC with second order effect to Large Scale User Facilities/Advanced Instrumentation and Systems Engineering and Integration.

PPPL plays a key role in assisting FES achieve its strategic goals. PPPL carries out experiments and computer simulations of the behavior of plasma, with sufficient temperature to generate fusion reactions. PPPL's aims to be a leading center for future fusion concepts through industry collaborations that develop new modeling and measurement techniques to improve understanding of plasma processes and that develop innovations for the next generation microelectronics.

PPIC will enhance the configuration of the PPPL campus to accommodate future scientific efforts and address the lack of adequate laboratory infrastructure, modern collaboration space, and modern office infrastructure.

Key Performance Parameters (KPPs)

The Threshold KPP represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPP will be a prerequisite for project completion.

Performance Measure	Threshold	Objective
Multi-Story Building	50,000 gsf	75,000 gsf

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	12,500	12,500	3,200	1,000
Prior Years - IRA Supp.	1,000	1,000	—	—
FY 2024	—	—	5,300	—
FY 2025	—	—	800	—
FY 2026	—	—	3,200	—
Total, Design (TEC)	**13,500**	**13,500**	**12,500**	**1,000**
Construction (TEC)				
Prior Years	5,400	5,400	—	—
Prior Years - IRA Supp.	9,000	9,000	—	—
FY 2024	15,000	15,000	—	3,900
FY 2025	30,000	30,000	9,900	5,100
FY 2026	34,600	34,600	35,000	—
Outyears	—	—	40,100	—
Total, Construction (TEC)	**94,000**	**94,000**	**85,000**	**9,000**
Total Estimated Cost (TEC)				
Prior Years	17,900	17,900	3,200	1,000
Prior Years - IRA Supp.	10,000	10,000	—	—
FY 2024	15,000	15,000	5,300	3,900
FY 2025	30,000	30,000	10,700	5,100
FY 2026	34,600	34,600	38,200	—
Outyears	—	—	40,100	—
Total, Total Estimated Cost (TEC)	**107,500**	**107,500**	**97,500**	**10,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	1,923	1,923	1,923	–
Outyears	277	277	277	–
Total, Other Project Cost (OPC)	**2,200**	**2,200**	**2,200**	–

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	19,823	19,823	5,123	1,000
Prior Years - IRA Supp.	10,000	10,000	–	–
FY 2024	15,000	15,000	5,300	3,900
FY 2025	30,000	30,000	10,700	5,100
FY 2026	34,600	34,600	38,200	–
Outyears	277	277	40,377	–
Total, TPC	109,700	109,700	99,700	10,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	12,300	9,500	N/A
Design - Contingency	1,200	2,500	N/A
Total, Design (TEC)	**13,500**	**12,000**	N/A
Construction	77,810	75,600	N/A
Construction - Contingency	16,190	19,900	N/A
Total, Construction (TEC)	**94,000**	**95,500**	N/A
Total, TEC	**107,500**	**107,500**	N/A
Contingency, TEC	*17,390*	*22,400*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	300	300	N/A
Conceptual Design	1,700	1,700	N/A
OPC - Contingency	200	200	N/A
Total, Except D&D (OPC)	**2,200**	**2,200**	N/A
Total, OPC	**2,200**	**2,200**	N/A
Contingency, OPC	*200*	*200*	*N/A*
Total, TPC	109,700	109,700	N/A
Total, Contingency (TEC+OPC)	*17,590*	*22,600*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	27,900	15,000	35,000	—	29,600	107,500
	OPC	1,923	—	—	—	277	2,200
	TPC	29,823	15,000	35,000	—	29,877	109,700
FY 2026	TEC	27,900	15,000	30,000	34,600	—	107,500
	OPC	1,923	—	—	—	277	2,200
	TPC	29,823	15,000	30,000	34,600	277	109,700

Notes:
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	8/30/29
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	4Q FY 2079

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	1,336	1,336	46,774	46,774
Utilities	198	198	6,936	6,936
Maintenance and Repair	1,518	1,518	53,154	53,154
Total, Operations and Maintenance	3,052	3,052	106,864	106,864

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at PPPL	~71,000
Area of D&D in this project at PPPL	None
Area at PPPL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	13,400[b]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	13,400

[b] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

8. Acquisition Approach

The PPPL Management and Operating (M&O) Contractor, Princeton University, is performing the acquisition for this project, overseen by the Princeton Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL
Princeton Plasma Physics Laboratory, PPPL
Project is for Design and Construction

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

Summary

The FY 2026 Request for the Critical Infrastructure Recovery & Renewal (CIRR) project is $9,400,000 of Total Estimated Cost (TEC) funding. The preliminary TEC range for this project is $80,100,000 to $96,000,000. The preliminary Total Project Cost (TPC) range for this project is $81,800,000 to $97,700,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is $89,000,000.

Princeton Plasma Physics Laboratory's (PPPL's) increasingly unreliable and antiquated utility infrastructure is negatively impacting laboratory operations. Scientific productivity is dependent on a capable, available, flexible, maintainable, reliable, and resilient support infrastructure. This project will provide critical infrastructure needed to operate the laboratory missions safely and efficiently. These systems will be modern and energy efficient, reducing the operating cost and improving the resilience of the facilities.

On April 29, 2025, CIRR was delegated to Laboratory Director. Prior to that delegation, the project received DOE Order 413.3B Critical Decision (CD)-3, Approve Long-Lead Procurements and Site Preparation Activities, on April 24, 2025.

Significant Changes

This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and is not a new start for FY 2026. FY 2026 funds will continue to fund construction.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	9/16/19	2/23/21	2/23/21	TBD	3Q FY 2025	TBD	TBD

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	TBD	4/24/25

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

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	9,950	77,350	87,300	1,700	1,700	89,000
FY 2026	9,680	77,620	87,300	1,700	1,700	89,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

The CIRR project at PPPL will revitalize critical infrastructure that supports the PPPL campus to ensure reliability and resilience. Upgrades that are completed as part of the CIRR project include: the electrical distribution system; standby power; chilled water generation and distribution; HVAC systems; and communication systems. The scientific activities that require reliable and resilient utilities include National Spherical Torus Experiment-Upgrade (NSTX-U), Facility for Laboratory Reconnection Experiments (FLARE), and Lithium Tokamak Experiment-Beta (LTX-β).

The long-lead equipment procurement was approved on April 24, 2025.

Justification

PPPL is a key DOE contributor to plasma science and directly supports the DOE mission to make fusion energy a practical reality and further U.S. economic competitiveness. To maintain system operability, it is essential to have reliable infrastructure in place. The current systems are past their useful life, obsolete, unreliable, and inefficient. Portions of the current system are part of the original infrastructure built in 1958. To maintain current missions and enable future ones, the infrastructure must be upgraded with modern, efficient, and reliable systems.

CIRR will deliver modern and resilient general-purpose infrastructure which will be more reliable, efficient, and sustainable and meet current industry standards. For example, replacing the obsolete hot deck/cold deck HVAC system will not only result in repair savings, but will generate energy savings as well. This project is being designed to consider the best available and most efficient technology to enhance operations and maintenance of new systems and equipment.

Key Performance Parameters (KPPs)

The KPPs are preliminary and may change as the project matures. The KPPs will be finalized in accordance with M&O contractor's plan for project execution. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of project completion.

Performance Measure	Threshold	Objective
Chilled Water Generation	▪ Install new Central Chilled Water Plant equipment and cooling tower cells to ensure distribution of 2,000 tons of cooling capacity to the site.	▪ Install new MV Cable between Q4 Switchgear and Substation 10 and Substation 61A to improve resiliency of Central Chilled Water Plant equipment.
Communications Distribution Network	▪ Complete redundant fiber optic connection between Princeton University's High-Performance Computing Research Center and the PPPL Computer Center (PPLCC). ▪ Replace 10,000 linear feet of legacy fiber optic cable between PPLCC and network distribution closets across site.	▪ Provide 1,000 linear feet of redundant fiber optic connections between redundant PPLCC network core and critical network distribution closets. ▪ Provide fully divergent pathway for new service provider connection to the PPLCC.
Electrical Distribution & Standby Power	▪ Improve mission readiness of the primary electrical distribution system in the 138 kV Yard by replacing XQT-2, XVT-1 transformers. ▪ Provide 2600kW generator for C-Site. ▪ Replace Q1 Switchgear and shift Q6 switchgear loads to Q1. ▪ Upgrade 4 Substations for priority buildings and facilities.	▪ Replace existing 26 kV OCB VB-1 to improve resilience of back-up power source. ▪ Replace 5 substations for priority buildings and facilities.
HVAC Systems	▪ Upgrade 2 HVAC system equipment for priority buildings on C-Site.	▪ Upgrade up to 4 HVAC system equipment priority buildings on C-Site.
Underground Distribution Network	▪ Replace 800 L.F. of chilled water main piping that has exceeded its useful life expectancy and is prone to failure.	▪ Replace 250 L.F. of existing underground 5kV electrical feeders that have exceeded their useful life expectancy. ▪ Replace 1700 L.F. of existing underground 26kV electrical feeders that have exceeded their useful life expectancy.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	6,150	6,150	355
FY 2024	3,530	3,530	3,600
FY 2025	—	—	5,725
Total, Design (TEC)	**9,680**	**9,680**	**9,680**
Construction (TEC)			
FY 2024	6,470	6,470	—
FY 2025	10,000	10,000	16,000
FY 2026	9,400	9,400	8,400
Outyears	51,750	51,750	53,220
Total, Construction (TEC)	**77,620**	**77,620**	**77,620**
Total Estimated Cost (TEC)			
Prior Years	6,150	6,150	355
FY 2024	10,000	10,000	3,600
FY 2025	10,000	10,000	21,725
FY 2026	9,400	9,400	8,400
Outyears	51,750	51,750	53,220
Total, Total Estimated Cost (TEC)	**87,300**	**87,300**	**87,300**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	1,392	1,392	1,392
Outyears	308	308	308
Total, Other Project Cost (OPC)	**1,700**	**1,700**	**1,700**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	7,542	7,542	1,747
FY 2024	10,000	10,000	3,600
FY 2025	10,000	10,000	21,725
FY 2026	9,400	9,400	8,400
Outyears	52,058	52,058	53,528
Total, TPC	89,000	89,000	89,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	7,510	7,600	N/A
Design - Contingency	2,170	2,350	N/A
Total, Design (TEC)	**9,680**	**9,950**	N/A
Construction	60,230	59,500	N/A
Construction - Contingency	17,390	17,850	N/A
Total, Construction (TEC)	**77,620**	**77,350**	N/A
Total, TEC	**87,300**	**87,300**	N/A
Contingency, TEC	*19,560*	*20,200*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	200	200	N/A
Conceptual Design	1,300	1,300	N/A
OPC - Contingency	200	200	N/A
Total, Except D&D (OPC)	**1,700**	**1,700**	N/A
Total, OPC	**1,700**	**1,700**	N/A
Contingency, OPC	*200*	*200*	*N/A*
Total, TPC	89,000	89,000	N/A
Total, Contingency (TEC+OPC)	*19,760*	*20,400*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	6,150	10,000	20,000	—	51,150	87,300
	OPC	1,392	—	—	—	308	1,700
	TPC	7,542	10,000	20,000	—	51,458	89,000
FY 2026	TEC	6,150	10,000	10,000	9,400	51,750	87,300
	OPC	1,392	—	—	—	308	1,700
	TPC	7,542	10,000	10,000	9,400	52,058	89,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	TBD
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	1,100	1,100	55,000	55,000
Utilities	N/A	N/A	N/A	N/A
Maintenance and Repair	1,000	1,000	50,000	50,000
Total, Operations and Maintenance	2,100	2,100	105,000	105,000

7. D&D Information

This project replaces critical infrastructure components; no new construction area is anticipated to be constructed in this project, and it will not replace existing facilities.

	Square Feet
New area being constructed by this project at PPPL	None
Area of D&D in this project at PPPL	None
Area at PPPL to be transferred, sold, and/or D&D outside the project, including area previously “banked”	None
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously “banked”	None
Total area eliminated	None

8. Acquisition Approach

The PPPL Management and Operating (M&O) Contractor, Princeton University, is performing the acquisition for this project, overseen by the Princeton Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

20-SC-73, CEBAF Renovation and Expansion, TJNAF
Thomas Jefferson National Accelerator Facility, TJNAF
Project is for Design and Construction

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

Summary

The FY 2026 Request for the Continuous Electron Beam Accelerator Facility (CEBAF) Renovation and Expansion (CRE) project is $26,000,000. The preliminary Total Estimated Cost (TEC) range for this project is $46,600,000 to $99,500,000. The preliminary Total Project Cost (TPC) range for this project is $69,300,000 to $102,800,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is$90,300,000.

The CEBAF center at TJNAF has inadequate utility systems that are experiencing frequent failures. This project will renovate 95,000 to 247,000 gross square feet (gsf) of existing space in the CEBAF center and the Applied Research Center (ARC) space for visitors, users, research, education, and support and upgrade utility systems that are at the end of their useful life. To accommodate ongoing operations during the project, the renovation of the newly acquired ARC building will be executed prior to the CEBAF renovation.

On April 29, 2025, CEBAF was delegated to the Laboratory Director. Prior to that delegation, the project received DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on March 18, 2020.

Significant Changes

This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and is not a new start for FY 2026. The FY 2026 Request is the final year of funding and will support construction activities.

Critical Milestone History

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	7/20/18	10/16/19	3/18/20	TBD	TBD	TBD	TBD

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2026	TBD	TBD	2Q FY 2026

CD-3A – Approve start of construction activities in ARC.
CD-3B – Approve Start of Remaining Construction Activities in CEBAF

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	9,500	77,500	87,000	3,300	3,300	90,300
FY 2026	9,500	77,500	87,000	3,300	3,300	90,300

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

The scope of the CRE project will include renovating 95,000 to 247,000 gsf of office and laboratory space (including the renovation of the newly acquired ARC building) for 120 to 200 research, education, and support staff. The renovation will include reconfiguration to provide more functional, flexible, and efficient spaces that meet current code standards. CRE will replace the mechanical systems in the ARC and existing CEBAF Center, which have exceeded their service life and experienced multiple failures, with geothermal heat pump systems. The CRE project will be designed to account for projected changes in temperature and precipitation, energy and water efficiency, and enhanced monitoring of assets to reduce the risk of failure and outages. The renovated building will meet modern building performance standards. Upon completion, TJNAF will relocate administrative and support staff from the Service Support Center (SSC) (leased space) and CEBAF into the ARC, and will dedicate the CEBAF Center to scientific staff which will collectively and efficiently address functional workspace needs for TJNAF staff and users.

Justification

With nearly 1,600 users, TJNAF supports one of the largest nuclear physics user communities in the world. The expanded scientific scope associated with the 12 GeV upgrade (e.g., double the energy with simultaneous delivery to four experimental halls) is creating more and larger collaborations, requiring more technical workshops, and resulting in more visitors to the Laboratory. The Laboratory expects staff and the user population to increase by two percent per year for the next ten years and will soon exceed available space, which is already near capacity. Further, TJNAF is actively pursuing several large multi-program transfer projects such as the cryomodules and cryogenics plants for Linac Coherent Light Source (LCLS)-I, LCLS-II-High Energy, Facility for Rare Isotope Beams (FRIB), and the Utilities Upgrade Project (UUP) that will require additional staffing. TJNAF will continue to play a key role in the design and development of emerging SC initiatives.

Currently, TJNAF lacks technically equipped and functional space to accommodate advanced scientific research and major missions on the immediate horizon. The existing CEBAF Center is well beyond full capacity. The current occupant density of this building is 110 gsf per occupant which is significantly below the DOE standard of 180 gsf per occupant. In addition, utility systems at the CEBAF center are inadequate, failing, and inefficient for the existing usage.

