

## Science Laboratories Infrastructure

### Overview

The Science Laboratories Infrastructure (SLI) program mission is to support scientific and technological innovation at the Office of Science (SC) laboratories by funding and sustaining general purpose infrastructure and fostering safe, efficient, reliable, and environmentally responsible operations. The main priorities of the SLI program are improving SC's existing physical assets (including major utility systems) and funding new cutting-edge facilities that enable emerging science opportunities. The SLI program funds line-item construction projects; General Plant Projects (GPP) (minor construction less than \$30 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 will support a new Laboratory Operations Apprenticeship program to begin in FY 2024.

SC manages an infrastructure portfolio worth nearly \$31.8 billion, which is composed of 13 sites, including 10 national laboratories, with nearly 24 million gross square feet (gsf) in over 1,600 government-owned buildings and trailers. 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 SC mission requires significant stewardship of research facilities, the renovation and replacement of general-purpose infrastructure, including buildings and support infrastructure.

SC laboratories conduct an annual assessment of the condition, utilization, and mission readiness, of their buildings and support infrastructure. The assessments show that 43 percent of the buildings are rated substandard or inadequate to meet mission needs. In addition, 71 percent of the utility systems are rated as substandard or inadequate while 35 percent of the remaining support infrastructure is 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 projects to reduce the impacts of these deficiencies on the SC mission.

SC and the laboratories use the assessments to help develop comprehensive Campus Strategies required in the bi-annual laboratory planning process. To support the core capabilities and achieve the scientific vision, each laboratory's Campus Strategy identifies activities and infrastructure investments such as line-item construction and GPPs. SC leadership uses these Campus Strategies to inform the SLI budget requests.

To sustain and enhance its general-purpose infrastructure, SC invested nearly \$801 million in maintenance, repair, and construction in FY 2022. These investments came from a variety of funding sources, including Federal appropriations for line-item construction, GPPs, laboratory overhead funding of Institutional GPP projects, and maintenance and repair. The SLI investments in line-item construction and GPPs are key elements of this overall investment strategy.

### Highlights of the FY 2024 Request

The SLI program Request continues to focus on improving infrastructure across the SC national laboratory complex. The FY 2024 Request supports ten 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. Ames Infrastructure Modernization at Ames National Laboratory (AMES);
4. Seismic and Safety Modernization project at Lawrence Berkeley National Laboratory (LBNL);
5. CEBAF Renovation and Expansion project at Thomas Jefferson National Accelerator Facility (TJNAF);
6. Argonne Utilities Upgrade project at Argonne National Laboratory (ANL);
7. Linear Assets Modernization Project at Lawrence Berkeley National Laboratory (LBNL);
8. Critical Utilities Infrastructure Revitalization Project at SLAC National Accelerator Laboratory (SLAC);
9. Utilities Infrastructure Project at Fermi National Accelerator Laboratory (FNAL); and
10. Biological and Environmental Program Integration Center at Lawrence Berkeley National Laboratory (LBNL).

These ongoing line-item projects will upgrade and improve utility systems and facilities and provide new laboratory space with the necessary performance capabilities to enhance SC's mission.

The FY 2024 Request also includes funding for GPPs which are an essential component of our infrastructure modernization portfolio to address targeted and emerging, high priority core infrastructure and utility needs across SC laboratories and facilities. Infrastructure needs for all laboratories are evaluated annually by SLI. GPP projects are evaluated and prioritized through data analysis of criteria including mission readiness, cost savings (including energy and water), environment safety and health issues, sustainability (including net zero initiatives), resilience, and reliability.

**Science Laboratories Infrastructure  
Funding**

(dollars in thousands)

	<b>FY 2022 Enacted</b>	<b>FY 2023 Enacted</b>	<b>FY 2024 Request</b>	<b>FY 2024 Request vs FY 2023 Enacted</b>
<b>Science Laboratories Infrastructure</b>				
Payment In Lieu of Taxes (PILT)	4,820	4,891	5,004	+113
OR Landlord	6,430	6,559	6,910	+351
Facilities and Infrastructure	14,450	13,900	32,104	+18,204
Laboratory Operations Apprenticeship	—	—	3,000	+3,000
Oak Ridge Nuclear Operations	26,000	26,000	46,000	+20,000
<b>Subtotal, Science Laboratories Infrastructure</b>	<b>51,700</b>	<b>51,350</b>	<b>93,018</b>	<b>+41,668</b>
<b>Construction</b>				
22-SC-71 Critical Infrastructure Modernization Project (CIMP) - ORNL	1,000	1,000	—	-1,000
22-SC-72 Thomas Jefferson Infrastructure Improvements (TJII) - TJNAF	1,000	1,000	—	-1,000
21-SC-71 Princeton Plasma Innovation Center (PPIC), PPPL	7,750	10,000	15,000	+5,000
21-SC-72 Critical Infrastructure Recovery & Renewal (CIRR), PPPL	2,000	4,000	10,000	+6,000
21-SC-73 Ames Infrastructure Modernization (AIM)	2,000	2,000	8,000	+6,000
20-SC-71 Critical Utilities Rehabilitation Project (CURP), BNL	26,000	26,000	—	-26,000
20-SC-72 Seismic and Safety Modernization (SSM), LBNL	18,000	27,500	40,000	+12,500
20-SC-73 CEBAF Renovation and Expansion (CEBAF), TJNAF	10,000	15,000	11,000	-4,000
20-SC-75 Large Scale Collaboration Center (LSCC), SLAC	21,000	21,000	—	-21,000
20-SC-76 Tritium System Demolition and Disposal (TSDD), PPPL	6,400	—	—	—

(dollars in thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
20-SC-77 Argonne Utilities Upgrade (AU2), ANL	10,000	8,000	8,007	+7
20-SC-78 Linear Assets Modernization Project (LAMP), LBNL	10,400	23,425	18,900	-4,525
20-SC-79 Critical Utilities Infrastructure Revitalization (CUIR), SLAC	8,500	25,425	35,075	+9,650
20-SC-80 Utilities Infrastructure Project (UIP), FNAL	10,500	20,000	45,000	+25,000
19-SC-71 Science User Support Center (SUSC), BNL	38,000	—	—	—
19-SC-73 Translational Research Capability (TRC), ORNL	21,500	—	—	—
19-SC-74 - BioEPIC, LBNL	35,000	45,000	38,000	-7,000
17-SC-71 Integrated Engineering Research Center (IERC), FNAL	10,250	—	—	—
<b>Subtotal, Construction</b>	<b>239,300</b>	<b>229,350</b>	<b>228,982</b>	<b>-368</b>
<b>Total, Science Laboratories Infrastructure</b>	<b>291,000</b>	<b>280,700</b>	<b>322,000</b>	<b>+41,300</b>

Science Laboratories Infrastructure  
Explanation of Major Changes

(dollars in thousands)

<b>FY 2024 Request vs FY 2023 Enacted</b>
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+41,668

**Infrastructure Support**

The Request fully funds Oak Ridge nuclear operations through the Office of Science, increases funding for GPPs to address targeted and emerging high-priority infrastructure needs across the SC complex, and begins a Laboratory Operations Apprenticeship to support trade and craft employee development.

**Construction**

-368

Funding supports 10 ongoing line-item projects at Ames, ANL, FNAL, LBNL, PPPL, SLAC, and TJNAF.

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**Total, Science Laboratories Infrastructure**

+41,300

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**Program Accomplishments**

Since FY 2006, the SLI program has invested nearly \$1.95 billion in general purpose infrastructure, excluding GPPs, across the SC-stewarded laboratory complex. These investments have provided state-of-the-art science user support facilities, renovated, and repurposed aged facilities, upgraded inadequate core infrastructure and systems, and removed excess.

**Line-Item Construction Projects**

Since FY 2006, the SLI program has successfully completed 16 line-item construction projects and was honored with 13 DOE Secretary's Achievement Awards. These investments began following an FY 2006 SC decision to modernize infrastructure across the SC-stewarded laboratory complex. With these investments, the SLI program constructed approximately more than 1.8 million gsf of new and modernized existing space. As a result, an estimated 2,900 laboratory users and researchers now occupy newly constructed and/or modernized buildings that better support scientific and technological innovation in a collaborative environment.

**GPP upgrades across SC Laboratories**

Since FY 2016, SLI has funded nearly \$215 million in 37 laboratory core infrastructure improvement projects including \$137 million in electrical and utility improvements, \$35 million in building renovations, \$29 million in safety and environmental projects and \$14 million in sustainability/resilience projects. Examples of recent SLI investments in core infrastructure include building heating, ventilation, and air conditioning (HVAC) upgrades at BNL; access control upgrades at Ames and Fermi and steam to hydronics conversion project at PNNL. SLI also funded an emergency generator upgrade project and building HVAC system improvements at LBNL and a cooling tower water reuse project at TJNAF.

## **Science Laboratories Infrastructure Infrastructure Support**

### **Description**

This subprogram supports investments that focus on laboratory core infrastructure and operations. Continuing investments in core infrastructure (e.g., utility systems, site-wide services, and general-purpose facilities) ensure that facilities and utilities are either upgraded or replaced as they approach end-of-life. Upgraded facilities have improved reliability, resilience, efficiency, and performance. This subprogram also supports nuclear operations at ORNL, funds stewardship-type needs (e.g., roads and grounds maintenance) across the Oak Ridge Reservation, begins a Laboratory Operations Apprenticeship program in FY 2024, and funds Payments In Lieu of Taxes (PILT).

### Facilities and Infrastructure

This activity supports minor construction investments (general plant projects of less than \$30 million) that address urgent and emerging core infrastructure needs. SC laboratories conduct rigorous condition assessments of their core infrastructure, which determine the need for investments in these basic systems that form the backbone of their campuses. The Science Laboratories Infrastructure program maintains an active list of critical core infrastructure investment needs. Projects are evaluated on mission readiness; cost savings (including energy and water); environment, safety, and health issues; sustainability (including net zero initiatives); resilience; and reliability. Projects are evaluated continuously, and the highest priority projects are selected for funding upon entry into the corresponding execution year.

### Oak Ridge Nuclear Operations

To support critical DOE nuclear operations, this Request includes the full funding required to operate ORNL's non-reactor nuclear facilities (i.e., Buildings 7920, 7930, 3525, and 3025E) and the associated support facilities (i.e., Buildings 3502 and 7935). These facilities support a variety of users including SC programs, the National Nuclear Security Administration, the Office of Nuclear Energy, and other federal agencies. This funding supports maintenance and repair of hot cells and supporting systems and ensuring compliance with safety standards and procedures.

### OR Landlord

This funding supports landlord responsibilities, including infrastructure for the 24,000-acre Oak Ridge Reservation and DOE facilities in the city of Oak Ridge, Tennessee. Activities include maintenance of roads, grounds, other infrastructure, and support and improvement of environmental protection, safety, and health.

### Payment In Lieu of Taxes (PILT)

Funding within 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

Funding will support the initiation of a Laboratory Operations Apprenticeship program to ensure the next generation of critical, highly skilled trade and craft employees is in place to replace the aging and retiring workforce throughout the SC laboratory complex.

**Science Laboratories Infrastructure  
Infrastructure Support**

**Activities and Explanation of Changes**

(dollars in thousands)

FY 2023 Enacted		FY 2024 Request	Explanation of Changes FY 2024 Request vs FY 2023 Enacted
<b>Infrastructure Support</b>	<b>\$51,350</b>	<b>\$93,018</b>	<b>+\$41,668</b>
Facilities and Infrastructure	\$13,900	\$32,104	+\$18,204
Funding supports the replacement of the emergency generator at the LBNL Hazardous Waste Building, the Steam to Hot Water Conversion project in the Physical Sciences Laboratory at PNNL and the Storm Water Reuse project at TJNAF.		The Request will continue to support the highest priority core infrastructure needs across the SC complex. Projects being considered are: HVAC Upgrade Life Sciences Laboratory (Bldg. 331) (PNNL); Power Quality Compensation Equipment Installation (SLAC); Chiller Replacement (Bldg. 450) (ANL); Electrical Component Replacement 88 Inch Cyclotron User Facility (Bldg. B88) (LBNL).	Increased funding will support at least four general plant projects at multiple labs.
<b>Oak Ridge Nuclear Operations</b>	<b>\$26,000</b>	<b>\$46,000</b>	<b>+\$20,000</b>
Funding supports critical nuclear operations and provides funding to manage ORNL's nuclear facilities.		The Request will provide full funding for ORNL's nuclear facilities from the Office of Science.	Funding will provide the full amount needed to support the most critical nuclear operations and facilities at ORNL.
<b>OR Landlord</b>	<b>\$6,559</b>	<b>\$6,910</b>	<b>+\$351</b>
Funding continues support of landlord responsibilities across the Oak Ridge Reservation. Activities include maintenance of roads, grounds, and other infrastructure; and support and improvement of environmental protection, safety, and health.		The Request will continue to support of 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)

<b>FY 2023 Enacted</b>	<b>FY 2024 Request</b>	<b>Explanation of Changes FY 2024 Request vs FY 2023 Enacted</b>
Payment In Lieu of Taxes (PILT) \$4,891	\$5,004	+\$113
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 anticipated PILT requirements.
Laboratory Operations Apprenticeship \$ —	\$3,000	+\$3,000
No funding requested or appropriated in FY 2023.	The Request will begin a new program to support technician- and craft-level apprenticeships in the SC complex.	FY 2024 will be the first year of funding to initiate the Laboratory Operations Apprenticeship program.