As part of TJNAF's strategic campus plan, CRE will deliver more efficient, collaborative, and functional workspaces that consolidates the Laboratory workforce scattered over several leased buildings into a single center. The project consolidates workers currently housed in the ARC and SSC leased spaces to efficiently address functional workspace needs, allows leases to be discontinued, and reduces the cost to sustain existing buildings and infrastructure. This project will provide upgraded laboratories and additional space for visitors, users, research, education, and support especially for new science capabilities such as 12 GeV and upcoming Electron Ion Collider (EIC) at BNL.

Key Performance Parameters (KPPs)

The KPPs are preliminary and may change as the project matures. The KPPs will be finalized in accordance with TJNAF's plan for project execution. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of project completion.

Performance Measure	Threshold	Objective
CEBAF Center/ARC Renovation	95,000 gsf	247,000 gsf

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Estimated Cost (TEC)				
Design (TEC)				
Prior Years	8,000	8,000	5,359	—
FY 2024	1,000	1,000	1,794	—
FY 2025	500	500	1,700	—
FY 2026	—	—	647	—
Total, Design (TEC)	**9,500**	**9,500**	**9,500**	**—**
Construction (TEC)				
Prior Years	21,000	21,000	—	—
Prior Years - IRA Supp.	10,000	10,000	—	—
FY 2024	10,000	10,000	—	—
FY 2025	10,500	10,500	—	—
FY 2026	26,000	26,000	10,000	10,000
Outyears	—	—	57,500	—
Total, Construction (TEC)	**77,500**	**77,500**	**67,500**	**10,000**
Total Estimated Cost (TEC)				
Prior Years	29,000	29,000	5,359	—
Prior Years - IRA Supp.	10,000	10,000	—	—
FY 2024	11,000	11,000	1,794	—
FY 2025	11,000	11,000	1,700	—
FY 2026	26,000	26,000	10,647	10,000
Outyears	—	—	57,500	—
Total, Total Estimated Cost (TEC)	**87,000**	**87,000**	**77,000**	**10,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Prior Years	1,492	1,492	1,492	–

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Other Project Cost (OPC)				
Outyears	1,808	1,808	1,808	–
Total, Other Project Cost (OPC)	**3,300**	**3,300**	**3,300**	**–**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
Total Project Cost (TPC)				
Prior Years	30,492	30,492	6,851	–
Prior Years - IRA Supp.	10,000	10,000	–	–
FY 2024	11,000	11,000	1,794	–
FY 2025	11,000	11,000	1,700	–
FY 2026	26,000	26,000	10,647	10,000
Outyears	1,808	1,808	59,308	–
Total, TPC	90,300	90,300	80,300	10,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	8,500	8,500	N/A
Design - Contingency	1,000	1,000	N/A
Total, Design (TEC)	**9,500**	**9,500**	N/A
Construction	62,000	62,000	N/A
Construction - Contingency	15,500	15,500	N/A
Total, Construction (TEC)	**77,500**	**77,500**	N/A
Total, TEC	**87,000**	**87,000**	N/A
Contingency, TEC	*16,500*	*16,500*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	2,700	2,700	N/A
Conceptual Design	600	600	N/A
Total, Except D&D (OPC)	**3,300**	**3,300**	N/A
Total, OPC	**3,300**	**3,300**	N/A
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	90,300	90,300	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total, Contingency (TEC+OPC)	*16,500*	*16,500*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	39,000	11,000	11,000	—	26,000	87,000
	OPC	1,492	—	—	—	1,808	3,300
	TPC	40,492	11,000	11,000	—	27,808	90,300
FY 2026	TEC	39,000	11,000	11,000	26,000	—	87,000
	OPC	1,492	—	—	—	1,808	3,300
	TPC	40,492	11,000	11,000	26,000	1,808	90,300

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	TBD
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	288	288	14,400	14,400
Utilities	432	432	21,600	21,600
Maintenance and Repair	1,008	1,008	50,400	50,400
Total, Operations and Maintenance	1,728	1,728	86,400	86,400

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at TJNAF	up to 47,000
Area of D&D in this project at TJNAF	None
Area at TJNAF to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None[c]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	None

8. Acquisition Approach

The TJNAF Management and Operating (M&O) Contractor, Jefferson Sciences Associates, LLC, is performing the acquisition for this project, overseen by the Thomas Jefferson Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

[c] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

20-SC-77, Argonne Utilities Upgrade, ANL
Argonne National Laboratory, ANL
Project is for Design and Construction

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

Summary
The FY 2026 Request for the Argonne Utilities Upgrade (AU2) project is$1,500,000 of Total Estimated Cost (TEC) funding. The preliminary TEC range for this project is $172,000,000 to $290,250,000. The preliminary Total Project Cost (TPC) range for this project is $173,000,000 to $291,250,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is $216,000,000.

AU2 will revitalize and selectively upgrade ANL's existing major utility systems including steam, water, sanitary sewer, chilled water, and electrical systems.

On April 29, 2025, AU2 was delegated to the Laboratory Director. Prior to the delegation, the project received DOE Order 413.3B Critical Decision (CD)-3A, Approve Site Preparation, on September 14, 2023.

Significant Changes
This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and does not include a new start for FY 2026. FY 2026 funds will support construction activities.

Critical Milestone History

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
AU2 - Overall, ANL	5/17/19	10/30/20	7/1/21	4Q FY 2029	1Q FY 2030	4Q FY 2029	3Q FY 2035
AU2 - Chilled Water Plant , ANL	–	–	–	3Q FY 2030	3/15/24	3Q FY 2030	2Q FY 2034
AU2 - Steam Plant and Utility Piping, ANL	–	–	–	4Q FY 2032	4Q FY 2029	4Q FY 2032	3Q FY 2035

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

	Performance Baseline Validation	CD-3A
AU2 - Overall, ANL	4Q FY 2029	9/14/23
AU2 - Chilled Water Plant , ANL	3Q FY 2026	9/14/23
AU2 - Steam Plant and Utility Piping, ANL	4Q FY 2029	1Q FY 2032

CD-3A – Long Lead Procurements and Site Preparation Activities.

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	45,500	169,500	215,000	1,000	1,000	216,000
FY 2026	15,000	200,000	215,000	1,000	1,000	216,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

The preliminary scope of the AU2 project includes upgrading failing 1940s-era utilities across the ANL campus. These utilities include steam, water, sanitary sewer, chilled water, and electrical systems. To facilitate its execution, the AU2 project is comprised of two subprojects consisting of scope needed to achieve complete and usable assets. Subproject 1 is the Chilled Water and Utility Piping Upgrades and consists of site preparation and demolition, which was approved via CD-3A and will be followed by construction of a new chilled water plant when construction is authorized. Subproject 2 is the Steam and Utility Piping Upgrades and consists of modernization of an existing boiler, replacement and modernization of several major utility systems, including steam and condensate, domestic water, canal water, and sewer systems.

Justification

An efficient, maintainable, and reliable infrastructure is critical to the success and mission capability of ANL's research facilities. Revitalizing and upgrading the near century old major utility systems—including steam, water, sanitary sewer, chilled water, and electrical systems—is a mission need for ANL to overcome current limitations in meeting modern demands. For example, steam is a critical infrastructure for Argonne facilities; the Advanced Photon Source (APS) is dependent on the steam utility for holding extremely tight temperature and humidity ranges required for beam line operations and stability.

Improving the performance and resilience of utilities would not only allow major pieces of scientific equipment to operate more efficiently and effectively with modern engineered controls but also prevent catastrophic climate related damage to both buildings and equipment.

AU2 will reduce operational risks in critical infrastructure and utility support systems and provide more resilient, efficient, and sustainable general-purpose infrastructure. The project will include installation of a combination of data collection and monitoring systems that enable predicting failures and making adjustments that minimize impacts to mission critical scientific operations.

Key Performance Parameters (KPPs)

The KPPs are preliminary and may change as the project matures. The KPPs will be finalized in accordance with the M&O contractor's plan for project execution. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for project completion.

Performance Measure	Threshold	Objective
Chilled Water and Utility Piping Upgrades (Cooling Systems).	▪ Construct a new 6,300 ton chilled water plant with N+1 reliability.	▪ Upgrade equipment and controls at the 371, and 528 chilled water plants.

Performance Measure	Threshold	Objective
	▪ Modernize, replace, or construct new distribution piping for 5,000 linear feet of utility piping.	▪ Modernize fire domestic water tanks. ▪ Potential capacity upgrades, new equipment, equipment replacements, and various other utility system reliability projects to increase reliability of laboratory internal utilities.
Steam and Utility Piping Upgrades (Steam & Condensate, Water Supply, Sewer).	▪ Recapitalize one (1) existing boiler in Building 108. ▪ Modernize, replace or construct new distribution piping for 2,500 linear feet of utility piping.	▪ Recapitalize one additional boilers in Building 108. ▪ Modernize, replace or construct new distribution piping for up to 15,000 linear feet of utility piping and support structures (e.g., vaults, pipe supports, valves, culverts, etc.). ▪ Install between 50 and 250 new smart meters.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	11,000	11,000	5,200
FY 2024	—	—	1,427
FY 2025	—	—	2,000
Outyears	4,000	4,000	6,373
Total, Design (TEC)	**15,000**	**15,000**	**15,000**
Construction (TEC)			
Prior Years	8,000	8,000	—
FY 2024	8,007	8,007	2,250
FY 2025	3,000	3,000	—
FY 2026	1,500	1,500	—
Outyears	179,493	179,493	197,750
Total, Construction (TEC)	**200,000**	**200,000**	**200,000**
Total Estimated Cost (TEC)			
Prior Years	19,000	19,000	5,200
FY 2024	8,007	8,007	3,677
FY 2025	3,000	3,000	2,000
FY 2026	1,500	1,500	—

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Outyears	183,493	183,493	204,123
Total, Total Estimated Cost (TEC)	**215,000**	**215,000**	**215,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	1,000	1,000	1,000
Total, Other Project Cost (OPC)	**1,000**	**1,000**	**1,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	20,000	20,000	6,200
FY 2024	8,007	8,007	3,677
FY 2025	3,000	3,000	2,000
FY 2026	1,500	1,500	–
Outyears	183,493	183,493	204,123
Total, TPC	**216,000**	**216,000**	**216,000**

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	13,400	36,400	N/A
Design - Contingency	1,600	9,100	N/A
Total, Design (TEC)	**15,000**	**45,500**	N/A
Construction	162,600	135,600	N/A
Construction - Contingency	37,400	33,900	N/A
Total, Construction (TEC)	**200,000**	**169,500**	N/A
Total, TEC	**215,000**	**215,000**	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency, TEC	*39,000*	*43,000*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	1,000	1,000	N/A
Total, Except D&D (OPC)	**1,000**	**1,000**	N/A
Total, OPC	**1,000**	**1,000**	N/A
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	**216,000**	**216,000**	N/A
Total, Contingency (TEC+OPC)	*39,000*	*43,000*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	19,000	8,007	3,000	—	184,993	215,000
	OPC	1,000	—	—	—	—	1,000
	TPC	20,000	8,007	3,000	—	184,993	216,000
FY 2026	TEC	19,000	8,007	3,000	1,500	183,493	215,000
	OPC	1,000	—	—	—	—	1,000
	TPC	20,000	8,007	3,000	1,500	183,493	216,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	SP-1: 2Q FY 2034 SP2: 3Q FY 2035
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	SP-1: 2Q FY 2084 SP-2: 3Q FY 2085

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	2,955	2,955	147,750	147,750
Utilities	4,423	4,423	221,150	221,150
Maintenance and Repair	739	739	36,950	36,950
Total, Operations and Maintenance	8,117	8,117	405,850	405,850

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at ANL	20,221
Area of D&D in this project at ANL	10,473
Area at ANL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None[d]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	None

8. Acquisition Approach

The ANL Management and Operating (M&O) Contractor, UChicago Argonne, LLC, is performing the acquisition for this project, overseen by the Argonne Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

[d] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with the decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

20-SC-78, Linear Assets Modernization Project, LBNL
Lawrence Berkeley National Laboratory, LBNL
Project is for Design and Construction

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

Summary
The FY 2026 Request for the Linear Assets Modernization Project is $13,100,000 of Total Estimated Cost (TEC) funding. The preliminary TEC range for this project is $164,000,000 to $376,000,000. The preliminary Total Project Cost (TPC) range for this project is $170,000,000 to $386,000,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is $242,000,000.

LAMP will upgrade high priority utility systems to increase the reliability, capability, resilience, and safety of LBNL's infrastructure to meet DOE's mission. The project will upgrade utility systems, including, but not limited to, domestic water, natural gas, electrical, and communication.

On April 29, 2025, LAMP was delegated to the Laboratory Director. Prior to that delegation, the project received DOE Order 413.3B Critical Decision (CD) for LAMP, CD-1, Approve Alternative Selection and Cost Range, was approved on April 13, 2022.

Significant Changes
This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and is not a new start for FY 2026. The FY 2026 Request will support the activities of the design-build contractor. The M&O Contractor is in the process of executing the major subcontract to perform the work.

Due to the evolution of project execution, subprojects are no longer required to efficiently carry out the project.

Critical Milestone History

20-SC-78 Linear Assets Modernization Project, LBNL

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2026	5/17/19	4/13/22	4/13/22	TBD	TBD	TBD	TBD

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

20-SC-78 Linear Assets Modernization Project, LBNL

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2026	TBD	TBD

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

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	50,000	186,000	236,000	6,000	6,000	242,000
FY 2026	43,800	192,200	236,000	6,000	6,000	242,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

LAMP will upgrade the highest priority utility systems to increase the reliability, capability, and safety of LBNL's infrastructure to meet the DOE's mission. The utility systems include, but are not limited to, domestic water, natural gas, storm drain, sanitary sewer, electrical, and communication.

The project will aim to upgrade the most critical utility components considering operational risk and efficiencies, redundancy, utility bundling, and capacity needed for strategic growth, including expanding the primary electrical substation capacity at Grizzly Peak to power advanced supercomputing capability (NERSC-10) to full capacity and meet future lab power needs. LAMP will also implement a multi-system approach for the renewal and improvement of LBNL's utility assets, considering geographical limitations as well as potential synergies with nearby sustainment and improvement projects, that provide opportunities for enhancement. In addition to electrical expansion, the LAMP scope will upgrade multiple utility systems providing for overall increased reliability and ease of maintenance.

Justification

SC uses the capabilities of LBNL to execute 23 of the 24 core capabilities and the mission of multiple SC program offices, including ASCR, BER, BES, and HEP. The SC mission and multiple scientific programs require increased reliability, capability, and safety of LBNL's utility infrastructure. Utility infrastructure represents almost half of LBNL's large, deferred maintenance backlog and represents a significant capability gap in LBNL's ability to provide reliable and safe services to meet DOE's mission needs. Existing infrastructure is insufficient to support planned facility modernization and growth. Without a modern utility infrastructure backbone, future growth of the science mission at LBNL may not be achievable. For these reasons, direct infrastructure investment is necessary to address deferred maintenance reduction, restore operational reliability, increase resiliency, and provide the backbone necessary for scientific advancements.

LBNL has begun measures to strengthen the laboratory's resilience to outages due to planned safety outages or natural phenomena such as earthquakes, wildfires, and extreme weather.

LAMP will deliver modern and resilient general-purpose infrastructure which will be more efficient and sustainable. It will be designed to consider the best available and most efficient technology to enhance operations and maintenance of new systems and equipment and includes installation of a combination of data collection and monitoring systems that enable predicting failures and extreme weather events and adjusting in real time to minimize impacts to mission critical scientific operations. The initial stages of the project will enable an optimized NERSC-10 upgrade, which will play a central role in breakthrough science.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets.*

Key Performance Parameters (KPPs)
The KPPs are preliminary and may change as the project matures. The KPPs will be finalized in accordance with the M&O contractor's plan for project execution. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the baselined Threshold KPPs will be a prerequisite for project completion.