## **Science Laboratories Infrastructure Construction**

### **Description**

The SLI program funds line-item projects to maintain and enhance the general-purpose infrastructure at SC laboratories. SLI's infrastructure modernization construction projects are focused on the accomplishment of long-term science goals and strategies at each SC laboratory. The main objectives of the SLI program are improvement of SC's physical assets and funding of new cutting-edge facilities to enable emerging science opportunities. Modernizing infrastructure supporting the SC national laboratories will ensure the critical needs of the future science initiatives and world class user facilities are met for decades to come, while minimizing unwanted disruptions through resilience and reliability and ensuring safety.

The FY 2024 Request includes funding for ten ongoing line-item construction projects:

1. Princeton Plasma Innovation Center at PPPL;
2. Critical Infrastructure Recovery & Renewal at PPPL;
3. Ames Infrastructure Modernization at AMES;
4. Seismic and Safety Modernization at LBNL;
5. CEBAF Renovation and Expansion at TJNAF;
6. Argonne Utilities Upgrade at ANL;
7. Linear Assets Modernization Project at LBNL;
8. Critical Utilities Infrastructure Revitalization at SLAC;
9. Utilities Infrastructure Project at FNAL; and
10. Biological and Environmental Program Integration Center at LBNL.

No new line-item construction projects are included within this request.

### 21-SC-71, Princeton Plasma Innovation Center, PPPL

The Princeton Plasma Innovation Center (PPIC) will provide a multi-purpose facility to PPPL, with space for offices, medium bay research labs for diagnostics and fabrication, remote participation and collaboration, and research support to meet the SC mission and fulfill the research needs of the Fusion Energy Sciences (FES), Advanced Scientific Computing Research (ASCR), and Basic Energy Sciences (BES) programs.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on January 22, 2021. The preliminary estimate for CD-2, Approve Performance Baseline, is anticipated in the second quarter of FY 2024. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. The current preliminary TEC range for this project is \$78,300,000 to \$96,300,000 and the preliminary Total Project Cost (TPC) range is \$80,500,000 to \$98,500,000. These cost ranges encompass the most feasible preliminary alternative at this time. The preliminary TEC point estimate for this project is \$96,300,000 and the preliminary TPC point estimate for this project is \$98,500,000.

### 21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL

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; distribution networks for steam, compressed air, sanitary waste, and condenser, storm, canal, and potable water; HVAC systems; and communication systems.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on February 23, 2021. The project's CD-2, Approve Performance Baseline, is anticipated in the first quarter of FY 2026. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. 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. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC point estimate for this project is \$87,300,000 and the preliminary TPC point estimate for this project is \$89,000,000.

#### 21-SC-73, Ames Infrastructure Modernization, AMES

The Ames Infrastructure Modernization (AIM) project will support the SC mission by providing a safer and more operationally efficient campus for the employees, visitors, and guests at Ames, as well as reduce deferred maintenance costs. This project is designed to support DOE mission-critical programs and initiatives, increase the reliability of utility infrastructure, minimize facility costs through effective and efficient operations, and modernize laboratories in Ames's research buildings, thereby enhancing Ames Laboratory's ability to continue to deliver on SC's mission across multiple program offices.

Specifically, this project will provide updated infrastructure building systems in existing research and operations buildings at Ames National Laboratory, such as plumbing systems; building envelopes; electrical systems-emergency, backup power, and uninterruptible power supplies; and telecommunication systems. In addition, some of the laboratory spaces will be modernized to support the SC mission.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, Approve Mission Need, and was approved on September 16, 2019. The preliminary estimate for CD-1, Approve Alternative Selection and Cost Range, is anticipated in the third quarter of FY 2023. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. The current preliminary TEC range for this project is \$22,000,000 to \$89,000,000. The preliminary TPC range for this project is \$26,400,000 to \$86,500,000. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC point estimate for this project is \$30,000,000 and the preliminary TPC point estimate for this project is \$31,000,000.

#### 20-SC-72, Seismic and Safety Modernization, LBNL

The Seismic and Safety Modernization project will address seismic safety issues and emergency response capabilities at LBNL. Specifically, facilities with large congregation areas, facilities that are necessary for emergency response personnel, and facilities necessary to maintain continuity of operations will be improved. The facilities that are the primary focus of this project are the Cafeteria and Health Services.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-3A/R1, Approve Alternative Selection and Cost Range (Revised), and was approved on January 13, 2023, and CD-3A Approve Early Site Preparation. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. This project has a preliminary TEC range of \$112,800,000 to \$183,300,000 and the preliminary TPC range of \$116,000,000 to \$188,500,000. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC point estimate for this project is \$141,000,000 and the preliminary TPC point estimate for this project is \$145,000,000.

#### 20-SC-73, CEBAF Renovation and Expansion, TJNAF

The CEBAF Renovation and Expansion (CRE) project will renovate existing space and provide new research, administrative, and support service space enabling TJNAF to better support SC missions. The CEBAF center at TJNAF has inadequate utility systems that are experiencing frequent failures. This project will renovate 131,000 to 250,000 gross square feet (gsf) of existing space in the CEBAF center and the Applied Research Center (ARC), upgrade high risk utility systems, and provide 82,000 to 150,000 gsf of additional space for visitors, users, research, education, and support.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range and was approved on March 18, 2020. The preliminary estimate for CD-2, Approve Performance Baseline, is anticipated in the fourth quarter of FY 2023. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. 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. These cost ranges encompass the most feasible preliminary alternatives at this time. 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.

#### 20-SC-77, Argonne Utilities Upgrade, ANL

The Argonne Utilities Upgrade 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.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on July 1, 2021. The preliminary estimate for CD-2, Approve Baseline, is anticipated in the third quarter of FY 2024. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. 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. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC point estimate is \$215,000,000 and the TPC point estimate for this project is \$216,000,000.

#### 20-SC-78, Linear Assets Modernization Project, LBNL

The Linear Assets Modernization Project 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.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on April 13, 2022. The project's CD-3A is anticipated in the first quarter of FY 2026. This project is pre-CD-2, therefore schedule estimates are preliminary and subject to change. 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. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC is \$236,000,000 and the preliminary TPC estimate for this project is \$242,000,000.

#### 20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC

The primary objective of CUIR is to close infrastructure gaps to support multi-program science missions as technologies, instruments, experimental parameters, sensitivities, and complexity associated with evolving science demand increases required 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.

The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on January 21, 2022. This project is pre-CD-2; therefore, schedule estimates are preliminary and subject to change. The preliminary TEC range for this project is \$160,000,000 to \$306,000,000. The preliminary TPC range for this project is \$164,500,000 to \$310,500,000. These cost ranges encompass the most feasible preliminary alternatives at this time. The preliminary TEC estimate is \$204,000,000 and the preliminary TPC estimate for this project is \$208,500,000.

#### 20-SC-80, Utilities Infrastructure Project, FNAL

The Utilities Infrastructure Project at FNAL will modernize the highest risk major utility systems across the FNAL campus. Specifically, this project will evaluate the current condition of 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 will be modernized to assure safe, reliable, and efficient service to mission critical facilities. In addition, upgrades to obsolete, end-of-life components will increase capacity, reliability, and personnel safety at critical utilities.

The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, and was approved on February 23, 2022. The preliminary estimate for CD-2, Approve Performance Baseline, is anticipated in the second quarter of FY 2024. This project is pre-CD-2; therefore, schedule estimates are preliminary and 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 is \$314,000,000.

#### 19-SC-74, BioEPIC, LBNL

The BioEPIC project is constructing a new, state-of-the-art facility with laboratory space to support high performance research by the BER, ASCR, and BES programs. LBNL has grown from a pioneering particle and nuclear physics laboratory into a multidisciplinary research facility with broad capabilities in physical, chemical, computational, biological, and environmental systems research in support of the DOE mission. This facility is being constructed in close proximity to key LBNL facilities and programs. Research operations currently located in commercially leased space and dispersed across the campus will be co-located to the BioEPIC building. Co-location of researchers in this unique experimental facility, near other important SC assets, will increase synergy and efficiency, which will better facilitate collaborative research in support of the SC mission.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-2/3, Approve Performance Baseline and Approve Start of Construction, and was approved on September 13, 2021. The preliminary estimate for CD-4, Approve Start of Operations, is anticipated in the fourth quarter of FY 2027. The TEC for this project is \$165,000,000 and the TPC for this project is \$167,200,000.

**Science Laboratories Infrastructure  
Construction**

**Activities and Explanation of Changes**

(dollars in thousands)

FY 2023 Enacted	FY 2024 Request	Explanation of Changes FY 2024 Request vs FY 2023 Enacted	
Construction	\$229,350	\$228,982	-\$368
21-SC-71, Princeton Plasma Innovation Center, PPPL	\$10,000	\$15,000	+\$5,000
Funding will support ongoing PED activities and initiate construction activities.	The Request will support ongoing PED activities and continuation of construction activities.	Funding will support the continuation of PED activities for this project and continuation of construction activities. This project received supplemental funding under the Inflation Reduction Act.	
21-SC-72, Critical Infrastructure Recovery & Renewal, PPPL	\$4,000	\$10,000	+\$6,000
Funding will support ongoing PED activities and initiate construction and associated activities.	The Request will support ongoing PED activities and continuation of construction and associated activities.	Funding will support the continuation of PED activities for this project and enable the continuation of construction and associated activities.	
21-SC-73, Ames Infrastructure Modernization	\$2,000	\$8,000	+\$6,000
Funding will support ongoing PED and construction activities.	Final funding for this project is requested to be received in FY 2024 to support construction activities.	Funding Request will provide final funding for this project. This project received supplemental funding under the Inflation Reduction Act.	
20-SC-71, Critical Utilities Rehabilitation Project, BNL	\$26,000	\$ —	-\$26,000
Funding will support ongoing construction activities.	Funding will support ongoing construction activities for this project.	Project was fully funded in FY 2023.	

(dollars in thousands)

FY 2023 Enacted	FY 2024 Request	Explanation of Changes FY 2024 Request vs FY 2023 Enacted	
20-SC-72, Seismic and Safety Modernization, LBNL	\$27,500	\$40,000	+\$12,500
Funding will support construction and associated activities.	The Request will support construction and associated activities.	Funding Request will provide final funding for this project. This project received supplemental funding under the Inflation Reduction Act.	
20-SC-73, CEBAF Renovation and Expansion, TJNAF	\$15,000	\$11,000	-\$4,000
Funding will support ongoing PED and construction activities.	The Request will support ongoing PED and construction activities.	Funding will support ongoing PED and construction activities for this project. This project received supplemental funding under the Inflation Reduction Act.	
20-SC-75, Large Scale Collaboration Center, SLAC	\$21,000	\$ —	-\$21,000
Funding will support ongoing construction activities.	Final funding for this project is requested to be received in FY 2023.	Project was fully funded in FY 2023.	
20-SC-77, Argonne Utilities Upgrade, ANL	\$8,000	\$8,007	+\$7
Funding will support ongoing PED activities.	The Request will support ongoing PED and initiate construction and associated activities.	Funding will support the continuation of construction and associated activities.	
20-SC-78, Linear Assets Modernization Project, LBNL	\$23,425	\$18,900	-\$4,525
Funding will support ongoing PED activities and early construction activities.	The Request will support ongoing PED activities and early construction activities.	Funding will support ongoing PED activities and the early construction activities for this project.	
20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC	\$25,425	\$35,075	+\$9,650
Funding will support ongoing PED activities and initiate early construction activities.	The Request will support ongoing PED activities and continuation of early construction activities.	Funding will support ongoing PED activities and the continuation of early construction activities for this project.	