Performance Measure	Threshold	Objective
Storm Drainage System, Hydrauger/ Slope Stability	Install 1,000 Linear Feet of hydraugers.	Install up to 5,500 Linear Feet of hydraugers.
Sanitary Sewer	Install 150 Linear Feet of pipe.	Install up to 7,000 Linear Feet of pipe.
High Pressure City Water	Install new 12" ductile iron pipe (DIP) water main and remove existing main in the East Canyon Corridor.	Install new 12" DIP water main and remove existing main in the McMillan Corridor.
Communications & Data	Install 2,600 Linear Feet of ductbank.	Install up to 14,500 Linear Feet of ductbank with manholes and cables. (Lawrence Corridor).
Electrical Distribution/Grizzly Substation	Expand the Grizzly Substation to 70 MW capacity.	Expand the Grizzly Substation up to 150 MW capacity with two redundant lines with SCADA for new equipment.
		Provide a new SCADA Control Building.
		Provide two remote SCADA Control Rooms.
		Provide SCADA remote control and monitoring of existing and new circuit breakers.
		Install up to 400 Linear Feet of electrical feeders segregating lines 1 and 2 for SW-A1.
		Install SCADA for existing 115kV equipment.
	Install 2,700 Linear Feet of electrical feeders segregating lines 1 and 2.	Install up to 8,300 Linear Feet of electrical feeders segregating lines 1 and 2.
		Feed B59 (NERSC-10) with up to 80 MW of electrical power with 3,500 Linear Feet of redundant and segregated lines.

Performance Measure	Threshold	Objective
		Install up to 14,000 Linear Feet of electrical feeders and Pad Mounted Switches for electrical distribution loops, segregating lines 1 and 2.
		Provide up to 3 SCADA remote controls and monitoring of existing and new circuit breakers.
Natural Gas	Install 200 Linear Feet of pipe.	Install up to 5,500 Linear Feet of pipe. (Lawrence Corridor).
Compressed Air	Not Applicable	Install up to 7,500 Linear Feet of pipe.
Controls	Not Applicable	Install up to 150 Smart Meters for new wet utility construction.
		Provide integration with SCADA.
		Provide integration with Microgrid enhancement.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	29,400	29,400	5,832
FY 2024	1,000	1,000	3,158
FY 2025	13,400	13,400	3,500
FY 2026	—	—	16,000
Outyears	—	—	15,310
Total, Design (TEC)	**43,800**	**43,800**	**43,800**
Construction (TEC)			
Prior Years	5,425	5,425	—
FY 2024	17,900	17,900	—
FY 2025	11,600	11,600	—
FY 2026	13,100	13,100	25,000
Outyears	144,175	144,175	167,200
Total, Construction (TEC)	**192,200**	**192,200**	**192,200**
Total Estimated Cost (TEC)			
Prior Years	34,825	34,825	5,832
FY 2024	18,900	18,900	3,158
FY 2025	25,000	25,000	3,500
FY 2026	13,100	13,100	41,000
Outyears	144,175	144,175	182,510

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Total, Total Estimated Cost (TEC)	236,000	236,000	236,000

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	3,263	3,263	3,263
Outyears	2,737	2,737	2,737
Total, Other Project Cost (OPC)	6,000	6,000	6,000

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	38,088	38,088	9,095
FY 2024	18,900	18,900	3,158
FY 2025	25,000	25,000	3,500
FY 2026	13,100	13,100	41,000
Outyears	146,912	146,912	185,247
Total, TPC	242,000	242,000	242,000

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	37,250	38,500	N/A
Design - Contingency	6,550	11,500	N/A
Total, Design (TEC)	43,800	50,000	N/A
Construction	165,135	144,000	N/A
Construction - Contingency	27,065	42,000	N/A
Total, Construction (TEC)	192,200	186,000	N/A
Total, TEC	236,000	236,000	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Contingency, TEC	*33,615*	*53,500*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	2,610	N/A	N/A
Conceptual Design	2,190	2,610	N/A
Start-up	N/A	2,190	N/A
OPC - Contingency	1,200	1,200	N/A
Total, Except D&D (OPC)	**6,000**	**6,000**	N/A
Total, OPC	**6,000**	**6,000**	N/A
Contingency, OPC	*1,200*	*1,200*	*N/A*
Total, TPC	**242,000**	**242,000**	N/A
Total, Contingency (TEC+OPC)	*34,815*	*54,700*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	34,825	18,900	30,000	—	152,275	236,000
	OPC	3,263	—	—	—	2,737	6,000
	TPC	38,088	18,900	30,000	—	155,012	242,000
FY 2026	TEC	34,825	18,900	25,000	13,100	144,175	236,000
	OPC	3,263	—	—	—	2,737	6,000
	TPC	38,088	18,900	25,000	13,100	146,912	242,000

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2031
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	1,200	1,200	60,000	60,000
Utilities	12	12	600	600
Maintenance and Repair	3,000	3,000	150,000	150,000
Total, Operations and Maintenance	4,212	4,212	210,600	210,600

7. D&D Information

This project replaces critical infrastructure components; no new construction area is anticipated to be constructed in this project and it will not replace existing facilities.

	Square Feet
New area being constructed by this project at LBNL	None
Area of D&D in this project at LBNL	None
Area at LBNL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None[e]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	None

8. Acquisition Approach

The LBNL Management and Operating (M&O) Contractor, University of California, is performing the acquisition for this project, overseen by the Berkeley Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

[e] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with the decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC
SLAC National Accelerator Laboratory, SLAC
Project is for Design and Construction

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

Summary
The FY 2026 Request for the Critical Utilities Infrastructure Revitalization (CUIR) project is$10,000,000 of Total Estimated Cost (TEC) funding. The preliminary Total Estimated Cost (TEC) range for this project is $160,000,000 to $306,000,000. The preliminary Total Project Cost (TPC) range for this project is $165,000,000 to $311,000,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is $208,500,000.

The primary objective of this project is to close utilities infrastructure gaps, such as utility piping breaks, power fluctuations, faults, and cooling water interruptions, to support multi-program science missions at SLAC. Evolving technologies, instruments, experimental parameters, sensitivities, and complexity require increased reliability, resiliency, and service levels in electrical, mechanical, and civil systems site wide. The CUIR project will address the critical campus-wide utility and infrastructure issues by replacing, repairing, and modernizing the highest risk water/fire protection, sanitary sewer, storm drain, electrical, and cooling water system deficiencies. These needs have been identified through condition assessments, inspections, and recommendations from subject matter experts responsible for stewardship of the systems.

On April 29, 2025, CUIR was delegated to the Laboratory Director. Prior to that delegation, the project received DOE Order 413.3B approved Critical Decision (CD) is CD-3A, Approve Long-Lead Procurement and Early Site Preparation, which was approved on May 8, 2023.

Significant Changes
This Construction Project Data Sheet (CPDS) is an update to the FY 2024 CPDS and does not include a new start for FY 2025.
FY 2025 funds will support construction activities in accordance with SLAC's plan for project execution.

Critical Milestone History

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
CUIR - Overall, SLAC	5/17/19	4/15/21	1/21/22	3Q FY 2029	1Q FY 2029	3Q FY 2029	1Q FY 2035
CUIR - Critical Electrical Work, SLAC	–	–	–	3Q FY 2025	2Q FY 2025	3Q FY 2025	4Q FY 2029
CUIR - Linac Utilities and Equipment, SLAC	–	–	–	1Q FY 2029	4Q FY 2028	1Q FY 2029	4Q FY 2032
CUIR - Sitewide Utilities, SLAC	–	–	–	3Q FY 2029	1Q FY 2029	3Q FY 2029	1Q FY 2035

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

	Performance Baseline Validation	CD-3A
CUIR - Overall, SLAC	3Q FY 2029	5/8/23
CUIR - Critical Electrical Work, SLAC	–	5/8/23

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

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	13,000	191,000	204,000	4,500	4,500	208,500
FY 2026	27,706	176,294	204,000	4,500	4,500	208,500

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

CUIR's preliminary scope is to update major electrical gear, instrumentation, and cooling water systems for the two-mile long klystron gallery and accelerator housing constructed in 1962. Additionally, it will upgrade underground domestic water/fire protection, sanitary sewer, and storm drain systems site-wide. To facilitate its execution, CUIR is comprised of 3 subprojects to achieve complete and usable assets:

- Critical Electrical System Improvements: Subproject to replace and upgrade electrical components that present the greatest risk of failure or substandard performance of the Linac and associated Science projects.
- Critical Civil Utilities Replacement and Upgrade Subproject: Subproject to upgrade the storm drain, sanitary sewer and domestic/fire water piping along the Linac.
- Critical Mechanical Utilities Upgrade: Subproject will replace waveguide water heat exchangers, controls and pumps.

Justification

SLAC is currently implementing a Campus Strategy designed to support the DOE Science Mission, increase reliability, and minimize costs through safe, effective, resilient, and efficient operations.

Disruptions caused by power fluctuations, faults, and cooling water interruptions, and utility piping breaks have frequently impacted science research site wide. Electrical systems, pumps, and motors fail, valves on piping systems freeze, and there are inoperable or unsafe electrical components that require broad outages to respond and repair. Workarounds and administrative controls have been placed on existing equipment and systems because they are underrated, not operating as intended, or not designed/operational for today's science needs, which results in create tremendous inefficiencies and safety concerns, and sub-optimized operations.

The objective of the CUIR project is to reduce risks and close the capability gaps identified in SLAC's infrastructure assessments and surveys as they relate to storm water, sanitary sewer, domestic water/fire protection, electrical, and cooling water systems. The CUIR project will reduce operational risks in critical infrastructure and utility support systems for all science programs and will retire $18,000,000 in deferred maintenance. These existing reliability gaps will continue to impede operational efficiency, resilience, reliability, productivity, and competitive viability in science programs and other related science research breakthroughs until they are filled. The project will include installation of a combination of data collection and monitoring systems that enable predicting failures and other events affecting operations, to make adjustments that minimize impacts to mission critical scientific operations.

Key Performance Parameters (KPPs)
The KPPs are preliminary and may change as the project matures. The KPPs will be finalized in accordance with the M&O contractor's plan for project execution. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for project completion.

Performance Measure	Threshold	Objective
Subproject 1: Critical Electrical System Improvements		
	Install four (4) 12kV feeder cables and connect two feeders to final loads.*	Install eight (8) 12kV feeder cables and connect eight feeders to final loads.
	Install two (2) medium voltage switchgear at the MSS to allow feeder cable selection. *	None
	Install one (1) 230kV 60MVA (or larger) transformer. *	Install two (2) 230kV 65MVA transformers and four (4) fault current limitation equipment.**
	Install one (1) substation to provide 3.5MVA power*	None
	Install one (1) medium voltage switchgear at Sector 4 to allow feeder cable selection. *	None
	Replace monitoring equipment to provide monitoring and supervisory control input at eight (8) cubicles with one (1) integration hub, and one (1) Circuit Breaker Operating Remote Panel.	Replace monitoring equipment to provide monitoring and supervisory control input at fourteen (14) cubicles with one (1) integration hub, and one (1) Circuit Breaker Operating Remote Panel.
** Electrical equipment required to deliver noted threshold scope will be acquired upon approval of CD-3A.* *** Electrical equipment necessary to deliver noted objective scope, which may be acquired after approval of CD-3A to provide project team adequate time to integrate objective scope into Subproject 1 outage planning and construction schedule development.*		
Subproject 2: Critical Civil Utilities Replacement and Upgrades		
	Replace 12,000 linear feet of domestic/fire water piping. Install submeters, flow and pressure sensors at two (2) domestic water main branches.	Replace 18,000 linear feet of domestic/fire water piping. Install submeters, flow and pressure sensors at four (4) domestic water main branches.

Performance Measure	Threshold	Objective
	Replace 2,700 linear feet of water main, laterals, and valves. Install five (5) backflow preventors and five (5) fire hydrants. Install submeter flow and pressure sensors at one (1) domestic water key node.	None
	Replace 1,000 linear feet of sanitary sewer piping. Install sensors to measure sewage flow, Total Dissolved Solids (TDS) at two (2) effluent stations.	Install sensors to measure sewage flow, Total Dissolved Solids (TDS) at five (5) existing effluent stations.
	Replace or re-line 5,000 linear feet of storm drain piping.	Replace or re-line 10,000 linear feet of storm drain piping.
	Data Analytics Plan to enhance monitoring and operation performance for utility systems.	Data Analytics Plan to integrate substation and water-cooling system monitor output into recommended data-analytics platform.
	None	Replace and reconfigure medium-voltage equipment for four (4) Variable Voltage Substations (VVS) and replace low voltage gear at five (5) substations.
	None	Replace 4,500LF of 12kV cables in PEP region.
	None	Replace low voltage sections for ten (10) K-subs, ten (10) VVS and sixteen (16) Motor Control Centers (MCC).
Subproject 3: Subproject 3: Critical Mechanical Utilities Upgrades		
	Replace eleven (11) Waveguide water heat exchangers, controls, and pumps.	None
	Replace four (4) Klystron water heat exchangers, four (4) controls, and four (4) pumps.	Replace 1,000 KF of Klystron piping system.
	Replace eleven (11) Accelerator, Klystron, and Waveguide monitoring devices.	None
	Install two (2) natural gas main meters, replace six (6) existing BTU energy meter, and integrate each into data analytics platform.	Install four (4) main meters and eight (8) submeters for natural gas, replace twelve (12) energy BTU meters and integrate each into the data analytics platform.

Performance Measure	Threshold	Objective
	None	Replace ten (10) programmable logic controller (PLC) to provide Data Analytics input.
	None	Integrate substation and water-cooling system monitor output into data-analytics platform.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	12,856	12,856	5,150
FY 2024	6,000	6,000	1,906
FY 2025	—	—	3,000
FY 2026	—	—	5,000
Outyears	8,850	8,850	12,650
Total, Design (TEC)	**27,706**	**27,706**	**27,706**
Construction (TEC)			
Prior Years	22,069	22,069	2,821
FY 2024	24,000	24,000	4,827
FY 2025	20,000	20,000	15,000
FY 2026	10,000	10,000	35,000
Outyears	100,225	100,225	118,646
Total, Construction (TEC)	**176,294**	**176,294**	**176,294**
Total Estimated Cost (TEC)			
Prior Years	34,925	34,925	7,971
FY 2024	30,000	30,000	6,733
FY 2025	20,000	20,000	18,000
FY 2026	10,000	10,000	40,000
Outyears	109,075	109,075	131,296
Total, Total Estimated Cost (TEC)	**204,000**	**204,000**	**204,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	2,683	2,683	2,683
FY 2024	100	100	100
FY 2025	250	250	250
FY 2026	250	250	250
Outyears	1,217	1,217	1,217
Total, Other Project Cost (OPC)	4,500	4,500	4,500

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	37,608	37,608	10,654
FY 2024	30,100	30,100	6,833
FY 2025	20,250	20,250	18,250
FY 2026	10,250	10,250	40,250
Outyears	110,292	110,292	132,513
Total, TPC	**208,500**	**208,500**	**208,500**

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	24,600	11,300	N/A
Design - Contingency	3,106	1,700	N/A
Total, Design (TEC)	**27,706**	**13,000**	N/A
Construction	139,144	151,000	N/A
Construction - Contingency	37,150	40,000	N/A
Total, Construction (TEC)	**176,294**	**191,000**	N/A
Total, TEC	**204,000**	**204,000**	N/A
Contingency, TEC	*40,256*	*41,700*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	4,500	4,500	N/A
Total, Except D&D (OPC)	**4,500**	**4,500**	N/A

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total, OPC	4,500	4,500	N/A
Contingency, OPC	*N/A*	*N/A*	*N/A*
Total, TPC	208,500	208,500	N/A
Total, Contingency (TEC+OPC)	*40,256*	*41,700*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	34,925	35,075	20,000	—	114,000	204,000
	OPC	2,683	100	250	—	1,467	4,500
	TPC	37,608	35,175	20,250	—	115,467	208,500
FY 2026	TEC	34,925	30,000	20,000	10,000	109,075	204,000
	OPC	2,683	100	250	250	1,217	4,500
	TPC	37,608	30,100	20,250	10,250	110,292	208,500

Notes:
- *Funding estimates are preliminary as a formal baseline has not been established.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2035
Expected Useful Life	Average 30 years (based system)
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	8,673	8,673	260,176	260,176
Utilities	10,487	10,487	314,624	314,624
Maintenance and Repair	8,461	8,461	253,833	253,833
Total, Operations and Maintenance	27,621	27,621	828,632	828,632

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at SLAC	3000 gsf
Area of D&D in this project at SLAC	None
Area at SLAC to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None[f]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	None

8. Acquisition Approach

The SLAC Management and Operating (M&O) contractor, Stanford University, is performing the acquisition for this project, overseen by the Stanford Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project.