(dollars in thousands)

FY 2023 Enacted		FY 2024 Request	Explanation of Changes FY 2024 Request vs FY 2023 Enacted
20-SC-80, Utilities Infrastructure Project, FNAL		\$20,000	\$45,000
Funding will support ongoing PED activities and initiate early construction activities.			+\$25,000
The Request will support ongoing PED activities and continuation of early construction activities.			Funding will support ongoing PED activities and the continuation of early construction activities for this project.
19-SC-74, BioEPIC, LBNL		\$45,000	\$38,000
Funding will support ongoing construction activities.			-\$7,000
Final funding for this project is requested to be received in FY 2024.			Funding Request will provide final funding for this project. This project received supplemental funding under the Inflation Reduction Act.



**Science Laboratories Infrastructure  
Capital Summary**

(dollars in thousands)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
<b>Capital Operating Expenses</b>							
Minor Construction Activities							
General Plant Projects	N/A	N/A	14,250	65,890	13,700	32,104	+18,404
<b>Total, Capital Operating Expenses</b>	<b>N/A</b>	<b>N/A</b>	<b>14,250</b>	<b>65,890</b>	<b>13,700</b>	<b>32,104</b>	<b>+18,404</b>

**Science Laboratories Infrastructure  
Minor Construction Activities**

(dollars in thousands)

**General Plant Projects (GPP)**

GPPs (greater than or equal to \$5M and less than \$30M)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
Welcome and Access Center at FNAL	12,500	1,000	11,500	—	—	—	—
Steam to Hydronics Conversion Project at PNNL	5,400	—	—	—	5,400	—	-5,400
Emergency Generator Upgrades, Phase 1 at LBNL	5,500	—	—	—	5,500	—	-5,500
Fire Alarm System Replacement	8,200	—	—	8,200	—	—	—
B510 Upgrade Electrical Distribution, II	5,150	—	—	5,150	—	—	—
LSL2 Building Steam to Hydronics Conversion	8,220	—	—	8,220	—	—	—
Cooling Tower Upgrade Phase II	12,000	—	—	12,000	—	—	—
HVAC System Upgrade Harley Wilhelm Mall	6,200	—	—	6,200	—	—	—
Upgrade HVAC Systems Improvement II	9,300	—	—	9,300	—	—	—
Life safety Improvements	7,300	—	—	7,300	—	—	—
HVAC Upgrade Life Sciences Laboratory (Bldg. 331)	6,000	—	—	—	—	6,000	+6,000
Power Quality Compensation Equipment Installation	8,300	—	—	—	—	8,300	+8,300
Chiller Replacement (Bldg. 450)	6,530	—	—	—	—	6,530	+6,530
Electrical Component Replacement 88 Inch Cyclotron User (Bldg B88)	6,000	—	—	—	—	6,000	+6,000
Total GPPs (greater than or equal to \$5M and less than \$30M)	N/A	N/A	11,500	56,370	10,900	26,830	+15,930
Total GPPs less than \$5M	N/A	N/A	2,750	9,520	2,800	5,274	+2,474
<b>Total, General Plant Projects (GPP)</b>	<b>N/A</b>	<b>N/A</b>	<b>14,250</b>	<b>65,890</b>	<b>13,700</b>	<b>32,104</b>	<b>+18,404</b>

(dollars in thousands)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
<b>Total, Minor Construction Activities</b>	<b>N/A</b>	<b>N/A</b>	<b>14,250</b>	<b>65,890</b>	<b>13,700</b>	<b>32,104</b>	<b>+18,404</b>

*Note:*

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

**Science Laboratories Infrastructure  
Institutional General Plant Projects (IGPP)**

(dollars in thousands)

Total	FY 2022 Current	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
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**Institutional General Plant Projects (IGPP)**

IGPPs (greater than or equal to \$5M and less than \$30M)

Sitewide Generator Upgrades Phase 1, LBNL	16,750	16,750		—
Former B7 Tensile Structure Installation, LBNL	9,000	9,000		—
7625 Cooling Water System Replacement, ORNL	9,600	9,600		—
LSW High Ceiling Laboratory Conversion, PNNL	5,951	5,951		—
PNNL Richland North Infrastructure, PNNL	24,600	24,600		—
Secure Space Compliance Upgrades and Consolidation, ANL	5,000		5,000	-5,000
Bldg. 221 Renovations, ANL	8,800		8,800	-8,800
Autonomous Discovery Lab Renovations, ANL	10,000		10,000	-10,000
Switch Station SW-A3 Improvements, LBNL	21,000		21,000	-21,000
Helium Capture/Storage Capabilities, LBNL	5,000		5,000	-5,000
Strawberry Gatehouse Replacement, LBNL	6,000		6,000	-6,000
Modular HPC Datacenter, LBNL	8,000		8,000	-8,000
Chemical Receiving Space, LBNL	5,000		5,000	-5,000
B84 Lab Improvement, LBNL	6,000		6,000	-6,000
7600 Area (Experimental Gas Cooled Reactor - EGCR) Campus Utility Modernization, ORNL	9,600		9,600	-9,600
Melton Valley Warehouse Expansion, ORNL	11,000		11,000	-11,000
4500N Library Renovations (includes swing office space), ORNL	13,000		13,000	-13,000
7667 Low Level Waste Site Improvements, ORNL	10,000		10,000	-10,000
Advanced Microscopy Laboratory Expansion, ORNL	9,600		9,600	-9,600
Sewage Treatment Plant - Lift station (3501), ORNL	9,600		9,600	-9,600
318 Hot Water Piping Upgrade, PNNL	8,000		8,000	-8,000
Guest House Repurpose, PNNL	6,250		6,250	-6,250
300 Area Office, PNNL	8,000		8,000	-8,000
Advanced Secure Communications, PNNL	24,700		24,700	-24,700
East Campus Site & Utilities Improvement Project (ESUI), SLAC	10,000		10,000	-10,000
Klystron Gallery Power Distribution Infrastructure, SLAC	7,000		7,000	-7,000

Transit Hub and Utility Improvements Project (THUP), LBNL	24,900		24,900		-24,900
Space Renovation Program - Bldg. 360 Area, ANL	8,000			8,000	+8,000
Bldg. 362 Facility Modernization, ANL	12,000			12,000	+12,000
Enterprise Data Center Hall #2 Build Out, ANL	8,000			8,000	+8,000
High Voltage Substation and Transformer Upgrades, ANL	12,950			12,950	+12,950
Sitewide Retaining Wall Improvements, LBNL	5,000			5,000	+5,000
B66 4th Floor Lab Upgrades, LBNL	10,000			10,000	+10,000
B2 Space Conversion, LBNL	10,500			10,500	+10,500
B62 MEP Improvements, LBNL	15,000			15,000	+15,000
B62 Highbay Renovations, LBNL	5,000			5,000	+5,000
B71 Mechanical/Electrical Upgrades, LBNL	15,500			15,500	+15,500
B62 Slab Repair and Space Conversion, LBNL	21,050			21,050	+21,050
Transuranic Waste Certification and Loading Support Building, ORNL	24,000			24,000	+24,000
4508 Modernization, ORNL	9,600			9,600	+9,600
2000/3000 Utilities Modernization, ORNL	9,600			9,600	+9,600
Vehicle charging stations, ORNL	6,000			6,000	+6,000
5500 High Bay Modifications, ORNL	9,600			9,600	+9,600
Multi-program Office Building #2, ORNL	11,000			11,000	+11,000
4500N Wing 1 General use lab space, ORNL	12,000			12,000	+12,000
331 HVAC Upgrade, PNNL	5,000			5,000	+5,000
PNNL Richland North Central Infrastructure, PNNL				6,200	
318 HVAC Upgrade, PNNL				10,000	
331 Research Support Office, PNNL				10,000	
General Purpose Lab, PNNL				15,000	
Secure Physical Sciences, PNNL				23,300	
Total IGPPs (greater than or equal to \$5M and less than \$30M)	566,651	65,901	226,450	274,300	+47,850
Total IGPPs less than \$5M	74,932	27,993	25,950	20,989	-4,961
<b>Total, Institutional General Plant Projects (IGPP)</b>	<b>641,583</b>	<b>93,894</b>	<b>252,400</b>	<b>295,289</b>	<b>+42,889</b>

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 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
<b>22-SC-71, Critical Infrastructure Modernization Project, ORNL</b>							
Total Estimated Cost (TEC)	416,000	–	1,000	–	1,000	–	-1,000
Other Project Cost (OPC)	4,000	1,250	750	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>420,000</b>	<b>1,250</b>	<b>1,750</b>	<b>–</b>	<b>1,000</b>	<b>–</b>	<b>-1,000</b>
<b>22-SC-72, Thomas Jefferson Infrastructure Improvements, TJNAF</b>							
Total Estimated Cost (TEC)	96,000	–	1,000	–	1,000	–	-1,000
Other Project Cost (OPC)	1,000	1,000	–	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>97,000</b>	<b>1,000</b>	<b>1,000</b>	<b>–</b>	<b>1,000</b>	<b>–</b>	<b>-1,000</b>
<b>21-SC-71, Princeton Plasma Innovation Center, PPPL</b>							
Total Estimated Cost (TEC)	96,300	150	7,750	10,000	10,000	15,000	+5,000
Other Project Cost (OPC)	2,200	1,823	106	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>98,500</b>	<b>1,973</b>	<b>7,856</b>	<b>10,000</b>	<b>10,000</b>	<b>15,000</b>	<b>+5,000</b>
<b>21-SC-72, Critical Infrastructure Recovery &amp; Renewal, PPPL</b>							
Total Estimated Cost (TEC)	87,300	150	2,000	–	4,000	10,000	+6,000
Other Project Cost (OPC)	1,700	1,352	–	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>89,000</b>	<b>1,502</b>	<b>2,000</b>	<b>–</b>	<b>4,000</b>	<b>10,000</b>	<b>+6,000</b>
<b>21-SC-73, Ames Infrastructure Modernization</b>							
Total Estimated Cost (TEC)	30,000	150	2,000	17,850	2,000	8,000	+6,000
Other Project Cost (OPC)	1,000	257	250	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>31,000</b>	<b>407</b>	<b>2,250</b>	<b>17,850</b>	<b>2,000</b>	<b>8,000</b>	<b>+6,000</b>

(dollars in thousands)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
<b>20-SC-71, Critical Utilities Rehabilitation Project, BNL</b>							
Total Estimated Cost (TEC)	92,000	40,000	26,000	–	26,000	–	-26,000
Other Project Cost (OPC)	1,000	1,000	–	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>93,000</b>	<b>41,000</b>	<b>26,000</b>	<b>–</b>	<b>26,000</b>	<b>–</b>	<b>-26,000</b>
<b>20-SC-72, Seismic Safety and Infrastructure Upgrades, LBNL</b>							
Total Estimated Cost (TEC)	141,000	15,000	18,000	22,500	27,500	40,000	+12,500
Other Project Cost (OPC)	4,690	2,651	1,000	–	200	–	-200
<b>Total Project Cost (TPC)</b>	<b>145,690</b>	<b>17,651</b>	<b>19,000</b>	<b>22,500</b>	<b>27,700</b>	<b>40,000</b>	<b>+12,300</b>
<b>20-SC-73, CEBAF Renovation and Expansion, TJNAF</b>							
Total Estimated Cost (TEC)	87,000	4,000	10,000	10,000	15,000	11,000	-4,000
Other Project Cost (OPC)	3,300	1,492	–	–	600	–	-600
<b>Total Project Cost (TPC)</b>	<b>90,300</b>	<b>5,492</b>	<b>10,000</b>	<b>10,000</b>	<b>15,600</b>	<b>11,000</b>	<b>-4,600</b>
<b>20-SC-75, Large Scale Collaboration Center, SLAC</b>							
Total Estimated Cost (TEC)	55,000	22,000	12,000	–	21,000	–	-21,000
Other Project Cost (OPC)	2,000	504	–	–	400	950	+550
<b>Total Project Cost (TPC)</b>	<b>57,000</b>	<b>22,504</b>	<b>12,000</b>	<b>–</b>	<b>21,400</b>	<b>950</b>	<b>-20,450</b>
<b>20-SC-76, Tritium System Demolition and Disposal, PPPL</b>							
Total Estimated Cost (TEC)	32,400	26,000	6,400	–	–	–	–
Other Project Cost (OPC)	1,000	1,000	–	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>33,400</b>	<b>27,000</b>	<b>6,400</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>20-SC-77, Argonne Utilities Upgrade, ANL</b>							
Total Estimated Cost (TEC)	215,000	1,000	10,000	–	8,000	8,007	+7
Other Project Cost (OPC)	1,000	1,000	–	–	–	–	–

(dollars in thousands)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
<b>Total Project Cost (TPC)</b>	<b>216,000</b>	<b>2,000</b>	<b>10,000</b>	<b>–</b>	<b>8,000</b>	<b>8,007</b>	<b>+7</b>
<b>20-SC-78, Linear Assets Modernization Project, LBNL</b>							
Total Estimated Cost (TEC)	236,000	1,000	10,400	–	23,425	18,900	-4,525
Other Project Cost (OPC)	6,000	2,317	946	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>242,000</b>	<b>3,317</b>	<b>11,346</b>	<b>–</b>	<b>23,425</b>	<b>18,900</b>	<b>-4,525</b>
<b>20-SC-79, Critical Utilities Infrastructure Revitalization, SLAC</b>							
Total Estimated Cost (TEC)	204,000	1,000	8,500	–	25,425	35,075	+9,650
Other Project Cost (OPC)	4,450	1,894	778	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>208,450</b>	<b>2,894</b>	<b>9,278</b>	<b>–</b>	<b>25,425</b>	<b>35,075</b>	<b>+9,650</b>
<b>20-SC-80, Utilities Infrastructure Project, FNAL</b>							
Total Estimated Cost (TEC)	310,000	1,000	10,500	–	20,000	45,000	+25,000
Other Project Cost (OPC)	4,000	1,850	200	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>314,000</b>	<b>2,850</b>	<b>10,700</b>	<b>–</b>	<b>20,000</b>	<b>45,000</b>	<b>+25,000</b>
<b>19-SC-71, Science User Support Center at BNL</b>							
Total Estimated Cost (TEC)	85,000	47,000	38,000	–	–	–	–
Other Project Cost (OPC)	1,200	1,200	–	–	–	–	–
<b>Total Project Cost (TPC)</b>	<b>86,200</b>	<b>48,200</b>	<b>38,000</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>19-SC-73, Translational Research Capacity, ORNL</b>							
Total Estimated Cost (TEC)	93,500	72,000	21,500	–	–	–	–
Other Project Cost (OPC)	1,500	1,400	–	–	–	100	+100
<b>Total Project Cost (TPC)</b>	<b>95,000</b>	<b>73,400</b>	<b>21,500</b>	<b>–</b>	<b>–</b>	<b>100</b>	<b>+100</b>
<b>19-SC-74, BioEPIC Building</b>							
Total Estimated Cost (TEC)	165,000	40,000	35,000	7,000	45,000	38,000	-7,000



(dollars in thousands)

	Total	Prior Years	FY 2022 Enacted	FY 2022 IRA Supp.	FY 2023 Enacted	FY 2024 Request	FY 2024 Request vs FY 2023 Enacted
Other Project Cost (OPC)	2,200	1,536	—	—	—	—	—
<b>Total Project Cost (TPC)</b>	<b>167,200</b>	<b>41,536</b>	<b>35,000</b>	<b>7,000</b>	<b>45,000</b>	<b>38,000</b>	<b>-7,000</b>
<b>18-SC-71, Energy Sciences Capability, PNNL</b>							
Total Estimated Cost (TEC)	90,000	90,000	—	—	—	—	—
Other Project Cost (OPC)	3,000	1,362	1,638	—	—	—	—
<b>Total Project Cost (TPC)</b>	<b>93,000</b>	<b>91,362</b>	<b>1,638</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>
<b>17-SC-71, Integrated Engineering Research Center at FNAL</b>							
Total Estimated Cost (TEC)	85,000	74,750	10,250	—	—	—	—
Other Project Cost (OPC)	1,000	950	50	—	—	—	—
<b>Total Project Cost (TPC)</b>	<b>86,000</b>	<b>75,700</b>	<b>10,300</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>
<b>Total, Construction</b>							
Total Estimated Cost (TEC)	N/A	N/A	230,300	67,350	229,350	228,982	-368
Other Project Cost (OPC)	N/A	N/A	5,718	—	1,200	1,050	-150
<b>Total Project Cost (TPC)</b>	<b>N/A</b>	<b>N/A</b>	<b>236,018</b>	<b>67,350</b>	<b>230,550</b>	<b>230,032</b>	<b>-518</b>

**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**

**Summary**

The FY 2024 Request for the Princeton Plasma Innovation Center (PPIC) project is \$15,000,000 of Total Estimated Cost (TEC) funding. The TEC range for this project is \$78,300,000 to \$96,300,000. The preliminary Total Project Cost (TPC) range for this project is \$80,500,000 to \$98,500,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is \$98,500,000.

This project will provide a multi-purpose facility with modern, flexible, efficient, and agile research laboratories and office space to conduct plasma research activities in support of multiple SC programs.

**Significant Changes**

This project was initiated in FY 2021 Enacted Appropriations. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on January 22, 2021. The project received \$10,000,000 in Inflation Reduction Act (IRA) funding which will be used to mitigate the risks of escalation and allow the project schedule to be accelerated. FY 2024 funds will support construction activities after the appropriate CD approvals.

A Federal Project Director working towards the appropriate certification level was 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 2024	9/9/19	8/25/20	1/22/21	3Q FY 2024	2Q FY 2024	3Q FY 2024	3Q FY 2028

**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 2024	3Q FY 2024	1Q FY 2024

**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 2023	8,900	87,400	96,300	2,200	2,200	98,500
FY 2024	8,900	87,400	96,300	2,200	2,200	98,500

### **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**

The Princeton Plasma Innovation Center (PPIC) is envisioned as a 77,000 to 107,000 gross square feet (gsf) multi-story office 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. It is anticipated a review and approval for long-lead procurements (e.g. mechanical and electrical equipment) and site preparation (e.g. demolition) in support of CD-3A will occur in 1Q FY 2024.

### **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. The PPPL vision is "enabling a world powered by safe, clean, and plentiful fusion energy while leading discoveries in plasma science and technology." To support this vision, PPPL carries out experiments and computer simulations of the behavior of plasma, which is hot electrically charged gas. Plasmas with sufficient temperature generate fusion reactions. Therefore, PPPL's aim is to be a leading center for future fusion concepts. The understanding of plasma and its related technologies also has a broad impact on many other scientific fields and applications that are central to U.S. economic health and competitiveness. This impact extends to astrophysics and space sciences, plasma-material interactions, plasma processing, particle acceleration, and high energy density plasmas. Many industries, such as the microelectronics industry, utilize plasmas to synthesize and shape the materials in their products. These industries are increasingly seeking collaboration with PPPL to improve their understanding of existing plasma processes and to develop new modeling and measurement techniques potentially leading to new processes and applications. PPPL, in collaboration with Princeton University, is strengthening its efforts to develop innovations for the next generation microelectronics to advance economic competitiveness, national security, and future energy applications.

However, the current condition, capabilities, and configuration of PPPL infrastructure do not adequately accommodate current or planned scientific efforts. In particular, the lack of adequate laboratory infrastructure, modern collaboration space, and modern office infrastructure are not optimal to support PPPL research. PPPL would benefit from office and laboratories capabilities that can effectively accomplish the advancement of the FES mission.

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
Multi-Story Building	77,000 gsf	107,000 gsf

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Estimated Cost (TEC)</b>				
Design (TEC)				
Prior Years	150	150	–	–
FY 2022	7,750	7,750	1,500	–
FY 2022 - IRA Supp.	1,000	1,000	–	–
FY 2023	–	–	4,000	1,000
FY 2024	–	–	2,400	–
<b>Total, Design (TEC)</b>	<b>8,900</b>	<b>8,900</b>	<b>7,900</b>	<b>1,000</b>
Construction (TEC)				
FY 2022 - IRA Supp.	9,000	9,000	–	–
FY 2023	10,000	10,000	–	–
FY 2024	15,000	15,000	6,000	9,000
Outyears	53,400	53,400	72,400	–
<b>Total, Construction (TEC)</b>	<b>87,400</b>	<b>87,400</b>	<b>78,400</b>	<b>9,000</b>
Total Estimated Cost (TEC)				
Prior Years	150	150	–	–
FY 2022	7,750	7,750	1,500	–
FY 2022 - IRA Supp.	10,000	10,000	–	–
FY 2023	10,000	10,000	4,000	1,000
FY 2024	15,000	15,000	8,400	9,000
Outyears	53,400	53,400	72,400	–
<b>Total, TEC</b>	<b>96,300</b>	<b>96,300</b>	<b>86,300</b>	<b>10,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Other Project Cost (OPC)</b>				
Prior Years	1,823	1,823	1,823	–
FY 2022	106	106	106	–
Outyears	271	271	271	–
<b>Total, OPC</b>	<b>2,200</b>	<b>2,200</b>	<b>2,200</b>	<b>–</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Project Cost (TPC)</b>				
Prior Years	1,973	1,973	1,823	–
FY 2022	7,856	7,856	1,606	–
FY 2022 - IRA Supp.	10,000	10,000	–	–
FY 2023	10,000	10,000	4,000	1,000
FY 2024	15,000	15,000	8,400	9,000
Outyears	53,671	53,671	72,671	–
<b>Total, TPC</b>	<b>98,500</b>	<b>98,500</b>	<b>88,500</b>	<b>10,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	7,900	7,900	N/A
Design - Contingency	1,000	1,000	N/A
<b>Total, Design (TEC)</b>	<b>8,900</b>	<b>8,900</b>	<b>N/A</b>
Construction	72,000	72,000	N/A
Construction - Contingency	15,400	15,400	N/A
<b>Total, Construction (TEC)</b>	<b>87,400</b>	<b>87,400</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>96,300</b>	<b>96,300</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>16,400</i>	<i>16,400</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	300	300	N/A
Conceptual Design	1,700	1,700	N/A
OPC - Contingency	200	200	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>2,200</b>	<b>2,200</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>2,200</b>	<b>2,200</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>200</i>	<i>200</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>98,500</b>	<b>98,500</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>16,600</b>	<b>16,600</b>	<b>N/A</b>

#### 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2022 IRA Supp.	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	150	900	—	10,000	—	85,250	96,300
	OPC	1,860	—	—	—	—	340	2,200
	TPC	2,010	900	—	10,000	—	85,590	98,500
FY 2024	TEC	150	7,750	10,000	10,000	15,000	53,400	96,300
	OPC	1,823	106	—	—	—	271	2,200
	TPC	1,973	7,856	10,000	10,000	15,000	53,671	98,500

**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 2028
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	3Q FY 2078

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 .....	77,000-107,000
Area of D&D in this project at PPPL .....	13,400
Area at PPPL to be transferred, sold, and/or D&D outside the project, including area previously “banked” .....	None <sup>a</sup>
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

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. Project performance metrics will be performed by in-house management and Project Controls.

<sup>a</sup> 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.

**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 2024 Request for the Critical Infrastructure Recovery & Renewal (CIRR) project is \$10,000,000 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.

**Significant Changes**

This project was initiated in FY 2021 Enacted Appropriations. The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on February 23, 2021. FY 2024 funds will continue design activities.

A Federal Project Director working towards the appropriate certification level was 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 2024	9/16/19	2/23/21	2/23/21	4Q FY 2025	4Q FY 2025	4Q FY 2025	4Q FY 2029

**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 2024	4Q FY 2025	4Q FY 2024

**CD-3A** – Approve Long-Lead Procurements and Start of Early Construction Activities.



## **Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	9,950	77,350	87,300	1,700	1,700	89,000
FY 2024	9,950	77,350	87,300	1,700	1,700	89,000

### **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**

The CIRR project at PPPL will revitalize critical infrastructure that supports the PPPL campus to ensure reliability and resilience. Upgrades that may be completed as part of the CIRR project include: the electrical distribution system; standby power; chilled water generation and distribution; distribution networks for steam, compressed air, sanitary waste, and condenser, storm, canal, and potable water; 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 specifics of long-lead electrical equipment procurement will be reviewed and approved in support of CD-3A.

### **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. Every element of this project will be designed to consider the best available and most efficient technology and employ artificial intelligence systems to enhance operations and maintenance of new systems and equipment.