The Office of Science delegated Project Management Executive responsibilities to the National Laboratory Director. The project will be managed and delivered by the M&O Contractor. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process.

[f] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

20-SC-80, Utilities Infrastructure Project, FNAL
Fermi National Accelerator Laboratory, FNAL
Project is for Design and Construction

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

<u>Summary</u>
The FY 2026 Request for the Utilities Infrastructure Project (UIP) is$12,000,000 of Total Estimated Cost (TEC) funding. The preliminary Total TEC range for this project is $248,000,000 to $403,000,000. The preliminary Total Project Cost (TPC) range for this project is $252,000,000 to $411,000,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is $314,000,000.

This project will modernize and upgrade obsolete and deteriorated utilities infrastructure at Fermi National Accelerator Laboratory (FNAL) and provide resiliency, reliability, and increased safety of operations to ensure the infrastructure can continue supporting the Laboratory's scientific missions. Major elements include modernization of the existing central utility building including an expansion to provide a new chilled water capacity to support current and future chilled water capacity, hot water, and low conductivity water systems. Additionally, the Kautz Road substation will be modernized to enhance its reliability and reduce safety risks. Both the modernization of the central utility building and the electrical substation are scheduled for construction during FNAL's FY 2028–2030 Long Accelerator Shutdown. The balance of the project will revitalize aging linear utilities across the FNAL site including sanitary sewers, domestic water, industrial cooling water, natural gas, and electrical feeders and equipment is in the early planning stages.

The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-3A, Approve Long-Lead Procurements and Site Preparation Activities, which was approved for subprojects 1 and 2 on December 6, 2024.

A Federal Project Director with the appropriate certification level has been assigned to this project.

<u>Significant Changes</u>
This Construction Project Data Sheet (CPDS) is an update to the FY 2025 CPDS and is not a new start for FY2026. The
FY 2026 Request will support construction activities after the appropriate CD approvals.

<u>Critical Milestone History</u>

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
UIP - Overall, FNAL	5/17/19	–	2/23/22	3Q FY 2029	4Q FY 2030	3Q FY 2029	3Q FY 2034
UIP - New Chill Water Plant, Cent Utility Build Upgrades, FNAL	–	–	–	3Q FY 2026	2Q FY 2025	3Q FY 2026	2Q FY 2031
UIP - Kautz Road Substation Replacement, FNAL	–	–	–	3Q FY 2026	2Q FY 2025	3Q FY 2026	1Q FY 2031
UIP - Linear Utilities, FNAL	–	–	–	3Q FY 2031	2Q FY 2031	3Q FY 2031	3Q FY 2034

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range; **Conceptual Design Complete** – Actual date the conceptual design was completed (if applicable); **CD-1** – Approve Alternative Selection and Cost Range; **CD-2** – Approve Performance Baseline; **Final Design Complete** – Estimated/Actual date the project design will be/was complete(d); **CD-3** – Approve Start of Construction; **D&D Complete** – Completion of D&D work; **CD-4** – Approve Start of Operations or Project Closeout.

	Performance Baseline Validation	CD-3A
UIP - Overall, FNAL	3Q FY 2029	1Q FY 2025
UIP - New Chill Water Plant, Cent Utility Build Upgrades, FNAL	3Q FY 2026	12/6/24
UIP - Kautz Road Substation Replacement, FNAL	3Q FY 2026	12/6/24
UIP - Linear Utilities, FNAL	3Q FY 2031	4Q FY 2029

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

Project Cost History

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2025	40,750	269,250	310,000	4,000	4,000	314,000
FY 2026	48,950	261,050	310,000	4,000	4,000	314,000

Notes:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

2. Project Scope and Justification

Scope

UIP's preliminary scope includes upgrading the highest risk major utility systems across the FNAL campus. Specifically, this project will first evaluate and identify the condition and risks of failure and inadequate performance of the industrial cooling water system, potable water distribution system, sanitary sewer and storm collection systems, natural gas distribution system, electrical distribution system, Kautz Road Substation, and the Central Utility Building. Selected portions of the systems with the highest risk of impact to operations will then be replaced or upgraded to assure safe, reliable, and efficient service to mission critical facilities. As such, the project will perform upgrades to obsolete, end-of-life components, which will increase capacity, reliability, and personnel safety for critical utilities. Long-lead procurements (e.g., mechanical, and electrical equipment) and site preparation was approved via a CD-3A, on 12/6/2024..

To facilitate its execution, UIP is comprised of three subprojects consisting of scope needed to achieve complete and usable assets. Subproject 1: the New Chilled Water Plant and Central Utility Plant Upgrades Subproject plans to 1) expand the existing Central Utility Building to provide chilled water capacity to support current and future loads, and 2) modernize the existing section of the Central Utility Building systems such as hot water and low conductivity water systems. Subproject 2: the Kautz Road Substation Replacement

Subproject plans to enhance the reliability of the Kautz Road Substation and reduce safety risks to personnel by replacing aging infrastructure, facilitating energy control, and reducing arc-flash incident energies. The primary construction phase of Subprojects 1 and 2 need to occur during FNAL's FY 2028–2030 Long Accelerator Shutdown to minimize disruption to the accelerator complex. Subproject 3: the Linear Utilities Replacement Subproject preliminary plans to revitalize aging linear utilities across the FNAL site including sanitary sewers, domestic water, industrial cooling water, natural gas, and electrical feeders and equipment. These improvements plan to enhance system reliability and reduce deferred maintenance.

Justification

DOE's Office of Science (SC) advances new experiments, international partnerships, and research programs to transform the understanding of nature and to advance U.S. energy, economic and national security interests. This mission requires the modernization and upgrades of obsolete and severely deteriorated utilities infrastructure at FNAL. SC has identified recapitalization of FNAL's Central Utilities Building and distributed site utility infrastructure to as a priority need ensure the stewardship of SC's investments and to provide modern, world-class facilities for scientific experiments and research.

Although there has been substantial investment in recent years to modernize and construct new research facilities at FNAL, much of FNAL's utility infrastructure serving these facilities is over 50 years old, is beyond useful life and suffering from failures, decreased reliability, lack of redundancy, and limitations in capacity. As such, there is an urgent need to revitalize and selectively upgrade FNAL's existing major utility systems to ensure reliable service, meet capacity requirements, and enable readiness of facilities critical to the research mission.

The UIP will reduce operational risks in critical enabling infrastructure and utility support systems and increase resilience, efficiency, reliability, productivity, and competitive viability in science programs. The project includes installation of a combination of data collection and monitoring systems that enable predicting failures and other events affecting operations and making adjustments to minimize impacts to mission critical scientific operations.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

Key Performance Parameters (KPPs)

The KPPs are preliminary and may change as the project continues towards CD-2. At CD-2 approval, the KPPs will be baselined. The Threshold KPPs represent the minimum acceptable performance that the project must achieve. The Objective KPPs represent the desired project performance. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
Chilled Water Plant and CUB Upgrades	• Construct an addition to CUB for chilled water production (5,000 tons cooling capacity) • Install chillers • Install arc-resistant switchgear • Install boilers to cover historical heating load of 11.4 MMBH, with natural gas boilers for emergency backup • Provide vibration monitoring of chillers, cooling towers, and pumps integrated with AI/ML predictive analytics	▪ Increase chilled water production to 6,000 tons cooling capacity. ▪ Upgrade chillers to magnetic bearing chillers ▪ Install heat recovery chillers to provide heating to Wilson Hall with electric boiler backup

Performance Measure	Threshold	Objective
Kautz Road Substation	▪ Replace the KRS Control House to improve arc flash safety requirements ▪ Replace bus duct ▪ Replace T-85 Transformer ▪ Replace 345kV Circuit Breaker	• Replace Harmonic Filter Components • Replace CCVTs, metering transformers
Linear Utilities Replacement	▪ Revitalize 5 miles of the Industrial Cooling Water system.	▪ Revitalize 16 miles of the Industrial Cooling Water system.
	▪ Revitalize 5 miles of the Domestic Water System (DWS).	▪ Revitalize 19 miles of the Domestic Water System (DWS).
	▪ Revitalize 3.5 miles of the Sanitary Sewer systems.	▪ Revitalize 11 miles of the Sanitary Sewer System.
	▪ Revitalize 2 miles of underground Natural Gas lines.	▪ Revitalize 22 miles of underground Natural Gas lines.
	▪ Revitalize 2 miles of electrical distribution feeders and associated unit substations, transformers, etc.	▪ Revitalize 65 miles of electrical distribution feeders and associated unit substations, transformers, etc. ▪ Provide Electrical Code upgrades to Master Substation ▪ Revitalize 100 percent of the High-Pressure Sodium exterior lights along sidewalks, roads, and parking lots with LED.

3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design (TEC)			
Prior Years	31,500	31,500	4,174
FY 2024	3,500	3,500	7,800
FY 2025	—	—	6,000
FY 2026	—	—	15,525
Outyears	13,950	13,950	15,451
Total, Design (TEC)	**48,950**	**48,950**	**48,950**
Construction (TEC)			
FY 2024	31,500	31,500	—
FY 2025	35,000	35,000	27,500
FY 2026	12,000	12,000	18,000

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Outyears	182,550	182,550	215,550
Total, Construction (TEC)	**261,050**	**261,050**	**261,050**
Total Estimated Cost (TEC)			
Prior Years	31,500	31,500	4,174
FY 2024	35,000	35,000	7,800
FY 2025	35,000	35,000	33,500
FY 2026	12,000	12,000	33,525
Outyears	196,500	196,500	231,001
Total, Total Estimated Cost (TEC)	**310,000**	**310,000**	**310,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Other Project Cost (OPC)			
Prior Years	2,050	2,050	2,050
Outyears	1,950	1,950	1,950
Total, Other Project Cost (OPC)	**4,000**	**4,000**	**4,000**

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Cost (TPC)			
Prior Years	33,550	33,550	6,224
FY 2024	35,000	35,000	7,800
FY 2025	35,000	35,000	33,500
FY 2026	12,000	12,000	33,525
Outyears	198,450	198,450	232,951
Total, TPC	**314,000**	**314,000**	**314,000**

4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design	42,750	33,500	N/A
Design - Contingency	6,200	7,250	N/A
Total, Design (TEC)	**48,950**	**40,750**	N/A
Construction	215,700	225,000	N/A
Construction - Contingency	45,350	44,250	N/A
Total, Construction (TEC)	**261,050**	**269,250**	N/A
Total, TEC	**310,000**	**310,000**	N/A
Contingency, TEC	*51,550*	*51,500*	*N/A*
Other Project Cost (OPC)			
Conceptual Planning	880	880	N/A
Conceptual Design	1,170	1,170	N/A
OPC - Contingency	1,950	1,950	N/A
Total, Except D&D (OPC)	**4,000**	**4,000**	N/A
Total, OPC	**4,000**	**4,000**	N/A
Contingency, OPC	*1,950*	*1,950*	*N/A*
Total, TPC	**314,000**	**314,000**	N/A
Total, Contingency (TEC+OPC)	*53,500*	*53,450*	*N/A*

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2024	FY 2025	FY 2026	Outyears	Total
FY 2025	TEC	31,500	45,000	45,000	—	188,500	310,000
	OPC	2,050	—	—	—	1,950	4,000
	TPC	33,550	45,000	45,000	—	190,450	314,000
FY 2026	TEC	31,500	35,000	35,000	12,000	196,500	310,000
	OPC	2,050	—	—	—	1,950	4,000
	TPC	33,550	35,000	35,000	12,000	198,450	314,000

Notes:
- *This project has not received CD-2 approval; therefore, funding estimates are preliminary.*
- *Other Project Costs (OPC) are funded through laboratory overhead.*

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	3Q FY 2034
Expected Useful Life	30 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	287	287	8,610	8,610
Utilities	577	577	17,310	17,310
Maintenance and Repair	287	287	8,610	8,610
Total, Operations and Maintenance	1,151	1,151	34,530	34,530

7. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at FNAL	10,000 – 30,000
Area of D&D in this project at FNAL	None
Area at FNAL to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None[g]
Area of D&D in this project at other sites	None
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	None
Total area eliminated	None

8. Acquisition Approach

The FNAL Management and Operating (M&O) contractor, FNAL Research Alliance LLC, will perform the acquisition for this project, overseen by the FNAL Site Office. The M&O contractor is responsible for awarding and managing all subcontracts related to this project. Project performance metrics will be performed by in-house management and Project Controls. SC will evaluate the M&O contractor's performance through the annual laboratory performance appraisal process

SC and the M&O will draw from lessons learned from other SC projects and other similar facilities in planning and executing the project.

[g] With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

Safeguards and Security

Overview

The Office of Science (SC) Safeguards and Security (S&S) program is designed to ensure critical Federally-mandated security measures are in place to protect the array of government and national security assets entrusted to SC. These assets are vital to accomplishing the SC mission of basic research in key scientific fields such as physics, materials science, computing, and chemistry, as well as fundamental scientific research related to energy.

Potential threats to SC high-consequence assets come from an array of evolving sources that the DOE's Office of Intelligence/Counterintelligence, National intelligence agencies, and local law enforcement agencies follow, to include transnational terrorists, domestic terrorists, criminals, disgruntled employees, malevolent insiders motivated for financial or ideological reasons, and foreign national visitors with the malicious intent of performing espionage.

The security measures employed at each of the 10 Science National Laboratories and three federal sites are based on National and DOE requirements. The requirements are solidified in DOE policies approved by the Secretary or Deputy Secretary of Energy and reflect the Department's level of acceptable protection and risk. Failure to implement these requirements degrades security and increases National security risk, such as unauthorized access to facilities and information, and unauthorized use of weapons-grade special nuclear material and radiological materials. SC ensures these policies are formally incorporated in the contracts at each of the SC sites and Federal line management provides oversight to ensure implementation is cost efficient and achieves the required level of security performance.

Accomplishing the full scope of security operations to support the SC mission depends on providing physical security tools, processes, and cyber security controls that will mitigate current and future threats to the laboratories' employees, nuclear and special nuclear materials, classified and sensitive information, hazardous materials, mission essential functions and facilities, using risk-based decision processes. To counter these threats and support operations, the physical security program continually looks to decrease reliance on human-based protection services and leverage the latest security technologies and tactics, to include artificial intelligence (AI) systems and software, to enhance program performance and effectiveness in addressing new and emerging threats. The SC S&S program also provides funding for cybersecurity for the laboratories' information technology systems to protect SC mission systems, computers, networks, and data from unauthorized access and virtual incursion from many of these same threats.