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 Generation	<ul style="list-style-type: none"> <li>Improve configuration and efficiency of the Central Chilled Water Plant to ensure distribution of 1,200 tons of cooling capacity to the site.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
Communications Distribution Network	<ul style="list-style-type: none"> <li>Improve data infrastructure cabling and components by replacing existing copper cable with 2,000 linear feet of cat 6 cable.</li> <li>Provide 2,500 linear feet of 48 strand network fiber cable connected to the PU Computer Center.</li> <li>Provide 15,000 linear feet of 24 strand fiber optic cable to support site wide communication.</li> </ul>	<ul style="list-style-type: none"> <li>Threshold plus upgrade additional communication system components to improve security, reliability, and flexibility.</li> </ul>
Electrical Distribution & Standby Power	<ul style="list-style-type: none"> <li>Create redundancy and improve mission readiness of the primary electrical distribution system in the 138 kV Yard.</li> <li>Provide site-wide capacity of standby generation at 3,500 KW.</li> <li>Upgrade 8 Substations for priority buildings and facilities.</li> </ul>	<ul style="list-style-type: none"> <li>Increase site-wide capacity of standby generation up to 4,350 KW.</li> <li>Upgrade up to 10 substations for additional buildings/facilities to improve flexibility for maintenance and operations.</li> </ul>
HVAC Systems	<ul style="list-style-type: none"> <li>Upgrade 8 HVAC system equipment for priority buildings on C-Site and D-Site.</li> </ul>	<ul style="list-style-type: none"> <li>Upgrade up to 14 HVAC system equipment for additional buildings to meet sustainability goals and improve maintenance and operations.</li> </ul>
Underground Distribution Network	<ul style="list-style-type: none"> <li>Replace all failed critical underground piping, valves, and components for campus utilities.</li> <li>Replace 1,700 linear feet of electrical feeders (26kv) for improved reliability.</li> <li>Upgrade 9,500 sqft. of Storm Retention Basin liner.</li> </ul>	<ul style="list-style-type: none"> <li>Threshold plus upgrade additional underground system components to improve maintenance and reliability.</li> </ul>

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Estimated Cost (TEC)</b>			
Design (TEC)			
Prior Years	150	150	–
FY 2022	2,000	2,000	1,000
FY 2023	4,000	4,000	4,000
FY 2024	3,800	3,800	4,000
Outyears	–	–	950
<b>Total, Design (TEC)</b>	<b>9,950</b>	<b>9,950</b>	<b>9,950</b>
Construction (TEC)			
FY 2024	6,200	6,200	–
Outyears	71,150	71,150	77,350
<b>Total, Construction (TEC)</b>	<b>77,350</b>	<b>77,350</b>	<b>77,350</b>
Total Estimated Cost (TEC)			
Prior Years	150	150	–
FY 2022	2,000	2,000	1,000
FY 2023	4,000	4,000	4,000
FY 2024	10,000	10,000	4,000
Outyears	71,150	71,150	78,300
<b>Total, TEC</b>	<b>87,300</b>	<b>87,300</b>	<b>87,300</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Other Project Cost (OPC)</b>			
Prior Years	1,352	1,352	1,352
Outyears	348	348	348
<b>Total, OPC</b>	<b>1,700</b>	<b>1,700</b>	<b>1,700</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Project Cost (TPC)</b>			
Prior Years	1,502	1,502	1,352
FY 2022	2,000	2,000	1,000
FY 2023	4,000	4,000	4,000
FY 2024	10,000	10,000	4,000
Outyears	71,498	71,498	78,648
<b>Total, TPC</b>	<b>89,000</b>	<b>89,000</b>	<b>89,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	7,600	7,600	N/A
Design - Contingency	2,350	2,350	N/A
<b>Total, Design (TEC)</b>	<b>9,950</b>	<b>9,950</b>	<b>N/A</b>
Construction	59,500	59,500	N/A
Construction - Contingency	17,850	17,850	N/A
<b>Total, Construction (TEC)</b>	<b>77,350</b>	<b>77,350</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>87,300</b>	<b>87,300</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>20,200</i>	<i>20,200</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	200	200	N/A
Conceptual Design	1,300	1,300	N/A
OPC - Contingency	200	200	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>1,700</b>	<b>1,700</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>1,700</b>	<b>1,700</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>200</i>	<i>200</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>89,000</b>	<b>89,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>20,400</b>	<b>20,400</b>	<b>N/A</b>

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	150	2,000	4,000	—	81,150	87,300
	OPC	1,352	—	—	—	348	1,700
	TPC	1,502	2,000	4,000	—	81,498	89,000
FY 2024	TEC	150	2,000	4,000	10,000	71,150	87,300
	OPC	1,352	—	—	—	348	1,700
	TPC	1,502	2,000	4,000	10,000	71,498	89,000

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	4Q FY 2029
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	1,100	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, will perform the acquisition for this project, overseen by the Princeton Site Office. The M&O Contractor will be responsible for awarding and managing all subcontracts related to the project. Project performance metrics will be performed by in-house management and Project Controls.

**21-SC-73, Ames Infrastructure Modernization**  
**Ames National Laboratory, AMES**  
**Project is for Design and Construction**

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

**Summary**

The FY 2024 Request for the Ames Infrastructure Modernization (AIM) project is \$8,000,000 of Total Estimated Cost (TEC). The preliminary Total Estimated Cost (TEC) range for this project is \$22,000,000 to \$89,000,000. The preliminary Total Project Cost (TPC) range for this project is \$26,400,000 to \$86,500,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is \$31,000,000.

Ames objective is to support the SC mission by providing safer and more operationally efficient buildings that meet modern needs as well as to reduce deferred maintenance. This project is designed to support DOE mission-critical programs and initiatives, increase the reliability of utility infrastructure, minimize facility costs through effective and efficient operations, and modernize laboratories in Ames research buildings, thereby enhancing Ames ability to continue to deliver on SC mission across multiple program offices.

**Significant Changes**

This project was initiated in FY 2021 Enacted Appropriations. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-0, Approve Mission Need, which was approved September 16, 2019. The project received \$17,850,000 in Inflation Reduction Act (IRA) funding which will be used to mitigate the risks of escalation and allow the project schedule to be accelerated. FY 2024 funds will support construction activities upon the appropriate CD approvals.

A Federal Project Director will be assigned to this project prior to CD-1 approval.

**Critical Milestone History**

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2024	9/16/19	2Q FY 2023	3Q FY 2023	3Q FY 2024	2Q FY 2024	3Q FY 2024	2Q FY 2029

**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 2024	3Q FY 2024	1Q FY 2024

**CD-3A** – Approve Long-Lead Procurements.

## **Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2024	6,000	24,000	30,000	1,000	1,000	31,000

### **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**

The AIM project will provide updated infrastructure building systems in existing research and operations buildings at Ames Laboratory, such as: plumbing systems; building envelopes; electrical distribution systems, emergency backup power, and uninterruptible power supplies; and telecommunication systems. In addition, some existing laboratory spaces may be modernized to support the SC mission and associated equipment. It is anticipated a review and approval for long-lead procurements (e.g., mechanical and electrical equipment) in support of CD-3A will occur in 1Q FY 2024.

### **Justification**

SC utilizes the capabilities of AMES to execute three of SC's 24 core capabilities and the mission of multiple SC program offices, including research by the offices of BES, ASCR, BER, and to a lesser extent, FES. These core capabilities are 1) Condensed Matter Physics and Materials Science, 2) Chemical and Molecular Science, and 3) Applied Materials Science and Engineering.

The current condition of the building systems and infrastructure impedes the execution and advancement of the SC mission for the following reasons: 1) deteriorating plumbing systems result in unplanned events such as sanitary sewer or major water leaks that lead to disruption of scientific operations, jeopardizing instrumentation, and presenting a safety and health risk to personnel; 2) deteriorating building envelopes negatively impact the SC mission through increased operational costs, elevated risk of scientific research equipment damage, and a poor work environment for Ames staff; 3) antiquated and unreliable electrical supply and distribution places sensitive scientific research equipment at risk of damage, limits program expansion and acquisition of new state-of-the-art equipment and instrumentation; 4) inadequate telecommunication systems impede program expansion and limit SC acquisition of new state-of-the-art instrumentation; and 5) inflexible research laboratory space limits the ability to house state-of-the-art equipment and instrumentation, implement best safety management practices, create collaborative environments; and attract, recruit, and retain the scientific talent.

Therefore, to better accommodate the current and future DOE Office of Science mission, minimize disruptions to critical research activities, reduce risks to operations and deferred maintenance, and improve the safety and reliability, AMES needs improved infrastructure systems and workspaces.

The project is being conducted in accordance with the project management principles in accordance with requirements of DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets* for projects less than \$50 million.

### **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
Replace and upgrade plumbing systems in mission critical buildings	<ul style="list-style-type: none"> <li>Replace deficient domestic supply and sanitary sewer piping in two (2) mission critical buildings: Spedding Hall and Wilhelm Hall.</li> </ul>	<ul style="list-style-type: none"> <li>Replace deficient domestic supply and sanitary sewer piping in three (3) mission critical buildings: Spedding Hall, Wilhelm Hall, and Metals Development.</li> </ul>
Upgrade building envelopes for mission critical buildings	<ul style="list-style-type: none"> <li>Upgrade end-of-life built up roofs and facades on two (2) mission critical buildings: Spedding Hall and Wilhelm Hall.</li> </ul>	<ul style="list-style-type: none"> <li>Upgrade past end-of-life built up roofs and facades on three (3) mission critical buildings: Spedding Hall, Wilhelm Hall, and Metals Development.</li> </ul>
Improve emergency/backup power systems	<ul style="list-style-type: none"> <li>Replace two (2) existing backup generators at Wilhelm Hall for Ames Laboratory campus.</li> </ul>	<ul style="list-style-type: none"> <li>Replace three (3) existing backup generators: (2) at Wilhelm Hall, (1) at Sensitive Instrument Facility.</li> </ul>
Improve telecommunications systems	<ul style="list-style-type: none"> <li>Establish two (2) new telecom rooms and install new data cabling in two (2) mission critical buildings: Technical Administrative Services Facility (TASF) and Wilhelm Hall.</li> </ul>	<ul style="list-style-type: none"> <li>Establish three (3) new telecom rooms and install new data cabling in three (3) mission critical buildings: Spedding Hall, Wilhelm Hall, and Metals Development, as well as TASF.</li> </ul>
Modernize existing laboratory spaces in mission critical buildings	<ul style="list-style-type: none"> <li>Renovate wet labs, dry labs, office space, and common areas in two (2) mission critical buildings: Spedding Hall and Wilhelm Hall.</li> </ul>	<ul style="list-style-type: none"> <li>Renovate wet labs, dry labs, office space, and common areas in three (3) mission critical buildings: Spedding Hall, Wilhelm Hall, and Metals Development.</li> </ul>
Replace and upgrade HVAC systems in mission critical buildings	<ul style="list-style-type: none"> <li>Not Applicable.</li> </ul>	<ul style="list-style-type: none"> <li>Replace past end-of-life air handling units and associated controls in three (3) mission critical buildings: Spedding Hall, Wilhelm Hall, and Metals Development.</li> </ul>

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Estimated Cost (TEC)</b>				
Design (TEC)				
Prior Years	150	150	–	–
FY 2022	2,000	2,000	–	–
FY 2022 - IRA Supp.	3,850	3,850	–	–
FY 2023	–	–	–	1,500
FY 2024	–	–	1,050	2,350
Outyears	–	–	1,100	–
<b>Total, Design (TEC)</b>	<b>6,000</b>	<b>6,000</b>	<b>2,150</b>	<b>3,850</b>
Construction (TEC)				
FY 2022 - IRA Supp.	14,000	14,000	–	–
FY 2023	2,000	2,000	–	–
FY 2024	8,000	8,000	–	6,000
Outyears	–	–	10,000	8,000
<b>Total, Construction (TEC)</b>	<b>24,000</b>	<b>24,000</b>	<b>10,000</b>	<b>14,000</b>
Total Estimated Cost (TEC)				
Prior Years	150	150	–	–
FY 2022	2,000	2,000	–	–
FY 2022 - IRA Supp.	17,850	17,850	–	–
FY 2023	2,000	2,000	–	1,500
FY 2024	8,000	8,000	1,050	8,350
Outyears	–	–	11,100	8,000
<b>Total, TEC</b>	<b>30,000</b>	<b>30,000</b>	<b>12,150</b>	<b>17,850</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Other Project Cost (OPC)</b>				
Prior Years	257	257	257	–
FY 2022	250	250	250	–
Outyears	493	493	493	–
<b>Total, OPC</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>–</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Project Cost (TPC)</b>				
Prior Years	407	407	257	–
FY 2022	2,250	2,250	250	–
FY 2022 - IRA Supp.	17,850	17,850	–	–
FY 2023	2,000	2,000	–	1,500
FY 2024	8,000	8,000	1,050	8,350
Outyears	493	493	11,593	8,000
<b>Total, TPC</b>	<b>31,000</b>	<b>31,000</b>	<b>13,150</b>	<b>17,850</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	5,000	2,500	N/A
Design - Contingency	1,000	500	N/A
<b>Total, Design (TEC)</b>	<b>6,000</b>	<b>3,000</b>	<b>N/A</b>
Construction	19,500	22,500	N/A
Construction - Contingency	4,500	4,500	N/A
<b>Total, Construction (TEC)</b>	<b>24,000</b>	<b>27,000</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>30,000</b>	<b>30,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>5,500</i>	<i>5,000</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	250	250	N/A
Conceptual Design	250	250	N/A
OPC - Contingency	500	500	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>1,000</b>	<b>1,000</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>1,000</b>	<b>1,000</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>500</i>	<i>500</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>31,000</b>	<b>31,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>6,000</b>	<b>5,500</b>	<b>N/A</b>