Accomplishing the security mission is heavily reliant on SC sites employing security professionals in a wide range of technical security disciplines. The suite of security professionals at the sites includes specialists in nuclear material control and accounting; advanced security systems and centralized alarm monitoring stations; classified and unclassified controlled information handling and marking; personnel vetting, to include employees and foreign visitors; protective forces training and highly qualified security officers; a broad range of technical experts in varying cybersecurity disciplines; and security management and assurance. Across the 10 laboratories and three SC federal facilities, there are nearly 550 physical security and 170 cyber professionals supporting the SC mission. Congressional security direct funding is vital to sustain the services of these security professionals as approximately 90 percent of the physical security funding is currently labor based. The SC security workforce represents one of the most labor efficient workforces in DOE/NNSA based on the number of sites under the purview of SC (reference the DOE Security Crosscut). Additionally, across all of SC, the security workforce is responsible for the protection of over 20,000 acres, 1,500 buildings, and a combined laboratory workforce population exceeding 94,000 (including guest researchers, users, employees, etc.). While the security workforce is efficient, it must also be postured to scale in the out-years in order to meet emerging requirements and the rapidly expanding scientific mission at each of the SC sites. The latter includes more assets, facilities, and a growing workforce. Based on projected increased costs for IT and Cyber related services and applications, along with mandated requirements for Zero Trust, CUI, the transfer of CDM (Continuous Diagnostics and Mitigation) costs from OCIO to SC, and the stand-up of a SOC (Security Operations Center) to support the Office of Science, current requirements also continue to increase for cybersecurity. The FY 2026 Request remains flat with the FY25 Enacted budget. This profile will enable the program to continue to meet current requirements but will inhibit development of innovative technology solutions and delay divestment of legacy systems and processes that could potentially realize savings in the future.

Highlights of the FY 2026 Request

The S&S FY 2026 Request for S&S is $190.0 million, which is flat with FY 2025 Enacted level. This budget will cover resource annual labor rate increases, and hence, the sustainment of the nearly 550 physical security professionals. The remaining balance will support the replacement of highest priority end of life security systems across the 13 SC laboratories and sites.

The FY 2026 Request includes $82.5 million in Cybersecurity to help address long-standing gaps in IT infrastructure, operations, and compliance to ensure adequate detection, response, protection, identification and recovery from cyber intrusions and attacks against the 13 SC laboratories and sites. The FY 2026 Request supports the implementation of requirements set forth by the administration and congress for Multi-Factor Authentication (MFA) where feasible, Encryption of data both at rest and in transit, Cloud Strategy/Security, Improved Logging, Supply Chain Management, and Zero Trust Infrastructure to address the continued attacks on our IT infrastructure by increasingly more sophisticated adversaries both from traditional adversaries, but also from adversaries attempting to profit from intellectual property at the Labs to the Personally Identifiable Information (PII) of DOE personnel.

Description

The S&S program is organized into seven program elements:

1. Protective Forces
2. Security Systems
3. Information Security
4. Cybersecurity
5. Personnel Security
6. Material Control and Accountability
7. Program Management

<u>Protective Forces</u>

The Protective Forces program element supports security officers that control access and protect S&S interests, along with their related equipment and training. Protective Forces at SC laboratories and facilities, and their coordinated efforts with federal and local law enforcement agencies, are our first line of defense against any violent attack against DOE personnel, contractors, and visitors. Activities within this program element include access control and security response operations as well as physical protection of the Department's critical assets and SC facilities. The Protective Force response and deployment configurations at SC laboratories reflect some of the most advanced tactical operator skills within the US government (e.g., the armed security police officers protecting Building 3019 at ORNL), which are necessary due to the inherent consequences of protecting weapons grade nuclear materials, critical program assets, and classified information. Additionally, the Protective Forces mission includes providing effective response to emergency situations, prohibited article inspections, security alarm monitoring, and performance testing of the Protective Force response to various event scenarios.

<u>Security Systems</u>

Detection and delay of potential threats at SC facilities is made possible by security systems that provide SC sites with advanced notification to save lives and protect DOE property, classified information, and other national security assets. The Security Systems program element provides the backbone of the physical protection of Departmental personnel, material, equipment, property, and facilities. Systems currently deployed at SC sites include, but are not limited to, Homeland Security Presidential Directive 12 (HSPD-12) and local credentials, entry control points, fences, barriers, lighting, sensors, surveillance devices, access control systems, and power systems. In addition, the continued use of AI-based technologies provides further enhance performance with respect to sites' abilities to detect, identify, track, and classify physical security threats, to include people and vehicles, at and within the site perimeter (e.g., the advanced AI-based video analytics used at Laboratories such as Argonne National Laboratory and Lawrence Berkeley National Laboratory).

Information Security

The Information Security program element provides support to ensure that sensitive and classified information is accurately, appropriately, and consistently identified, reviewed, marked, protected, transmitted, stored, and ultimately destroyed. Specific activities within this element include management, planning, training, and oversight for maintaining security containers and combinations, marking documents, and administration of control systems, operations security, special access programs, technical surveillance countermeasures, and classification and declassification determinations. In particular, the classification area of this program element has experienced a significant increase in the volume of work because of SC's growth in national security activities and federal requirements to digitize millions of pages of scientific working documents, which must first undergo a classification review.

Cybersecurity

The Cybersecurity program element develops and maintains a comprehensive program for ten national laboratories and three dedicated offices. There are numerous advanced persistent threats (APTs) with the goals of disrupting vital DOE SC missions and stealing critical research intellectual property in the areas of Artificial Intelligence, Material Science, High Performance Computing, and Basic Energy Science. The risks from these APTs include not only disrupting the missions of SC and stealing intellectual property, but also acquiring PII of the members of both the Federal and contractor workforce. This program element's goals are to enable mission and science, align cyber funding for risk reduction, strengthen security posture by embracing new security designs, and offer unified guidance and cybersecurity procedures. The Cybersecurity program element responds to cyber incidents by supporting the activities needed for incident management, prosecution, and investigation of cyber intrusions. The program element supports both disaster recovery and incident recovery, as well as notifications within the cybersecurity community. Based on Departmental directives, the SC cybersecurity program management, site initiatives, and IT infrastructure management comprise the final component of the cybersecurity program element.

The increasing costs of cybersecurity tools limit the pace at which SC can reach full adherence to congressional and OMB cyber and IT requirements.

Personnel Security

The Personnel Security program element is critical to identification of predictors of potentially dangerous or destructive behavior and encompasses the processes for employee suitability and security clearance determinations at each site to ensure that individuals are trustworthy and eligible for access to DOE facilities, IT networks, and classified information or material. This also includes the new Federally mandated requirements for continuous evaluations, which generates thousands of additional Federal adjudications on a monthly basis. Additionally, this program element addresses the process of vetting the uncleared contractor workforce that have physical and/or logical access to federal facilities, information, and personnel. This element also includes the management of security clearance programs, adjudications, security education, and awareness programs for Federal and contractor employees. The Personnel Security program element also manages the Human Reliability Program to ensure individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability. The program processes the large number of foreign visitors that engage with the 10 Science laboratories to mitigate Nation State information and intelligence collection efforts.

Material Control and Accountability (MC&A)

The MC&A program element provides assurance that Departmental materials are properly controlled and accounted for at all times. This performance of this program element includes, but is not limited to, testing performance and assessing the levels of protection, control, and accountability required for the types and quantities of materials at each facility; documenting facility plans for materials control and accountability; assigning authorities and responsibilities for MC&A functions; and establishing programs to detect and report occurrences such as material theft, the loss of control or inability to account for materials, or evidence of malevolent acts.

Program Management

The Program Management program element functionally integrates the S&S Program, including Protective Forces, Security Systems, Information Security, Personnel Security, and MC&A to achieve and ensure appropriate levels of security are in place through performance assurance activities such as self-assessments, maintenance, and performance testing. In addition, this program element includes the performance of vulnerability and/or risk assessments, which provide a technical basis for the integrated security program at the site and the acceptance of any associated residual risk.

Safeguards and Security
Funding

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Safeguards and Security				
Protective Forces	53,911	57,732	57,908	+176
Security Systems	27,012	21,068	20,227	-841
Information Security	5,830	5,830	5,804	-26
Cybersecurity	82,497	82,497	82,497	–
Personnel Security	9,327	10,553	10,794	+241
Material Control and Accountability	3,054	3,494	3,767	+273
Program Management	8,369	8,826	9,003	+177
Total, Safeguards and Security	190,000	190,000	190,000	–

Safeguards and Security
Explanation of Major Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Safeguards and Security	**$190,000**	**$190,000**	**$—**
Protective Forces	$57,732	$57,908	+$176
Funding continues support for security officers and their required equipment, and at some sites, advanced armament specifically analyzed and required to combat advanced threats to our weapons grade nuclear materials. Additionally, funding supports training for these perishable skills; thereby, ensuring the readiness of our security officers at all SC laboratories.		The Request will maintain support for security officers and their required equipment, and at some sites, advanced armament specifically analyzed and required to combat advanced threats to our weapons grade nuclear materials. Additionally, the Request will support training for these perishable skills, thereby ensuring the readiness of our security officers at all SC laboratories.	Funding will support sustained levels of operations and training at increased overhead, inflation, and contractually obligated Cost of Living Adjustments for Protective Forces.
Security Systems	$21,068	$20,227	-$841
Funding continues support for the security systems in place as well as continued implementation of security modifications and enhancements that support the deterrence, sensing, and assessment of an array of threats to our range of assets.		The Request will maintain support for the security systems in place as well as continued implementation of security modifications and enhancements that support the deterrence, sensing, and assessment of an array of threats to our range of assets.	Funding will address sustained levels of operations at increased overhead and inflation rates. Additionally, the funding supports the replacement of highest priority end of life security across the 13 SC sites.
Information Security	$5,830	$5,804	-$26
Funding continues support for the personnel, equipment, training, and systems necessary to ensure the growing SC mission and associated sensitive and classified information is safeguarded at SC laboratories.		The Request will maintain support for the personnel, equipment, training, and systems necessary to ensure the growing SC mission and associated sensitive and classified information is safeguarded at SC laboratories.	Funding will support sustained levels for Information Security activities at increased overhead and inflation rates.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Cybersecurity	$82,497	$82,497	$ —
Funding supports 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. Additionally, funding continues the implementation of Executive Order 14028 requirements at both federal and Management & Operating sites to build out Maximum MFA, Maximum Encryption, Cloud Strategy/Security, Improved Logging and Supply Chain Management, Zero Trust Infrastructure, Secure Critical Software, Controlled Unclassified Information cyber protections, participate in the Department of Homeland Security Continuous Diagnostics and Monitoring program, build out Industrial Control Systems protections, and protect Government Furnished Equipment on foreign travel.		The Request 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. Additionally, the Request will continue implementation of Executive Order 14028 requirements at both federal and Management & Operating sites to build out Maximum MFA, Maximum Encryption, Cloud Strategy/Security, Improved Logging and Supply Chain Management, Zero Trust Infrastructure, Secure Critical Software, Controlled Unclassified Information cyber protections, participate in the Department of Homeland Security Continuous Diagnostics and Monitoring program, build out Industrial Control Systems protections, and protect Government Furnished Equipment on foreign travel.	Funding will support sustained efforts to continue implementing Executive Order 14028 requirements to include Zero Trust Infrastructure at increased overhead and inflation rates.
Personnel Security	$10,553	$10,794	+$241
Funding continues support for processing of clearances and the vetting of uncleared personnel of the large workforce at SC laboratories as well as SC Headquarters security investigations. Also, funding continues to support the processing of the large number of foreign visitors that engage with the 10 Science laboratories, which is vital to thwarting known Nation State information and intelligence collection efforts.		The Request will continue support for processing of clearances and the vetting of uncleared personnel of the large workforce at SC laboratories as well as SC Headquarters security investigations. Also, the Request will support the processing of the large number of foreign visitors that engage with the 10 Science laboratories, which is vital to thwarting known Nation State information and intelligence collection efforts.	Funding will provide sustained support for personnel security at increased overhead and inflation rates.

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Material Control and Accountability	$3,494	$3,767	+$273
Funding continues to support functions ensuring Departmental materials are properly controlled and accounted for at all times and to detect and report occurrences such as material theft, the loss of control or inability to account for materials, or evidence of malevolent acts.		The Request will continue to support functions ensuring Departmental materials are properly controlled and accounted for at all times and to detect and report occurrences such as material theft, the loss of control or inability to account for materials, or evidence of malevolent acts.	Funding will provide sustained support for MC&A activities at increased overhead and inflation rates.
Program Management	$8,826	$9,003	+$177
Funding continues support for oversight, administration, analysis, and planning for security programs at SC laboratories and provides integration of all security elements and security procedures protecting SC Research missions. In addition, funding ensures all security programs and elements continue to perform as designed through on-going testing and assurance activities.		The Request will continue support for oversight, administration, analysis, and planning for security programs at SC laboratories and provides integration of all security elements and security procedures protecting SC Research missions. In addition, the Request will ensure all security programs and elements will continue to perform as designed through on-going testing and assurance activities.	Funding will provide sustained support for Program Management activities at increased overhead and inflation rates.

Program Direction

Overview

The Office of Science (SC) Program Direction (PD) budget supports the highly skilled federal workforce needed to develop and oversee SC investments and Administration priorities in basic research on advanced computing, cybersecurity, quantum information sciences, artificial intelligence and machine learning (AI/ML), critical materials, fusion energy, isotope research and production, and construction and operation of scientific user facilities, all critical for the American scientific enterprise.

SC continues to employ and contract with sophisticated and experienced scientific and technical program and project managers, as well as experts in acquisition, finance, legal, construction management, and environmental, safety, and health oversight. SC continues to update its business processes for awards management and research related activities to meet to the priorities of the Administration.

<u>Headquarters</u>

The SC Headquarters (HQ) includes the six Science program offices (Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics), Isotope R&D and Production, Workforce Development for Teachers and Scientists, Project Assessment, and Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Offices, as well as several human resource (HR) management functions including Shared Service Center (SSC), and HQ-based field management functions.

<u>Consolidated Service Center</u>

The Consolidated Service Center (CSC) provides business management to support SC's federal responsibilities, including financial management and grant and contract processing.

<u>Site Offices</u>

SC Site Offices provide contract management and critical support for the scientific mission execution at the ten SC national laboratories. This includes day-to-day business management; approvals to operate hazardous facilities; safety and security oversight; leases; property transfers; sub-contracts; and activity approvals required by laws, regulations, and DOE policy.

<u>Office of Scientific and Technical Information</u>

Office of Scientific and Technical Information (OSTI) fulfills the Department's statutory responsibilities for providing public access to the unclassified results of its research investments and limited access to classified research results. DOE-funded researchers produce over 50,000 research publications, datasets, software, and patents annually. OSTI's publicly accessible databases exceed 4 million research outputs from the 1940s to the present, providing accountability for and transparency to the results of DOE's research investments.

Highlights of the FY 2026 Request

The PD FY 2026 Request is $226.8 million, which is flat with the FY 2025 Enacted level and will support a total level of approximately 600 full-time equivalents (FTEs). The Request focuses on SC's federal staff at Headquarters and in the Field to meet the challenges of the significant increase in workload associated with the broad scope of emerging science and technology, new security requirements, improved oversight, innovative outreach and communication, and the incorporation of data analytics into existing business systems. The Request supports the cost associated with the move of federal staff in the CSC out of the Federal Building to a new location in Oak Ridge, Tennessee per GSA instructions. The Request also supports SC portion of the new DOE initiative of Trusted Workforce. SC will continue to review, analyze, and prioritize mission requirements and identify those organizations and functions aligning with Administration and Department program objectives and SC strategic goals.