5. Schedule of Appropriations Requests

(dollars in thousands)								
Fiscal Year	Type	Prior Years	FY 2022	FY 2022 IRA Supp.	FY 2023	FY 2024	Outyears	Total
FY 2024	TEC	150	2,000	17,850	2,000	8,000	—	30,000
	OPC	257	250	—	—	—	493	1,000
	TPC	407	2,250	17,850	2,000	8,000	493	31,000

- 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	2Q FY 2029
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	2Q FY 2054

Related Funding Requirements (dollars in thousands)				
	Annual Costs		Life Cycle Costs <sup>a</sup>	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	335	335	8,375	8,375
Utilities	1,024	1,024	25,600	25,600
Maintenance and Repair	1,685	1,685	42,125	42,125
Total, Operations and Maintenance	3,044	3,044	76,100	76,100

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 AMES.....	None
Area of D&D in this project at AMES.....	None
Area at AMES to be transferred, sold, and/or D&D outside the project, including area previously “banked” .....	None <sup>b</sup>
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

<sup>a</sup> Life-Cycle costs will be performed as part of CD-1.  
<sup>b</sup> 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 Ames Management and Operating (M&O) contractor, Iowa State University, will perform the acquisition for this project, overseen by the Ames Site Office. It will evaluate various acquisition approaches and consider project delivery methods prior to achieving CD-1. The M&O contractor will be responsible for awarding and administering all subcontracts related to this project. The M&O contractor's annual performance evaluation and measurement plan will include project performance metrics on which it will be evaluated.

**20-SC-72, Seismic and Safety Modernization, LBNL**  
**Lawrence Berkeley National Laboratory, LBNL**  
**Project is for Design and Construction**

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

**Summary**

The FY 2024 Request for the Seismic and Safety Modernization (SSM) project is \$40,000,000 of Total Estimated Cost (TEC) funding. The TEC range for this project is \$95,400,000 to \$183,000,000. The preliminary Total Project Cost (TPC) range for this project is \$97,600,000 to \$187,000,000. Currently, these cost ranges encompass the most feasible preliminary alternatives. The preliminary TPC estimate for this project is \$145,000,000.

**Significant Changes**

This project was initiated in FY 2020 Enacted Appropriations. Based on a completed design, the SSM project team received bids in 2022 that exceeded the CD-1 cost range. Therefore, the SSM project revisited CD-1, Approve Alternative Selection and Cost Range, in the second quarter of FY 2023. The selected alternative remained the same, but the revised TEC range for this project is \$112,800,000 to \$183,300,000. The revised TPC range for this project is \$116,000,000 to \$188,500,000. The revised preliminary point estimate is \$145,000,000 which is within the estimated cost range for the project.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-3A/R1, which was approved on January 9, 2023, for demolition and site stabilization. Additionally, the CD-0, Approve Mission Need, was updated and approved December 21, 2022, to remove seismic upgrades to the firehouse and address the upgrades immediately with laboratory overhead funds as a separate activity. The project received \$22,500,000 in Inflation Reduction Act (IRA) funding to increase the TPC and initiate long lead procurement and site preparation to mitigate the risks of escalation. FY 2024 funds will support the highest priority project construction scope at time the funds are costed.

A Federal Project Director with the appropriate certification level 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 2024	12/21/22	6/17/19	01/13/23	2Q FY 2024	10/01/21	2Q FY 2024	4Q FY 2028

**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.

*Note:*

- CD-0 was originally approved on 9/6/2018, and has been updated to remove seismic upgrades to the firehouse.

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2024	2Q FY 2024	01/13/23

**CD-3A** – Approve Long-Lead Procurement 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 2023	9,000	86,400	95,400	2,200	2,200	97,600
FY 2024	12,000	129,000	141,000	4,000	4,000	145,000

### **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**

The SSM project will construct a new 47,000 (approximately) gross square feet facility on the existing cafeteria site to house the cafeteria, health services and operational support services (human resources, conferencing, and other potential groups) to meet the requirements of Risk Category III of the California Building Code (CBC).

### **Justification**

LBNL executes 22 of the Office of Science's (SC'S) 24 core capabilities and the mission of multiple SC program offices, including ASCR, BER, BES, and HEP programs. LBNL is located on a 202-acre site in the hills above the University of California, Berkeley campus, employs approximately 3,400 full time employees, and is home to five SC national user facilities: the Advanced Light Source, the Energy Sciences Network, the Joint Genome Institute, the Molecular Foundry, and the National Energy Research Scientific Computing Center. In FY 2016, over 11,000 researchers used these facilities, representing roughly one third of the total for all SC user facilities. In pursuing the SC mission, LBNL leverages collaborative science to bring together teams of individuals with different fields of expertise to work together on common solutions to the SC mission. However, these research activities must be executed with a unique caution since LBNL is located less than one mile from the Hayward Fault and less than 25 miles from the San Andreas Fault, which would both pose a life safety risk to employees, visitors, and guests during a significant seismic event.

The U.S. Geological Survey's earthquake forecast, the third Uniform California Earthquake Rupture Forecast, states a 98 percent probability of a 6.0 magnitude or higher earthquake in the San Francisco Bay Area before 2043. Recent engineering evaluations from a San Francisco Bay Area structural engineering firm have identified significant and extensive seismic safety hazards in critical LBNL support buildings, including the Cafeteria and Health Services. Structural deficiencies identified in these buildings will likely cause significant structural damage with life safety hazards during a magnitude 6.0+ earthquake on the Hayward Fault or a magnitude 8.3 earthquake on the San Andreas Fault and will impede LBNL's ability to resume operations.

The SSM project will address seismic safety issues and emergency response capabilities, specifically related to facilities with large congregation areas as well as transportation capabilities that are necessary for emergency response personnel and maintaining continuity of operations. Demolition of the existing cafeteria and site preparation activities are being conducted prior to CD-2 under the CD-3A authorization to minimize risks and schedule delays and ultimately allow for construction of a new, more sustainable, and operationally resilient facility. Additional supporting functions such as utilities or site modifications may be included in the project if they are deemed necessary.

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
New Facility to include a Cafeteria, Health Services & Operational Support Services	<ul style="list-style-type: none"><li>35,000 gross square feet (gsf).</li><li>Meet requirements of Risk Category III of the CBC.</li></ul>	<ul style="list-style-type: none"><li>60,000 gsf</li><li>N/A</li></ul>

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Estimated Cost (TEC)</b>				
Design (TEC)				
Prior Years	12,000	12,000	7,590	—
FY 2022	—	—	1,200	—
FY 2023	—	—	3,210	—
<b>Total, Design (TEC)</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>—</b>
Construction (TEC)				
Prior Years	3,000	3,000	—	—
FY 2022	18,000	18,000	—	—
FY 2022 - IRA Supp.	22,500	22,500	—	—
FY 2023	27,500	27,500	6,000	8,000
FY 2024	40,000	40,000	10,500	14,500
Outyears	18,000	18,000	90,000	—
<b>Total, Construction (TEC)</b>	<b>129,000</b>	<b>129,000</b>	<b>106,500</b>	<b>22,500</b>
Total Estimated Cost (TEC)				
Prior Years	15,000	15,000	7,590	—
FY 2022	18,000	18,000	1,200	—
FY 2022 - IRA Supp.	22,500	22,500	—	—
FY 2023	27,500	27,500	9,210	8,000
FY 2024	40,000	40,000	10,500	14,500
Outyears	18,000	18,000	90,000	—
<b>Total, TEC</b>	<b>141,000</b>	<b>141,000</b>	<b>118,500</b>	<b>22,500</b>



(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Other Project Cost (OPC)</b>				
Prior Years	2,651	2,651	2,651	—
FY 2022	260	260	260	—
FY 2023	250	250	250	—
Outyears	839	839	839	—
<b>Total, OPC</b>	<b>4,000</b>	<b>4,000</b>	<b>4,000</b>	<b>—</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Project Cost (TPC)</b>				
Prior Years	17,651	17,651	10,241	—
FY 2022	18,260	18,260	1,460	—
FY 2022 - IRA Supp.	22,500	22,500	—	—
FY 2023	27,750	27,750	9,460	8,000
FY 2024	40,000	40,000	10,500	14,500
Outyears	18,839	18,839	90,839	—
<b>Total, TPC</b>	<b>145,000</b>	<b>145,000</b>	<b>122,500</b>	<b>22,500</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	10,300	8,300	N/A
Design - Contingency	1,700	700	N/A
<b>Total, Design (TEC)</b>	<b>12,000</b>	<b>9,000</b>	<b>N/A</b>
Construction	108,000	71,400	N/A
Construction - Contingency	21,000	15,000	N/A
<b>Total, Construction (TEC)</b>	<b>129,000</b>	<b>86,400</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>141,000</b>	<b>95,400</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>22,700</i>	<i>15,700</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	600	200	N/A
Conceptual Design	2,200	1,800	N/A
OPC - Contingency	1,200	200	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>4,000</b>	<b>2,200</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>4,000</b>	<b>2,200</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>1,200</i>	<i>200</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>145,000</b>	<b>97,600</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>23,900</b>	<b>15,900</b>	<b>N/A</b>

#### 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2022 IRA Supp.	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	15,000	27,500	—	27,500	—	25,400	95,400
	OPC	1,070	—	—	—	—	1,130	2,200
	TPC	16,070	27,500	—	27,500	—	26,530	97,600
FY 2024	TEC	15,000	18,000	22,500	27,500	40,000	18,000	141,000
	OPC	2,651	260	—	250	—	839	4,000
	TPC	17,651	18,260	22,500	27,750	40,000	18,839	145,000

**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	4Q FY 2028
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	4Q FY 2078

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	N/A	N/A	N/A
Utilities	53	53	2,658	2,658
Maintenance and Repair	318	318	15,882	15,882
Total, Operations and Maintenance	371	371	18,540	18,540

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 LBNL.....	35,000 - 60,000
Area of D&D in this project at LBNL.....	13,000 - 60,000
Area at LBNL to be transferred, sold, and/or D&D outside the project, including area previously “banked” .....	None <sup>d</sup>
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 .....	13,000 - 60,000

8. Acquisition Approach

The LBNL Management and Operating (M&O) Contractor, University of California, will perform 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. Project performance metrics will be performed by in-house management and Project Controls.

<sup>d</sup> 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-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 2024 Request for the Continuous Electron Beam Accelerator Facility (CEBAF) Renovation and Expansion (CRE) project is \$11,000,000. 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 131,000 to 250,000 gross square feet (gsf) of existing space in the CEBAF center and the Applied Research Center (ARC), upgrade high risk utility systems, and provide 82,000 to 150,000 gsf of additional space for visitors, users, research, education, and support.

**Significant Changes**

This project was initiated in FY 2020 Enacted Appropriations. The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on March 18, 2020. FY 2024 funds will support design activities, and construction and associated activities. The project received \$10,000,000 in Inflation Reduction Act funding which will be used to mitigate the risks of escalation and allow the project schedule to be accelerated.

A Federal Project Director with the appropriate certification 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 2024	7/20/18	10/16/19	3/18/20	4Q FY 2023	3Q FY 2024	4Q FY 2023	4Q FY 2029

**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 2024	4Q FY 2023	2Q FY 2023	N/A

**CD-3A** – Approve Long-Lead Procurements and Start of Early Construction Activities;

**CD-3B** – Approve Start of Remaining Construction Activities

## **Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	5,000	82,000	87,000	3,000	3,000	90,000
FY 2024	7,000	80,000	87,000	3,300	3,300	90,300

### **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**

The scope of the CRE project will include renovating 131,000 to 250,000 gsf of existing space and providing 82,000 to 150,000 gsf of additional office and laboratory space (including acquisition of the ARC) 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 existing CEBAF Center, which have exceeded their service life and experienced multiple failures. The renovated building will be energy sustainable and will meet modern building performance standards, including energy conservation, green building principles, and sustainable design. Upon completion, SC will relocate administrative and support staff from the Service Support Center (SSC) (leased space) and CEBAF into the ARC, and TJNAF 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 user population to increase 2 percent per year for the next 10 years and will soon exceed available space, which is already near capacity. Further, TJNAF is actively pursuing several large inter-entity 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 is lacking 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.