Program Direction
Funding

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Program Direction				
Salaries and Benefits	172,141	175,070	161,621	-13,449
Travel	4,400	2,000	2,500	+500
Support Services	28,137	27,051	35,500	+8,449
Other Related Expenses	14,943	15,500	20,000	+4,500
Working Capital Fund	7,210	7,210	7,210	–
Total, Program Direction	**226,831**	**226,831**	**226,831**	**–**
Federal FTE	825	825	600	-225

Program Direction

Activities and Explanation of Changes

(dollars in thousands)

FY 2025 Enacted		FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
Program Direction	**$226,831**	**$226,831**	**$ —**
Salaries and Benefits	$175,070	$161,621	-$13,449
Funding supports salaries and benefits costs associated with 825 FTEs to perform scientific oversight, program and project management, essential operations support associated with science program portfolio management, and support for the Office of the Chief Human Capital Officer operating the SSC and supporting HR Advisory Offices.		The Request will support salaries and benefits costs associated with 600 FTEs to perform scientific oversight, program and project management, essential operations support associated with science program portfolio management, and support for the Office of the Chief Human Capital Officer operating the SSC and supporting HR Advisory Offices.	The Request will support the FTE levels to meet the challenges of the significant increase in workload associated with increased mission demands.
Travel	$2,000	$2,500	+$500
Funding supports facility visits where the use of electronic telecommunications is not practical for mandated on-site inspections and facility operations reviews. Funding supports the PCAST advisory committee travel.		The Request will support facility visits where the use of electronic telecommunications is not practical for mandated on-site inspections and facility operations reviews. The Request will support the PCAST advisory committee travel.	The Request will support mission critical travel while continuing videoconferencing instead of travel, where possible.
Support Services	$27,051	$35,500	+$8,449
Funding supports select administrative and professional services including: support for the SBIR/STTR program; grants and contract processing and close-out activities; accessibility to DOE's corporate multi-billion dollar R&D program through information systems managed and administered by OSTI; travel processing; correspondence control; select reports or analyses directed toward improving the effectiveness, efficiency, and economy of services and processes; and safeguards and security oversight functions. Funding supports essential information technology		The Request will support select administrative and professional services including: support for the SBIR/STTR program; grants and contract processing and close-out activities; accessibility to DOE's corporate multi-billion dollar R&D program through information systems managed and administered by OSTI; travel processing; correspondence control; select reports or analyses directed toward improving the effectiveness, efficiency, and economy of services and processes; and safeguards and security oversight functions. The Request will support essential information technology	The Request will support the projected support service contract requirements to include move of the CSC staff out of the Federal Building to a new location in Oak Ridge, Tennessee, and SC's portion of the DOE Trusted Workforce initiative.

(dollars in thousands)

FY 2025 Enacted	FY 2026 Request	Explanation of Changes FY 2026 Request vs FY 2025 Enacted
infrastructure; necessary upgrades to SC's financial management system; ongoing operations, maintenance, and enhancement of information technology systems; and safety management support. Funding supports federal staff training and education to maintain appropriate certifications and update skills.	infrastructure; necessary upgrades to SC's financial management system; ongoing operations, maintenance, and enhancement of information technology systems; and safety management support. The Request will fund federal staff training and education to maintain appropriate certifications and update skills.	
Other Related Expenses $15,500	$20,000	+$4,500
Funding supports fixed requirements associated with rent, utilities, and telecommunications; building and grounds maintenance; computer/video maintenance and support; the purchasing, leasing and maintenance of IT equipment and systems to support customers' evolving needs; and site-wide health care units. It will also include miscellaneous purchases for supplies, materials, and subscriptions.	The Request will support fixed requirements associated with rent, utilities, and telecommunications; building and grounds maintenance; computer/video maintenance and support; the purchasing, leasing and maintenance of IT equipment and systems to support customers' evolving needs; and site-wide health care units. It will also include miscellaneous purchases for supplies, materials, and subscriptions.	The Request will support the projected fixed requirements for FY 2026.
Working Capital Fund $7,210	$7,210	$ —
Funding supports a portion of the SC contribution to the Working Capital Fund for business lines: building occupancy, copy services, supplies, printing and graphics, health services, corporate training services, mail and translation, pension studies, procurement management, and Program Management Career Development. SC research programs also will contribute to the Working Capital Fund.	The Request will support a portion of the SC contribution to the Working Capital Fund for business lines: building occupancy, copy services, supplies, printing and graphics, health services, corporate training services, mail and translation, pension studies, procurement management, and Program Management Career Development. SC research programs also will contribute to the Working Capital Fund.	No change.

Program Direction
Funding Detail

(dollars in thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 Request	FY 2026 Request vs FY 2025 Enacted
Technical Support				
System review and reliability analyses	1,450	1,670	1,670	–
Management Support				
Automated data processing	11,700	11,700	13,340	+1,640
Training and education	742	400	500	+100
Reports and analyses, management, and general administrative services	14,245	13,281	15,990	+2,709
Total, Management Support	**26,687**	**25,381**	**29,830**	**+4,449**
Total, Support Services	**28,137**	**27,051**	**31,500**	**+4,449**
Other Related Expenses				
Rent to GSA	875	900	1,000	+100
Rent to others	2,300	2,300	2,400	+100
Communications, utilities, and miscellaneou s	3,600	4,050	4,150	+100
Other services	1,000	1,835	1,850	+15
Operation and maintenance of facilities	1,400	1,610	1,845	+235
Supplies and materials	675	675	675	–
Equipments	5,093	4,130	8,080	+3,950
Total. Other Related Expenses	**14,943**	**15,500**	**20,000**	**+4,500**
Working Capital Fund	7,210	7,210	7,210	–

Public Access

The Department of Energy fulfills Legislative and Executive requirements to provide public access to outputs resulting from DOE's research and development (R&D), including journal article accepted manuscripts, technical reports, data, and software. DOE-funded R&D outputs are stewarded and made available by SC's Office of Scientific and Technical Information (OSTI). OSTI collects these outputs and descriptive information from national laboratories and grantees, provides long-term preservation, and makes them widely discoverable through OSTI search tools and by enabling indexing of this content by major commercial search engines.

In addition to existing Legislative requirements, Executive branch requirements were originally included in a 2013 Office of Science and Technology Policy (OSTP) memorandum which required peer-reviewed, journal article accepted manuscripts to be made publicly available and for each sponsoring research office to ensure funded research activities have an associated data management plan. In 2022, OSTP updated its public access guidance, requiring agencies to provide immediate access to accepted manuscripts, rather than the 12-month embargo in the 2013 memorandum; immediate access to data underlying publications as described in data management and sharing plans; and wide adoption of persistent identifiers (PIDs) for R&D outputs, awards, researchers, and organizations.

Building on the 2013 Public Access Plan, DOE published a new Plan[a] in June 2023 to address the expectations in the 2022 guidance memo. Implementation of the new plan is underway, which included revising and issuing DOE O 241.1C, "Scientific and Technical Information Management," with requirements for immediate access to accepted manuscripts, developing data management and sharing plans, and adoption of PIDs. These requirements will be specified in national labs' management and operating contracts and annual performance plans and in the terms and conditions of DOE financial assistance awards. DOE-funded researchers are required to submit accepted manuscripts, which are made publicly accessible via the official agency repository, DOE PAGES (Public Access Gateway for Energy and Science). DOE is among the top agencies implementing public access, with over 240,000 scholarly publications made publicly available in DOE PAGES (developed and hosted by OSTI) since 2014. DOE is also a federal government leader in assigning and using persistent identifiers to promote research transparency and reproducibility as well as research security. By expanding the use of PIDs for researchers, their outputs, and organizations, DOE will better enable identification of agency support for given investments, the scientists who conduct that research, the organizations they are associated with, and the R&D outputs stemming from that support.

[a] https://www.energy.gov/sites/default/files/2023-07/DOE%20Public%20Access%20Plan%202023%20-%20Final.pdf

DEPARTMENT OF ENERGY
Funding by Site Detail
TAS_0222 - Science - FY 2026
(Dollars in Thousands)

	FY 2024 Enacted	FY 2025 Enacted	FY 2026 President's Budget
Ames Laboratory			
Research - Basic Energy Sciences	15,240	15,240	13,345
Basic Energy Sciences	15,240	15,240	13,345
Research - High Energy Physics	1,645	700	700
High Energy Physics	1,645	700	700
21-SC-73, Ames Infrastructure Modernization	8,000	0	0
Construction - Science Laboratories Infrastructure	8,000	0	0
Science Laboratories Infrastructure	8,000	0	0
Safeguards and Security - SC	1,210	1,477	1,477
Total Ames Laboratory	**26,095**	**17,417**	**15,522**
Ames Site Office			
Program Direction - SC	762	887	904
Total Ames Site Office	**762**	**887**	**904**
Argonne National Laboratory			
Research - Advanced Scientific Computing Research	229,338	225,984	233,093
Advanced Scientific Computing Research	229,338	225,984	233,093
Research - Basic Energy Sciences	264,296	296,708	289,755
Basic Energy Sciences	264,296	296,708	289,755
Research - Biological & Environmental Research	48,745	50,305	11,323
Biological and Environmental Research	48,745	50,305	11,323
Research - Fusion Energy Sciences	700	750	215
Fusion Energy Sciences	700	750	215
Research - High Energy Physics	16,503	15,981	7,225
High Energy Physics	16,503	15,981	7,225
Research - Nuclear Physics	35,329	35,602	33,916
Nuclear Physics	35,329	35,602	33,916
Research - Accelerator R&D and Production	315	371	0
Accelerator R&D and Production	315	371	0
Facilities and Infrastructure (SLI)	6,530	13,837	0
20-SC-77, Argonne Utilities Upgrade, ANL	8,007	3,000	1,500
Construction - Science Laboratories Infrastructure	8,007	3,000	1,500
Science Laboratories Infrastructure	14,537	16,837	1,500
Safeguards and Security - SC	9,750	10,100	10,100
Total Argonne National Laboratory	**619,513**	**652,638**	**587,127**
Argonne Site Office			
Program Direction - SC	4,494	4,603	4,743
Total Argonne Site Office	**4,494**	**4,603**	**4,743**
Berkeley Site Office			
Program Direction - SC	3,537	3,688	4,165
Total Berkeley Site Office	**3,537**	**3,688**	**4,165**
Brookhaven National Laboratory			
Research - Advanced Scientific Computing Research	2,495	2,583	2,495
Advanced Scientific Computing Research	2,495	2,583	2,495
Research - Basic Energy Sciences	232,806	221,338	214,317
24-SC-12 NSLS-II Experimental Tools - III (NEXT-III)	2,556	5,500	0
Construction - Basic Energy Sciences	2,556	5,500	0
Basic Energy Sciences	235,362	226,838	214,317
Research - Biological & Environmental Research	19,067	21,927	10,507

Biological and Environmental Research	19,067	21,927	10,507
Research - Fusion Energy Sciences	2,409	2,409	0
Fusion Energy Sciences	2,409	2,409	0
Research - High Energy Physics	64,116	59,296	56,520
11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment	10,000	14,300	14,300
Construction - High Energy Physics	10,000	14,300	14,300
High Energy Physics	74,116	73,596	70,820
Research - Nuclear Physics	206,484	206,384	210,913
20-SC-52, Electron Ion Collider, BNL	95,000	82,500	82,500
Construction - Nuclear Physics	95,000	82,500	82,500
Nuclear Physics	301,484	288,884	293,413
Research - Accelerator R&D and Production	8,469	8,567	0
Accelerator R&D and Production	8,469	8,567	0
Facilities and Infrastructure (SLI)	0	11,200	11,918
Science Laboratories Infrastructure	0	11,200	11,918
Safeguards and Security - SC	13,589	14,674	14,674
Total Brookhaven National Laboratory	**656,991**	**650,678**	**618,144**

Brookhaven Site Office			
Program Direction - SC	4,908	5,043	5,266
Total Brookhaven Site Office	**4,908**	**5,043**	**5,266**

Chicago Operations Office			
Research - Fusion Energy Sciences	0	0	1,046
Fusion Energy Sciences	0	0	1,046
Total Chicago Operations Office	**0**	**0**	**1,046**

Consolidated Business Center			
Payment In Lieu of Taxes	5,004	0	0
Oak Ridge Landlord	6,910	0	0
Science Laboratories Infrastructure	11,914	0	0
Safeguards and Security - SC	5,790	0	0
Program Direction - SC	38,407	0	0
Total Consolidated Business Center	**56,111**	**0**	**0**

Consolidated Service Center - Tennessee			
Payment In Lieu of Taxes	0	5,119	5,119
Oak Ridge Landlord	0	7,032	7,032
Science Laboratories Infrastructure	0	12,151	12,151
Safeguards and Security - SC	0	6,012	6,287
Program Direction - SC	0	38,436	37,535
Total Consolidated Service Center - Tennessee	**0**	**56,599**	**55,973**

Fermi National Accelerator Laboratory			
Research - High Energy Physics	320,308	359,399	322,510
18-SC-42, Proton Improvement Plan II (PIP-II), FNAL	125,000	125,000	114,000
11-SC-40, Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment	241,000	236,700	236,700
Construction - High Energy Physics	366,000	361,700	350,700
High Energy Physics	686,308	721,099	673,210
Research - Accelerator R&D and Production	0	101	0
Accelerator R&D and Production	0	101	0
20-SC-80, Utilities Infrastructure Project, FNAL	35,000	35,000	12,000
Construction - Science Laboratories Infrastructure	35,000	35,000	12,000
Science Laboratories Infrastructure	35,000	35,000	12,000
Safeguards and Security - SC	6,149	6,333	6,333
Total Fermi National Accelerator Laboratory	**727,457**	**762,533**	**691,543**

Fermi Site Office			
Program Direction - SC	4,830	4,980	5,212
Total Fermi Site Office	**4,830**	**4,980**	**5,212**

Idaho National Laboratory			
Research - Basic Energy Sciences	2,100	2,100	1,680
Basic Energy Sciences	2,100	2,100	1,680
Research - Fusion Energy Sciences	2,800	1,500	470
Fusion Energy Sciences	2,800	1,500	470
Total Idaho National Laboratory	**4,900**	**3,600**	**2,150**

Idaho Operations Office			
Research - Basic Energy Sciences	369	369	369
Basic Energy Sciences	369	369	369
Total Idaho Operations Office	**369**	**369**	**369**

Lawrence Berkeley National Laboratory			
Research - Advanced Scientific Computing Research	250,952	266,298	265,541
Advanced Scientific Computing Research	250,952	266,298	265,541
Research - Basic Energy Sciences	204,270	223,615	208,438
18-SC-12, Advanced Light Source Upgrade (ALS-U), LBNL	57,300	50,000	50,000
Construction - Basic Energy Sciences	57,300	50,000	50,000
Basic Energy Sciences	261,570	273,615	258,438
Research - Biological & Environmental Research	187,545	189,864	125,074
Biological and Environmental Research	187,545	189,864	125,074
Research - Fusion Energy Sciences	1,750	1,386	2,651
Fusion Energy Sciences	1,750	1,386	2,651
Research - High Energy Physics	58,545	55,297	25,115
High Energy Physics	58,545	55,297	25,115
Research - Nuclear Physics	20,745	22,945	17,178
Nuclear Physics	20,745	22,945	17,178
Research - Accelerator R&D and Production	2,092	1,113	0
Accelerator R&D and Production	2,092	1,113	0
Facilities and Infrastructure (SLI)	5,815	0	8,000
20-SC-72, Seismic and Safety Modernization, LBNL	35,000	23,000	0
20-SC-78, Linear Assets Modernization Project, LBNL	18,900	25,000	13,100
19-SC-74, BioEPIC, LBNL	38,000	0	0
Construction - Science Laboratories Infrastructure	91,900	48,000	13,100
Science Laboratories Infrastructure	97,715	48,000	21,100
Safeguards and Security - SC	7,397	7,973	7,973
Total Lawrence Berkeley National Laboratory	**888,311**	**866,491**	**723,070**