TJNAF also continues to advance a strategic campus plan designed to deliver more efficient, collaborative, and functional workspaces by consolidating 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 address functional workspace needs more efficiently for TJNAF staff and users, 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 the newly planned Electron Ion Collider (EIC) at BNL. The CRE project will be designed to support climate resilience by accounting for projected changes in temperature and precipitation, energy and water efficiency, and enhanced monitoring of assets to reduce the risk of failure.

TJNAF must be prepared to accommodate planned staff and user growth which means additional office space must be available soon. The Laboratory is pursuing Major Items of Equipment (MIEs), several large inter-entity transfer projects for other national laboratories, and a pivotal technical role in the proposed EIC at BNL.

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
CEBAF Center Renovation	66,000 gsf	128,000 gsf
CEBAF Center Expansion	22,000 gsf	57,000 gsf
ARC Renovation	65,000 gsf	122,000 gsf

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Estimated Cost (TEC)</b>				
Design (TEC)				
Prior Years	4,000	4,000	3,311	–
FY 2022	–	–	489	–
FY 2023	2,000	2,000	1,200	–
FY 2024	1,000	1,000	2,000	–
<b>Total, Design (TEC)</b>	<b>7,000</b>	<b>7,000</b>	<b>7,000</b>	<b>–</b>
Construction (TEC)				
FY 2022	10,000	10,000	–	–
FY 2022 - IRA Supp.	10,000	10,000	–	–
FY 2023	13,000	13,000	4,000	–
FY 2024	10,000	10,000	3,000	–
FY 2024 - IRA Supp.	–	–	–	10,000
Outyears	37,000	37,000	63,000	–
<b>Total, Construction (TEC)</b>	<b>80,000</b>	<b>80,000</b>	<b>70,000</b>	<b>10,000</b>
Total Estimated Cost (TEC)				
Prior Years	4,000	4,000	3,311	–
FY 2022	10,000	10,000	489	–
FY 2022 - IRA Supp.	10,000	10,000	–	–
FY 2023	15,000	15,000	5,200	–
FY 2024	11,000	11,000	5,000	–
FY 2024 - IRA Supp.	–	–	–	10,000
Outyears	37,000	37,000	63,000	–
<b>Total, TEC</b>	<b>87,000</b>	<b>87,000</b>	<b>77,000</b>	<b>10,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Other Project Cost (OPC)</b>				
Prior Years	1,492	1,492	1,492	–
FY 2023	600	600	600	–
Outyears	1,208	1,208	1,208	–
<b>Total, OPC</b>	<b>3,300</b>	<b>3,300</b>	<b>3,300</b>	<b>–</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Project Cost (TPC)</b>				
Prior Years	5,492	5,492	4,803	—
FY 2022	10,000	10,000	489	—
FY 2022 - IRA Supp.	10,000	10,000	—	—
FY 2023	15,600	15,600	5,800	—
FY 2024	11,000	11,000	5,000	—
FY 2024 - IRA Supp.	—	—	—	10,000
Outyears	38,208	38,208	64,208	—
<b>Total, TPC</b>	<b>90,300</b>	<b>90,300</b>	<b>80,300</b>	<b>10,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	6,000	3,500	N/A
Design - Contingency	1,000	1,500	N/A
<b>Total, Design (TEC)</b>	<b>7,000</b>	<b>5,000</b>	<b>N/A</b>
Construction	63,000	65,000	N/A
Construction - Contingency	17,000	17,000	N/A
<b>Total, Construction (TEC)</b>	<b>80,000</b>	<b>82,000</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>87,000</b>	<b>87,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>18,000</i>	<i>18,500</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	2,700	2,400	N/A
Conceptual Design	600	400	N/A
OPC - Contingency	N/A	200	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>3,300</b>	<b>3,000</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>3,300</b>	<b>3,000</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>N/A</i>	<i>200</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>90,300</b>	<b>90,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>18,000</b>	<b>18,700</b>	<b>N/A</b>



## 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2022 IRA Supp.	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	4,000	10,000	—	2,000	—	71,000	87,000
	OPC	1,467	—	—	600	—	933	3,000
	TPC	5,467	10,000	—	2,600	—	71,933	90,000
FY 2024	TEC	4,000	10,000	10,000	15,000	11,000	37,000	87,000
	OPC	1,492	—	—	600	—	1,208	3,300
	TPC	5,492	10,000	10,000	15,600	11,000	38,208	90,300

### 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	4Q FY 2029
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	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 .....	82,000 – 150,000
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 <sup>e</sup>
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

<sup>e</sup> 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 TJNAF Management and Operating (M&O) contractor, Jefferson Science Associates, will perform the acquisition for this Design-Bid-Build project, overseen by the Thomas Jefferson Site Office. The M&O contractor will be responsible for awarding and administering all subcontracts related to this project. Its annual performance evaluation and measurement plan will include project performance metrics on which it will be evaluated.

**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 2024 Request for the Argonne Utilities Upgrade (AU2) project is \$8,007,000 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 is proposed to revitalize and selectively upgrade ANL's existing major utility systems including 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:

- **Chilled Water and Utility Piping:** Consists of site preparation, demolition and construction of a new chilled water plant.
- **Steam and Utility Piping:** Consists of construction of a new steam plant and repair, replacement, and modernization of several major utility systems, including steam and condensate, domestic water, canal water and sewer systems.

**Significant Changes**

This project was initiated in FY 2020 Enacted Appropriations. The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on July 1, 2021. FY 2024 funds will support design and preparatory construction activities.

A Federal Project Director working towards the appropriate certification level was assigned to this project.

**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	2Q FY 2030	1Q FY 2030	2Q FY 2030	4Q FY 2034
AU2 - Chilled Water Plant , ANL	–	–	–	2Q FY 2026	1Q FY 2026	2Q FY 2027	4Q FY 2030
AU2 - Steam Plant and Utility Piping, ANL	–	–	–	2Q FY 2030	1Q FY 2030	2Q FY 2030	4Q 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
AU2 - Overall, ANL	3Q FY2024	N/A
AU2 - Chilled Water Plant , ANL	2Q FY 2026	2Q FY 2026
AU2 - Steam Plant and Utility Piping, ANL	2Q FY 2030	–

**CD-3A** – Approve Long-Lead Procurements and Start of Early Construction.

### **Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	37,500	177,500	215,000	1,000	1,000	216,000
FY 2024	37,500	177,500	215,000	1,000	1,000	216,000

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**

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. The specifics of these procurements will be reviewed and approved in support of CD-3A to purchase long-lead electrical equipment.

### **Justification**

An efficient, maintainable, and reliable infrastructure is critical to the success and mission capability of ANL’s research facilities. Due to their age and limitations to meeting modern demands, there is a mission need to revitalize and selectively upgrade ANL’s existing major utility systems including steam, water, sanitary sewer, chilled water and electrical systems. For example, steam is a critical infrastructure for Argonne facilities; improving the performance and resilience of this plant would prevent catastrophic climate related damage to buildings and major pieces of scientific equipment. Additionally, 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 requirements and would operate more efficiently and effectively with modern engineered controls.

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
Utility Plants (Chilled Water, Steam & Condensate)	<ul style="list-style-type: none"> <li>Construct new combined 6,300-ton chilled water plant with N+1 reliability and boiler house with peak demand of 250,000 lbs./hour of 200 psi saturated steam with N+1 reliability.</li> </ul>	<ul style="list-style-type: none"> <li>Equipment &amp; controls upgrades at the 371, 450, and 528 chilled water plants.</li> <li>Potential capacity upgrades, new equipment, equipment replacements, and various other utility system reliability projects to increase reliability of laboratory internal utilities.</li> </ul>
Utility Piping (Chilled Water, Steam & Condensate, Sewer, Domestic, Lab, & Canal Water)	<ul style="list-style-type: none"> <li>Repair, replace or construct new distribution piping for 7,500 linear feet of utility piping and support structures (e.g., vaults, pipe supports, valves, culverts, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>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.)</li> <li>Install between 50 and 250 new smart meters.</li> </ul>

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Estimated Cost (TEC)</b>			
Design (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,000	10,000	2,063
FY 2023	8,000	8,000	6,000
FY 2024	6,000	6,000	12,000
Outyears	12,500	12,500	17,437
<b>Total, Design (TEC)</b>	<b>37,500</b>	<b>37,500</b>	<b>37,500</b>
Construction (TEC)			
FY 2024	2,007	2,007	–
Outyears	175,493	175,493	177,500
<b>Total, Construction (TEC)</b>	<b>177,500</b>	<b>177,500</b>	<b>177,500</b>
Total Estimated Cost (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,000	10,000	2,063
FY 2023	8,000	8,000	6,000
FY 2024	8,007	8,007	12,000
Outyears	187,993	187,993	194,937
<b>Total, TEC</b>	<b>215,000</b>	<b>215,000</b>	<b>215,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Other Project Cost (OPC)</b>			
Prior Years	1,000	1,000	1,000
<b>Total, OPC</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Project Cost (TPC)</b>			
Prior Years	2,000	2,000	1,000
FY 2022	10,000	10,000	2,063
FY 2023	8,000	8,000	6,000
FY 2024	8,007	8,007	12,000
Outyears	187,993	187,993	194,937
<b>Total, TPC</b>	<b>216,000</b>	<b>216,000</b>	<b>216,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	30,000	30,000	N/A
Design - Contingency	7,500	7,500	N/A
<b>Total, Design (TEC)</b>	<b>37,500</b>	<b>37,500</b>	<b>N/A</b>
Construction	142,000	142,000	N/A
Construction - Contingency	35,500	35,500	N/A
<b>Total, Construction (TEC)</b>	<b>177,500</b>	<b>177,500</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>215,000</b>	<b>215,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>43,000</i>	<i>43,000</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	1,000	1,000	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>1,000</b>	<b>1,000</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>1,000</b>	<b>1,000</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>216,000</b>	<b>216,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>43,000</b>	<b>43,000</b>	<b>N/A</b>

## 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	1,000	500	8,000	—	205,500	215,000
	OPC	1,000	—	—	—	—	1,000
	TPC	2,000	500	8,000	—	205,500	216,000
FY 2024	TEC	1,000	10,000	8,000	8,007	187,993	215,000
	OPC	1,000	—	—	—	—	1,000
	TPC	2,000	10,000	8,000	8,007	187,993	216,000

### 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	Subproject 1 – 4Q FY 2030 Subproject 2 – 4Q FY 2034
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 <sup>f</sup>	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	N/A	2,955	N/A	147,750
Utilities	N/A	4,423	N/A	221,150
Maintenance and Repair	N/A	739	N/A	36,950
Total, Operations and Maintenance	N/A	8,117	N/A	405,850

<sup>f</sup> Life-Cycle costs will be performed as part of CD-1.

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 .....	None
Area of D&D in this project at ANL.....	None
Area at ANL to be transferred, sold, and/or D&D outside the project, including area previously “banked” .....	None <sup>g</sup>
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, will perform 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. Project performance metrics will be performed by in-house management and Project Controls.

<sup>g</sup> 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 2024 Request for the Linear Assets Modernization Project (LAMP) is \$18,900,000 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, storm drain, sanitary sewer, electrical, and communication.

**Significant Changes**

This project was initiated in the FY 2020 Enacted Appropriations. The most recent DOE Order 413.3B Critical Decision (CD) for LAMP, CD-1, Approve Alternative Selection and Cost Range, was for the entire project and was approved on April 13, 2022.

To facilitate its execution, LAMP is comprised of two subprojects consisting of scope needed to achieve complete and usable assets:

- The Grizzly Substation/Lawrence Corridor Subproject will focus on increasing the Lab's primary electrical substation to provide new switch stations and systems capable of supporting all existing and future lab loads, distributing power for advanced supercomputing needs (NERSC), and upgrading multiple utility systems including IT/communications, natural gas, compressed air, sanitary sewer, and storm drain/hydraugers, providing for overall increased reliability and ease of maintenance.
- The East Canyon-McMillan Subproject will establish common utility corridors for high voltage duct banks which will be developed to segregate lines and upgrade multiple utility systems, including IT/communication, natural gas, compressed air, domestic water, sanitary sewer, and storm drain/ hydraugers providing for overall increased reliability and ease of maintenance.