Lawrence Livermore National Laboratory			
Research - Advanced Scientific Computing Research	3,047	3,174	3,047
Advanced Scientific Computing Research	3,047	3,174	3,047
Research - Basic Energy Sciences	712	712	498
Basic Energy Sciences	712	712	498
Research - Biological & Environmental Research	28,337	33,027	7,261
Biological and Environmental Research	28,337	33,027	7,261
Research - Fusion Energy Sciences	9,225	13,900	10,736
Fusion Energy Sciences	9,225	13,900	10,736
Research - High Energy Physics	1,880	1,402	1,197
High Energy Physics	1,880	1,402	1,197
Research - Nuclear Physics	2,712	2,712	1,456
Nuclear Physics	2,712	2,712	1,456
Research - Accelerator R&D and Production	1,016	1,095	0
Accelerator R&D and Production	1,016	1,095	0
Total Lawrence Livermore National Laboratory	**46,929**	**56,022**	**24,195**

Los Alamos National Laboratory			
Research - Advanced Scientific Computing Research	3,263	3,390	3,263
Advanced Scientific Computing Research	3,263	3,390	3,263
Research - Basic Energy Sciences	24,931	25,562	23,197
Basic Energy Sciences	24,931	25,562	23,197

Research - Biological & Environmental Research	39,653	40,396	4,259
Biological and Environmental Research	39,653	40,396	4,259
Research - Fusion Energy Sciences	1,750	2,900	2,144
Fusion Energy Sciences	1,750	2,900	2,144
Research - High Energy Physics	1,990	1,502	1,692
High Energy Physics	1,990	1,502	1,692
Research - Nuclear Physics	9,888	9,888	6,090
Nuclear Physics	9,888	9,888	6,090
Research - Accelerator R&D and Production	613	290	0
Accelerator R&D and Production	613	290	0
Total Los Alamos National Laboratory	**82,088**	**83,928**	**40,645**

National Renewable Energy Laboratory			
Research - Advanced Scientific Computing Research	1,963	1,963	535
Advanced Scientific Computing Research	1,963	1,963	535
Research - Basic Energy Sciences	9,303	9,328	6,576
Basic Energy Sciences	9,303	9,328	6,576
Research - Biological & Environmental Research	6,045	1,200	449
Biological and Environmental Research	6,045	1,200	449
Total National Renewable Energy Laboratory	**17,311**	**12,491**	**7,560**

Oak Ridge Institute for Science and Education			
Research - Biological & Environmental Research	2,715	2,788	1,029
Biological and Environmental Research	2,715	2,788	1,029
Research - Fusion Energy Sciences	0	850	0
Fusion Energy Sciences	0	850	0
Research - Nuclear Physics	455	0	0
Nuclear Physics	455	0	0
Safeguards and Security - SC	1,576	900	1,678
Total Oak Ridge Institute for Science and Education	**4,746**	**4,538**	**2,707**

Oak Ridge National Laboratory			
Research - Advanced Scientific Computing Research	261,643	266,937	273,986
Advanced Scientific Computing Research	261,643	266,937	273,986
Research - Basic Energy Sciences	440,997	446,266	443,523
24-SC-10, HFIR Pressure Vessel Replacement (PVR), ORNL	4,000	6,000	0
19-SC-14, Second Target Station (STS), ORNL	52,000	52,000	52,000
18-SC-11, Spallation Neutron Source Proton Power Upgrade (PPU), ORNL	15,769	0	0
Construction - Basic Energy Sciences	71,769	58,000	52,000
Basic Energy Sciences	512,766	504,266	495,523
Research - Biological & Environmental Research	100,035	88,646	26,187
Biological and Environmental Research	100,035	88,646	26,187
Research - Fusion Energy Sciences	38,277	34,770	4,866
14-SC-60, U.S. Contributions to ITER (U.S. ITER)	240,000	200,000	77,500
Construction - Fusion Energy Sciences	240,000	200,000	77,500
Fusion Energy Sciences	278,277	234,770	82,366
Research - High Energy Physics	1,660	2,207	1,450
High Energy Physics	1,660	2,207	1,450
Research - Nuclear Physics	11,972	11,972	6,264
Nuclear Physics	11,972	11,972	6,264
Research - Accelerator R&D and Production	62	234	0
Accelerator R&D and Production	62	234	0
Oak Ridge Nuclear Operations	46,000	46,000	46,000
Facilities and Infrastructure (SLI)	0	9,690	0
Science Laboratories Infrastructure	46,000	55,690	46,000
Safeguards and Security - SC	29,077	31,688	31,688
Total Oak Ridge National Laboratory	**1,241,492**	**1,196,410**	**963,464**

Oak Ridge National Laboratory Site Office			
Program Direction - SC	8,213	8,358	7,581

Total Oak Ridge National Laboratory Site Office	**8,213**	**8,358**	**7,581**

Office of Scientific and Technical Information			
Research - Fusion Energy Sciences	0	4	5
Fusion Energy Sciences	0	4	5
Safeguards and Security - SC	251	419	420
Program Direction - SC	12,632	12,261	11,941
Total Office of Scientific and Technical Information	**12,883**	**12,684**	**12,366**

Pacific Northwest National Laboratory			
Research - Advanced Scientific Computing Research	5,212	4,545	2,764
Advanced Scientific Computing Research	5,212	4,545	2,764
Research - Basic Energy Sciences	28,356	28,406	19,805
Basic Energy Sciences	28,356	28,406	19,805
Research - Biological & Environmental Research	146,729	139,711	64,074
24-SC-31, Microbial Molecular Phenotyping Capability (M2PC), PNNL	10,000	19,000	10,000
Biological and Environmental Research - Construction	10,000	19,000	10,000
Biological and Environmental Research	156,729	158,711	74,074
Research - Fusion Energy Sciences	850	1,500	2,383
Fusion Energy Sciences	850	1,500	2,383
Research - High Energy Physics	1,800	1,633	0
High Energy Physics	1,800	1,633	0
Research - Nuclear Physics	818	818	409
Nuclear Physics	818	818	409
Facilities and Infrastructure (SLI)	6,000	0	8,100
Science Laboratories Infrastructure	6,000	0	8,100
Safeguards and Security - SC	11,038	12,380	12,380
Total Pacific Northwest National Laboratory	**210,803**	**207,993**	**119,915**

Pacific Northwest Site Office			
Program Direction - SC	6,592	6,742	5,952
Total Pacific Northwest Site Office	**6,592**	**6,742**	**5,952**

Princeton Plasma Physics Laboratory			
Research - Fusion Energy Sciences	61,083	59,597	68,210
Fusion Energy Sciences	61,083	59,597	68,210
21-SC-71, Princeton Plasma Innovation Center, PPPL	15,000	30,000	34,600
21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL	10,000	10,000	9,400
Construction - Science Laboratories Infrastructure	25,000	40,000	44,000
Science Laboratories Infrastructure	25,000	40,000	44,000
Safeguards and Security - SC	3,645	4,524	4,524
Total Princeton Plasma Physics Laboratory	**89,728**	**104,121**	**116,734**

Princeton Site Office			
Program Direction - SC	2,302	2,463	2,197
Total Princeton Site Office	**2,302**	**2,463**	**2,197**

Sandia National Laboratories			
Research - Advanced Scientific Computing Research	14,912	15,495	14,912
Advanced Scientific Computing Research	14,912	15,495	14,912
Research - Basic Energy Sciences	25,928	26,690	21,685
Basic Energy Sciences	25,928	26,690	21,685
Research - Biological & Environmental Research	13,848	15,929	3,231
Biological and Environmental Research	13,848	15,929	3,231
Research - Fusion Energy Sciences	1,600	2,285	1,197
Fusion Energy Sciences	1,600	2,285	1,197
Research - High Energy Physics	100	85	50
High Energy Physics	100	85	50
Total Sandia National Laboratories	**56,388**	**60,484**	**41,075**

Savannah River National Laboratory			
Research - Basic Energy Sciences	1,100	1,100	880
Basic Energy Sciences	1,100	1,100	880
Research - Fusion Energy Sciences	250	2,000	0
Fusion Energy Sciences	250	2,000	0
Total Savannah River National Laboratory	**1,350**	**3,100**	**880**

SLAC National Accelerator Laboratory			
Research - Basic Energy Sciences	311,154	338,735	337,215
21-SC-10, Cryomodule Repair and Maintenance Facility, SLAC	9,000	20,000	20,000
18-SC-13, Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC	120,000	100,000	99,343
Construction - Basic Energy Sciences	129,000	120,000	119,343
Basic Energy Sciences	440,154	458,735	456,558
Research - Biological & Environmental Research	6,786	5,100	3,456
Biological and Environmental Research	6,786	5,100	3,456
Research - Fusion Energy Sciences	7,500	6,585	5,920
20-SC-61, Matter in Extreme Conditions (MEC) Petawatt Upgrade, SLAC	10,000	0	0
Construction - Fusion Energy Sciences	10,000	0	0
Fusion Energy Sciences	17,500	6,585	5,920
Research - High Energy Physics	99,860	86,403	53,758
High Energy Physics	99,860	86,403	53,758
Research - Nuclear Physics	1,166	1,166	588
Nuclear Physics	1,166	1,166	588
Research - Accelerator R&D and Production	1,053	1,284	0
Accelerator R&D and Production	1,053	1,284	0
Facilities and Infrastructure (SLI)	0	7,765	10,028
20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC	30,000	20,000	10,000
Construction - Science Laboratories Infrastructure	30,000	20,000	10,000
Science Laboratories Infrastructure	30,000	27,765	20,028
Safeguards and Security - SC	3,880	3,997	3,997
Total SLAC National Accelerator Laboratory	**600,399**	**591,035**	**544,305**

Thomas Jefferson National Accelerator Facility			
Research - Advanced Scientific Computing Research	669	669	669
Advanced Scientific Computing Research	669	669	669
Research - Basic Energy Sciences	0	200	0
Basic Energy Sciences	0	200	0
Research - High Energy Physics	0	0	72
High Energy Physics	0	0	72
Research - Nuclear Physics	149,228	153,540	155,148
20-SC-52, Electron Ion Collider, BNL	0	27,500	27,500
Construction - Nuclear Physics	0	27,500	27,500
Nuclear Physics	149,228	181,040	182,648
Research - Accelerator R&D and Production	911	757	0
Accelerator R&D and Production	911	757	0
Facilities and Infrastructure (SLI)	0	0	3,935
20-SC-73, CEBAF Renovation and Expansion, TJNAF	11,000	11,000	26,000
Construction - Science Laboratories Infrastructure	11,000	11,000	26,000
Science Laboratories Infrastructure	11,000	11,000	29,935
Safeguards and Security - SC	3,123	3,167	3,667
Total Thomas Jefferson National Accelerator Facility	**164,931**	**196,833**	**216,991**

Thomas Jefferson Site Office			
Program Direction - SC	2,411	2,541	2,269
Total Thomas Jefferson Site Office	**2,411**	**2,541**	**2,269**

Undesignated Lab/Plant/Installation			
Research - Advanced Scientific Computing Research	103,301	101,963	86,473
Advanced Scientific Computing Research	103,301	101,963	86,473
Research - Basic Energy Sciences	373,479	312,203	201,737

Basic Energy Sciences	373,479	312,203	201,737
Research - Biological & Environmental Research	54,776	66,304	80,399
Biological and Environmental Research	54,776	66,304	80,399
Research - Fusion Energy Sciences	22,431	0	0
Fusion Energy Sciences	22,431	0	0
Research - High Energy Physics	49,230	50,835	87,325
High Energy Physics	49,230	50,835	87,325
Research - Nuclear Physics	55,601	63,768	67,115
Nuclear Physics	55,601	63,768	67,115
Research - Accelerator R&D and Production	2,046	5,435	0
Accelerator R&D and Production	2,046	5,435	0
Workforce Development for Teachers & Scientists	40,000	31,000	25,000
Facilities and Infrastructure (SLI)	185	200	711
Laboratory Operations Internship	3,000	3,000	3,000
Science Laboratories Infrastructure	3,185	3,200	3,711
Safeguards and Security - SC	93,525	86,081	84,802
Total Undesignated Lab/Plant/Installation	**797,574**	**720,789**	**636,562**

Washington Headquarters			
Research - Biological & Environmental Research	138	0	0
Biological and Environmental Research	138	0	0
Research - Fusion Energy Sciences	0	817	0
Fusion Energy Sciences	0	817	0
Research - Isotope R&D and Production	99,793	116,736	109,430
20-SC-51, U.S. Stable Isotope Production and Research Center (SIPRC), ORNL	20,900	45,900	45,900
24-SC-92, Clinical Alpha Radionuclide Producer (CARP), BNL	1,000	0	0
24-SC-91, Radioisotope Processing Facility (RPF), ORNL	8,500	7,000	7,000
Construction - Isotope R&D and Production	30,400	52,900	52,900
Isotope R&D and Production	130,193	169,636	162,330
Program Direction - SC	135,305	134,256	135,971
Total Washington Headquarters	**265,636**	**304,709**	**298,301**

Y-12 National Security Complex			
Safeguards and Security - SC	0	275	0
Total Y-12 National Security Complex	**0**	**275**	**0**

Other			
Research - Advanced Scientific Computing Research	138,205	143,234	129,222
24-SC-20, High Performance Data Facility	1,000	0	0
Advanced Scientific Computing Research	139,205	143,234	129,222
Research - Basic Energy Sciences	429,959	406,213	236,637
Basic Energy Sciences	429,959	406,213	236,637
Research - Biological & Environmental Research	235,581	195,803	47,671
Biological and Environmental Research	235,581	195,803	47,671
Research - Fusion Energy Sciences	389,375	458,747	567,437
Fusion Energy Sciences	389,375	458,747	567,437
Research - High Energy Physics	206,363	213,830	190,222
High Energy Physics	206,363	213,830	190,222
Research - Nuclear Physics	214,602	206,805	158,783
Nuclear Physics	214,602	206,805	158,783
Research - Accelerator R&D and Production	12,423	7,753	0
Accelerator R&D and Production	12,423	7,753	0
Total Other	**1,627,508**	**1,632,385**	**1,329,972**

General Provisions - Department of Energy
(Including transfers of funds)

SEC. 301.

(a) No appropriation, funds, or authority made available by this title for the Department of Energy shall be used to initiate or resume any program, project, or activity or to prepare or initiate Requests For Proposals or similar arrangements (including Requests for Quotations, Requests for Information, and Funding Opportunity Announcements) for a program, project, or activity if the program, project, or activity has not been funded by Congress.

(b)

(1) Unless the Secretary of Energy notifies the Committees on Appropriations of both Houses of Congress at least 3 full business days in advance, none of the funds made available in this title may be used to—

(A) make a grant allocation or discretionary grant award totaling $1,000,000 or more;

(B) make a discretionary contract award or Other Transaction Agreement totaling $1,000,000 or more, including a contract covered by the Federal Acquisition Regulation;

(C) issue a letter of intent to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B); or

(D) announce publicly the intention to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B).

(2) The Secretary of Energy shall submit to the Committees on Appropriations of both Houses of Congress within 15 days of the conclusion of each quarter a report detailing each grant allocation or discretionary grant award totaling less than $1,000,000 provided during the previous quarter.

(3) The notification required by paragraph (1) and the report required by paragraph (2) shall include the recipient of the award, the amount of the award, the fiscal year for which the funds for the award were appropriated, the account and program, project, or activity from which the funds are being drawn, the title of the award, and a brief description of the activity for which the award is made.

(c) The Department of Energy may not, with respect to any program, project, or activity that uses budget authority made available in this title under the heading "Department of Energy—Energy Programs", enter into a multiyear contract, award a multiyear grant, or enter into a multiyear cooperative agreement unless—

(1) the contract, grant, or cooperative agreement is funded for the full period of performance as anticipated at the time of award; or

(2) the contract, grant, or cooperative agreement includes a clause conditioning the Federal Government's obligation on the availability of future year budget authority and the Secretary notifies the Committees on Appropriations of both Houses of Congress at least 3 days in advance.

(d) Except as provided in subsections (e), (f), and (g), the amounts made available by this title shall be expended as authorized by law for the programs, projects, and activities specified in the "Final Bill" column in the "Department of Energy" table included under the heading "Title III—Department of Energy" in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act).

(e) The amounts made available by this title may be reprogrammed for any program, project, or activity, and the Department shall notify the Committees on Appropriations of both Houses of Congress at least 30 days prior to the use of any proposed reprogramming that would cause any program, project, or activity funding level to increase or decrease by more than $5,000,000 or 10 percent, whichever is less, during the time period covered by this Act.

(f) None of the funds provided in this title shall be available for obligation or expenditure through a reprogramming of funds that—

(1) creates, initiates, or eliminates a program, project, or activity;

(2) increases funds or personnel for any program, project, or activity for which funds are denied or restricted by this Act; or

(3) reduces funds that are directed to be used for a specific program, project, or activity by this Act.

(g)

(1) The Secretary of Energy may waive any requirement or restriction in this section that applies to the use of funds made available for the Department of Energy if compliance with such requirement or restriction would pose a substantial risk to human health, the environment, welfare, or national security.

(2) The Secretary of Energy shall notify the Committees on Appropriations of both Houses of Congress of any waiver

under paragraph (1) as soon as practicable, but not later than 3 days after the date of the activity to which a requirement or restriction would otherwise have applied. Such notice shall include an explanation of the substantial risk under paragraph (1) that permitted such waiver.

(h) The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. 302. 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. 303. 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. 304. None of the funds made available in this title may be used to support a grant allocation award, discretionary grant award, or cooperative agreement that exceeds $100,000,000 in Federal funding unless the project is carried out through internal independent project management procedures.

SEC. 305. No funds shall be transferred directly from "Department of Energy—Power Marketing Administration—Colorado River Basins Power Marketing Fund, Western Area Power Administration" to the general fund of the Treasury in the current fiscal year.

SEC. 306. Title III of division B of Public Law 112–74 is amended by striking section 304.

SEC. 307. Title VI of Public Law 95–619 is amended by striking Part 3.

SEC. 308. Of the funds appropriated to the Department of Energy by the Infrastructure Investment and Jobs Act (the Act; Public Law 117–58), the following are hereby permanently cancelled from the following accounts and programs in the specified amounts:

(1) $1,588,655,377 from unobligated balances made available for fiscal years 2022 through 2026 in the "Electricity" account provided for Preventing Outages and Enhancing the Resilience of the Electric Grid, as authorized under section 40101 of division D of such Act.

(2) $986,464,360 from unobligated balances made available for fiscal years 2022 through 2026 in the "Office of Clean Energy Demonstrations" account provided for grants for the Program Upgrading Our Electric Grid and Ensuring Reliability and Resiliency, as authorized under section 40103(b) of division D of such Act.

(3) $473,653,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Office of Clean Energy Demonstrations" account provided for the Energy Improvement in Rural and Remote Areas Program, as authorized under section 40103(c) of division D of such Act.

(4) $41,143,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Electricity" account provided for the Transmission Facilitation Program, as authorized under section 40106 of division D of such Act.

(5) $667,730,525 from unobligated balances made available for fiscal years 2022 through 2026 in the "Electricity" account provided for the Smart Grid Investment Matching Program, as authorized under section 40107 of division D of such Act.

(6) $47,148,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the State Energy Program, as authorized under section 40109 of division D of such Act.

(7) $166,171,162 from unobligated balances made available for fiscal years 2022 through 2026 in the "Cybersecurity, Energy Security, and Emergency Response" account provided for the Rural and Municipal Utility Advanced Cybersecurity Grant and Technical Assistance Program, as authorized under section 40124 of division D of such Act.

(8) $107,446,314 from unobligated balances made available for fiscal years 2022 through 2026 in the "Cybersecurity, Energy Security, and Emergency Response" account provided for the Cybersecurity For the Energy Sector Research, Development, and Demonstration Program, as authorized under section 40125(b) of division D of such Act.

(9) $19,450,000 from unobligated balances in the "Electricity" account provided to carry out an advanced energy security program to secure energy networks, as authorized under section 40125(d) of division D of such Act.

(10) $633,042,559 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for Battery Manufacturing and Recycling Grants, as authorized under section 40207(c) of division D of such Act.

(11) $694,270 from unobligated balances available in the "Energy Efficiency and Renewable Energy" account provided for the Lithium-Ion Battery Recycling Prize Competition, as authorized under section 40207(e) of division D of such Act.

(12) $36,620,326 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided to carry out activities authorized under section 40207(f) of division D of such Act.

(13) $72,298,954 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Electric Drive Vehicle Battery Recycling and Second-Life Applications Program, as authorized under subsection (k) of section 641 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17231), as amended by section 40208(1) of division D of the Act.

(14) $277,702,772 from unobligated balances made available for fiscal years 2022 through 2026 in the "Fossil Energy and Carbon Management" account provided for the Carbon Utilization Program, as authorized under section 40302 of division D of such Act.

(15) $68,640,068 from unobligated balances made available for fiscal years 2022 through 2026 in the "Fossil Energy and Carbon Management" account provided for the Front-End Engineering and Design, Carbon Capture Technology Program, as authorized under section 962 of the Energy Policy Act of 2005 (42 U.S.C. 16292), as amended by section 40303 of division D of the Act.

(16) $2,084,700,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Carbon Dioxide Transportation Infrastructure Finance and Innovation Program Account" provided for the Carbon Dioxide Transportation Infrastructure Finance and Innovation Program, as authorized by subtitle J of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16181 et seq.), as amended by section 40304 of division D of the Act.

(17) $1,163,735,574 from unobligated balances made available for fiscal years 2022 through 2026 in the "Fossil Energy and Carbon Management" account provided for Carbon Storage Validation and Testing, as authorized under section 963 of the Energy Policy Act of 2005 (42 U.S.C. 16293), as amended by section 40305 of division D of the Act.

(18) $2,002,474,357 from unobligated balances made available for fiscal years 2022 through 2026 in the "Fossil Energy and Carbon Management" account provided for Regional Direct Air Capture Hubs, as authorized under section 969D of the Energy Policy Act of 2005 (42 U.S.C. 16298d), as amended by section 40308 of division D of the Act.

(19) $92,000,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Office of Clean Energy Demonstrations" account provided for Regional Clean Hydrogen Hubs, as authorized under section 813 of the Energy Policy Act of 2005 (42 U.S.C. 16151 et seq.), as amended by section 40314 of division D of the Act.

(20) $184,198,304 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for the Clean Hydrogen Technology Recycling Research, Development, and Demonstration Program, as authorized under section 815 of the Energy Policy Act of 2005 (42 U.S.C. 16151 et seq.), as amended by section 40314 of division D of the Act.

(21) $350,084,449 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for activities for the Clean Hydrogen Electrolysis Program, as authorized under section 816 of the Energy Policy Act of 2005 (42 U.S.C. 16151 et seq.), as amended by section 40314 of division D of the Act.

(22) $981,479,556 from unobligated balances made available for fiscal year 2026 in the "Nuclear Energy" account provided for the Civil Nuclear Credit Program, as authorized under section 40323 of division D of such Act.

(23) $69,617,632 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities under section 242 of the Energy Policy Act of 2005 (42 U.S.C. 15881), as amended by section 40331 of division D of the Act.

(24) $1,097,435 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities under section 243 of the Energy Policy Act of 2005 (42 U.S.C. 15882), as amended by section 40332 of division D of the Act.

(25) $52,628,890 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for activities for Hydroelectric Incentives, as authorized under section 247 of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 674), as amended by section 40333 of division D of the Act.

(26) $964,421 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for activities for the Pumped Storage Hydropower Wind and Solar Integration and System Reliability Initiative, as authorized under section 3201 of the Energy Policy Act of 2020 (42 U.S.C. 17232), as amended by section 40334 of division D of the Act.

(27) $9,500,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Office of Clean Energy Demonstrations" account provided for the Clean Energy Demonstration Program on Current and Former Mine Land, as authorized under section 40342 of division D of such Act.

(28) $10,691,071 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Energy Auditor Training Grant Program, as authorized under section 40503 of division D of such Act.

(29) $54,462,256 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for grants for implementing of updated building energy codes, as authorized under section 309 of the Energy Conservation and Production Act (42 U.S.C. 6831 et seq.), as amended by section 40511(a) of division D of the Act.

(30) $670,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for Building, Training, and Assessment Centers, as authorized under section 40512 of division D of such Act.

(31) $1,205,411 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for Career Skills Training, as authorized under section 40513 of division D of such Act.

(32) $36,519,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for Industrial Research and Assessment Centers, as authorized under section 40521(b) of division D of such Act.

(33) $233,901,000 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for Industrial Research and Assessment Center Implementation Grants, as authorized under section 457(i) of the Energy Independence and Security act of 2007 (42 U.S.C. 17111 et seq.), as amended by section 40521(b) of division D of the Act.

(34) $4,533,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Manufacturing Leadership program, as authorized under section 40534 of division D of such Act.

(35) $195,807,333 from unobligated balances made available for fiscal years 2022 through 2026 in the "Energy Efficiency and Renewable Energy" account provided for Grants for Energy Efficiency Improvements and Renewable Improvements

at Public School Facilities, as authorized under section 40541 of division D of such Act.

(36) $1,146,529 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Energy Efficiency Materials Pilot Program, as authorized under section 40542 of division D of such Act.

(37) $138,040,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities for the Weatherization Assistance Program, as authorized under part A of title IV of the Energy Conservation and Production Act (42 U.S.C. 6861 et seq.).

(38) $91,850,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities for the Energy Efficiency and Conservation Block Grant Program, as authorized under section 542(a) of the Energy Independence and Security Act of 2007 (42 U.S.C. 17152(a)).

(39) $8,407,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for Extended Product System Rebates, as authorized under section 1005 of the Energy Act of 2020 (42 U.S.C. 6311 note; Public Law 116–260).

(40) $8,877,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for Energy Efficient Transformer Rebates, as authorized under section 1006 of the Energy Act of 2020 (42 U.S.C. 6317 note; Public Law 116–260).

(41) $116,385,099 from unobligated balances in the "Office of Clean Energy Demonstrations" account provided to carry out the Energy Storage Demonstration Projects Pilot Grant Program, as authorized under section 3201(c) of the Energy Act of 2020 (42 U.S.C. 17232(c)).

(42) $36,398,247 from unobligated balances in the "Office of Clean Energy Demonstrations" account provided to carry out the Long-Duration Demonstration Initiative and Joint Program, as authorized under section 3201(d) of the Energy Act of 2020 (42 U.S.C. 17232(d)).

(43) $573,319,000 from unobligated balances in the "Office of Clean Energy Demonstrations" account provided to carry out the Carbon Capture Large-Scale Pilot Projects, as authorized under section 962(b)(2)(B) of the Energy Policy Act of 2005 (42 U.S.C. 16292(b)(2)(B).

(44) $1,400,655,719 from unobligated balances in the "Office of Clean Energy Demonstrations" account provided for the Carbon Capture Demonstration Projects Program, as authorized under section 962(b)(2)(C) of the Energy Policy Act of 2005 (42 U.S.C. 16292(b)(2)(C).

(45) $6,630,000 from unobligated balances in the "Fossil Energy and Carbon Management" account provided for Precommercial Direct Air Capture Technologies Prize Competitions, as authorized under section 969D(e)(2)(A) of the Energy Policy Act of 2005 (42 U.S.C. 16298d(e)(2)(A)).

(46) $66,705,000 from unobligated balances in the "Fossil Energy and Carbon Management" account provided for Commercial Direct Air Capture Technologies Prize Competitions, as authorized under section 969D(e)(2)(B) of the Energy Policy Act of 2005 (42 U.S.C. 16298d(e)(2)(B)).

(47) $5,989,570 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities as authorized under section 634 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17213).

(48) $5,946,822 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities as authorized under section 635 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17214).

(49) $2,186,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities for the National Marine Energy Centers, as authorized under section 636 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17215).

(50) $19,551,040 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for

carrying out activities authorized under section 615(d) of the Energy Independence and Security Act of 2007 (42 U.S.C. 17194(d)).

(51) $14,484,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities for the Wind Energy Technology Program, as authorized under section 3003(b)(2) of the Energy Act of 2020 (42 U.S.C. 16237(b)(2)).
(52) $24,775,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Wind Energy Technology Recycling Research, Development, and Demonstration Program, as authorized under section 3003(b)(4) of the Energy Act of 2020 (42 U.S.C. 16237(b)(4)).

(53) $2,868,000 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities authorized under section 3004(b)(2) of the Energy Act of 2020 (42 U.S.C. 16238(b)(2)).

(54) $3,169,027 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for carrying out activities authorized under section 3004(b)(3) of the Energy Act of 2020 (42 U.S.C. 16238(b)(3)).

(55) $1,565,197 from unobligated balances in the "Energy Efficiency and Renewable Energy" account provided for the Solar Energy Technology Recycling Research, Development, and Demonstration Program, as authorized under section 3004(b)(4) of the Energy Act of 2020 (42 U.S.C. 16238(b)(4)).

(56) $1,000,000 from unobligated balances in the "Construction, Rehabilitation, Operation and Maintenance, Western Area Power Administration" account provided for the purchase of power and transmission services, as authorized under division J of such Act.

SEC. 309.

(a) None of the funds made available by this Act may be used by the Secretary of Energy to award any grant, contract, cooperative agreement, or loan of $10,000,000 or greater to an entity of concern as defined in section 10114 of division B of Public Law 117–167.
(b) The Secretary shall implement the requirements under subsection (a) using a risk-based approach and analytical tools to aggregate, link, analyze, and maintain information reported by an entity seeking or receiving such funds made available by this Act.
(c) This section shall be applied in a manner consistent with the obligations of the United States under applicable international agreements.
(d) The Secretary shall have the authority to require the submission to the agency, by an entity seeking or receiving such funds made available by this Act, documentation necessary to implement the requirements under subsection (a).
(e) Chapter 35 of title 44, United States Code (commonly known as the "Paperwork Reduction Act"), shall not apply to the implementation of the requirements under this section.
(f) The Secretary and other Federal agencies shall coordinate to share relevant information necessary to implement the requirements under subsection (a).

SEC. 310.

(a) Subject to subsection (b), none of the funds made available to the Department of Energy in this or any other Act, including prior Acts and Acts other than appropriations Acts, may be used to pay the salaries and expenses of any contractor detailed to a Congressional Committee or Member Office or to the Executive Branch for longer than a 24-month period, to perform a scope of work, or participate in any matter, with the intent to influence decisions or determinations regarding a Department of Energy National Laboratory, or participate in any matter that may have a direct and predictable effect on the contractor's employer or personal financial interest: Provided, That with respect to contractors detailed to a Congressional Committee or Member Office or to the Executive Branch as of the date of enactment of this Act, the initial 24-month period described in this subsection shall be deemed to have begun on the later of the date on which such contractor was detailed or the date that is 12 months before the date of enactment of this Act.
(b) For the purposes of this section, the term "contractor" is defined to mean any contracted employee of a Department of Energy National Laboratory, as defined by section 2 (3) of the Energy Policy Act of 2005 (42 U.S.C. 15801).

Title V - General Provisions

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

SEC. 502.

(a) None of the funds made available in 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.