A Level 2 Federal Project Director, working towards the appropriate certification level, was assigned to this project at CD-1.

**Critical Milestone History**

**20-SC-78 Linear Assets Modernization Project, LBNL**

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
LAMP - Overall, LBNL	5/17/19	4/13/22	4/13/22	1Q FY 2027	1Q FY 2027	1Q FY 2027	4Q FY 2031
LAMP - Grizzly Sub - Lawrence Corridor, LBNL	—	—	—	2Q FY 2026	2Q FY 2026	2Q FY 2026	1Q FY 2029
LAMP - McMillan and East Canyon Corridors, LBNL	—	—	—	1Q FY 2027	1Q FY 2027	1Q FY 2027	4Q FY 2031

**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**

	Performance Baseline Validation	CD-3A
LAMP - Overall, LBNL	1Q FY 2027	1Q FY 2026
LAMP - Grizzly Sub - Lawrence Corridor, LBNL	2Q FY 2026	1Q FY 2026
LAMP - McMillan and East Canyon Corridors, LBNL	1Q FY 2027	–

**Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	50,000	186,000	236,000	6,000	6,000	242,000
FY 2024	50,000	186,000	236,000	6,000	6,000	242,000

**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**

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 switching substation at Grizzly Peak to power the NERSC to full capacity. LAMP will implement a multi-system approach for the repair 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.

FY2024 funds will support long-lead procurement activities after the appropriate CD approval. The specifics of these procurements will be reviewed and approved in support of the CD-3A to procure electrical equipment.

**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. Direct infrastructure investment is necessary to address deferred maintenance reduction,

restore operational reliability, increase resiliency, and provide the backbone necessary for scientific advancements. 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.

LBNL has begun measures to strengthen the laboratory's resilience to outages due to planned safety outages or natural phenomena such as earthquake, wildfire, and extreme weather. The mission need of this project is to modernize distributed utilities to increase reliability, resiliency, and capacity to meet growing demands. The first sub-project of the LAMP project will enable an optimized NERSC-10 upgrade which will play a central role in breakthrough science.

LAMP will deliver modern and resilient general-purpose infrastructure which will be more efficient and sustainable. For example, the underground utility corridors will not only be upgraded to the best available technology but will be designed to be maintainable and monitored using artificial intelligence to enable predictive maintenance.

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
Storm Drainage System, Hydrauger/ Slope Stability	Install 1,000 Linear Feet of hydraugers.	Install up to 2,500 Linear Feet of hydraugers. (Lawrence Corridor).
		Install up to 3,000 Linear Feet of hydraugers. (East Canyon/McMillan Corridor).
Sanitary Sewer	Install 150 Linear Feet of pipe.	Install up to 2,500 Linear Feet of pipe. (Lawrence Corridor).
		Install up to 3,500 Linear Feet of pipe. (McMillan Corridor).
		Install up to 1,000 Linear Feet of pipe along the electrical distribution loop corridors. (McMillan Corridor).
High Pressure City Water	Install 1,500 Linear Feet of pipe.	Install up to 3,500 Linear Feet of pipe. (East Canyon Corridor).
		Install up to 2,000 Linear Feet of pipe along the electrical distribution loop corridors. (McMillan Corridor).
Communications & Data	Install 2,600 Linear Feet of ductbank.	Install up to 4,000 Linear Feet of ductbank with manholes and cables. (Lawrence Corridor).
		Install up to 2,500 Linear Feet of ductbank with manholes and cables. (East Canyon Corridor).
		Install up to 1,500 Linear Feet of ductbank with manholes and cables along the electrical distribution loop corridors. (East Canyon Corridor).
		Install up to 1,500 Linear Feet of ductbank with manholes and cables. (McMillan Corridor).

Performance Measure	Threshold	Objective
		Install up to 5,000 Linear Feet of ductbank with manholes and cables along the electrical distribution loop corridors. (McMillan 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.
Electrical Distribution/Grizzly Substation (Con't)	Install 1,500 Linear Feet of electrical feeders segregating lines 1 and 2. (Lawrence Corridor).	Install up to 3,500 Linear Feet of electrical feeders segregating lines 1 and 2.
		Feed B59 (NERSC) with up to 80 MW of electrical power with 3,500 Linear Feet of redundant and segregated lines.
		Install up to 2,000 Linear Feet of electrical feeders and Pad Mounted Switches for electrical distribution loops, segregating lines 1 and 2.
		Provide SCADA remote control and monitoring of existing and new circuit breakers.
	Install 1,200 Linear Feet of electrical feeders segregating lines 1 and 2. (East Canyon/McMillan Corridor).	Install up to 2,600 Linear Feet of electrical feeders segregating lines 1 and 2. (East Canyon Corridor).
		Install up to 5,700 Linear Feet of electrical feeders and Pad Mounted Switches for electrical distribution loops, segregating lines 1 and 2. (East Canyon Corridor).
		Provide SCADA remote control and monitoring of existing and new circuit breakers. (East Canyon Corridor).
	Install 1,200 Linear Feet of electrical feeders segregating lines 1 and 2. (East Canyon/McMillan Corridor) (Con't).	Install up to 2,200 Linear Feet of electrical feeders segregating lines 1 and 2. (McMillan Corridor).
		Install up to 6,300 Linear Feet of electrical feeders and Pad Mounted Switches for electrical distribution loops, segregating lines 1 and 2. (McMillan Corridor).
		Provide SCADA remote control and monitoring of existing and new circuit breakers. (McMillan Corridor).
Natural Gas	Install 200 Linear Feet of pipe.	Install up to 1,000 Linear Feet of pipe. (Lawrence Corridor).

Performance Measure	Threshold	Objective
		Install up to 2,500 Linear Feet of pipe. (McMillan Corridor).
		Install up to 2,000 Linear Feet of pipe along the electrical distribution loop corridors. (McMillan Corridor).
Compressed Air	Not Applicable	Install up to 3,500 Linear Feet of pipe. (Lawrence Corridor).
		Install up to 3,500 Linear Feet of pipe. (East Canyon Corridor).
		Install up to 2,500 Linear Feet of pipe. (McMillan Corridor).
		Install up to 1,500 Linear Feet of pipe along the electrical distribution loop corridors. (McMillan Corridor).
Controls/Artificial Intelligence	Not Applicable	Install up to 40 Smart Meters for new wet utility construction. (Lawrence Corridor).
		Provide integration with SCADA. (Lawrence Corridor).
		Provide integration with Microgrid enhancement. (Lawrence Corridor).
		Install up to 60 Smart Meters for new wet utility construction. (East Canyon Corridor).
		Install up to 50 Smart Meters for new wet utility construction. (McMillan Corridor).
		Provide integration with SCADA. (East Canyon/McMillan Corridors).
		Provide integration with Microgrid enhancement. (East Canyon/McMillan Corridors).

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Estimated Cost (TEC)</b>			
Design (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,400	10,400	6,000
FY 2023	21,600	21,600	9,000
FY 2024	–	–	13,000
Outyears	17,000	17,000	22,000
<b>Total, Design (TEC)</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>
Construction (TEC)			
FY 2023	1,825	1,825	–
FY 2024	18,900	18,900	–
Outyears	165,275	165,275	186,000
<b>Total, Construction (TEC)</b>	<b>186,000</b>	<b>186,000</b>	<b>186,000</b>
Total Estimated Cost (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,400	10,400	6,000
FY 2023	23,425	23,425	9,000
FY 2024	18,900	18,900	13,000
Outyears	182,275	182,275	208,000
<b>Total, TEC</b>	<b>236,000</b>	<b>236,000</b>	<b>236,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Other Project Cost (OPC)</b>			
Prior Years	2,317	2,317	2,317
FY 2022	946	946	946
Outyears	2,737	2,737	2,737
<b>Total, OPC</b>	<b>6,000</b>	<b>6,000</b>	<b>6,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Project Cost (TPC)</b>			
Prior Years	3,317	3,317	2,317
FY 2022	11,346	11,346	6,946
FY 2023	23,425	23,425	9,000
FY 2024	18,900	18,900	13,000
Outyears	185,012	185,012	210,737
<b>Total, TPC</b>	<b>242,000</b>	<b>242,000</b>	<b>242,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	38,500	49,000	N/A
Design - Contingency	11,500	1,000	N/A
<b>Total, Design (TEC)</b>	<b>50,000</b>	<b>50,000</b>	<b>N/A</b>
Construction	144,000	135,000	N/A
Construction - Contingency	42,000	51,000	N/A
<b>Total, Construction (TEC)</b>	<b>186,000</b>	<b>186,000</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>236,000</b>	<b>236,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>53,500</i>	<i>52,000</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Design	2,610	3,600	N/A
Start-up	2,190	1,200	N/A
OPC - Contingency	1,200	1,200	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>6,000</b>	<b>6,000</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>6,000</b>	<b>6,000</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>1,200</i>	<i>1,200</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>242,000</b>	<b>242,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>54,700</b>	<b>53,200</b>	<b>N/A</b>

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	1,000	500	23,425	—	211,075	236,000
	OPC	2,423	1,000	—	—	2,577	6,000
	TPC	3,423	1,500	23,425	—	213,652	242,000
FY 2024	TEC	1,000	10,400	23,425	18,900	182,275	236,000
	OPC	2,317	946	—	—	2,737	6,000
	TPC	3,317	11,346	23,425	18,900	185,012	242,000

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	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 <sup>a</sup>
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

<sup>a</sup> 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.



## **8. Acquisition Approach**

The LBNL Management and Operating (M&O) Contractor, University of California will perform 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. Project performance metrics will be performed by in-house management and Project Controls.

**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 2024 Request for the Critical Utilities Infrastructure Revitalization (CUIR) project is \$35,075,000 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 \$164,500,000 to \$310,500,000. 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.

To facilitate its execution, CUIR is comprised of three subprojects consisting of scope needed to achieve complete and usable assets:

- Critical Electrical Work Subproject to replace and upgrade electrical components that present the greatest risk of failure or substandard performance of the Linac and associated Science projects.
- Linac Utilities and Equipment Subproject will replace and reconfigure various electrical and mechanical equipment components and domestic/fire water piping.
- Sitewide Utilities Subproject will replace waveguide water heat exchangers, controls, and pumps.

**Significant Changes**

This project was initiated in FY 2020 Enacted Appropriations. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternatives Selection and Cost Range, which was approved on January 21, 2022.

FY 2024 funds will support long-lead procurement and early construction activities after the appropriate CD approvals.

A Federal Project Director working towards the appropriate certification level was assigned to this project.

**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 2028	1Q FY 2028	3Q FY 2028	1Q FY 2034
CUIR - Critical Electrical Work, SLAC	–	–	–	4Q FY 2024	2Q FY 2024	4Q FY 2024	4Q FY 2026
CUIR - Linac Utilities and Equipment, SLAC	–	–	–	4Q FY 2025	2Q FY 2025	4Q FY 2025	4Q FY 2030
CUIR - Sitewide Utilities, SLAC	–	–	–	3Q FY 2028	1Q FY 2028	3Q FY 2028	1Q 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
CUIR - Overall, SLAC	3Q FY 2028	3Q FY 2023
CUIR - Critical Electrical Work, SLAC	4Q FY 2025	3Q FY 2023
CUIR - Linac Utilities and Equipment, SLAC	–	–
CUIR - Sitewide Utilities, SLAC	–	–

**CD-3A** – Approve Long-Lead Procurements, Original Scope.

### **Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	15,000	189,000	204,000	4,500	4,500	208,500
FY 2024	13,000	191,000	204,000	4,500	4,500	208,500

#### **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**

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.

### **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. 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.

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, which impact science research and the greater SLAC population. 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. CUIR will retire \$18,000,000 in deferred maintenance.

**Science/Science Laboratories Infrastructure/  
20-SC-79, Critical Utilities Infrastructure  
Revitalization, SLAC**

**FY 2024 Congressional Budget Justification**

The CUIR project will reduce operational risks in critical infrastructure and utility support systems for all science programs. It will decrease dependency on unique, old, and outdated equipment. If these existing reliability gaps are not fulfilled, the operational efficiency, reliability, productivity, and competitive viability in science programs and other related science research breakthroughs will continue to be impeded.

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. The Objective KPPs are shown adjacent to the applicable Threshold KPPs in the following charts. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion.

Performance Measure	Threshold	Objective
<b>Subproject 1: Critical Electrical Work</b>		
	Install and test three (3) 12kV circuits.	Install and test (5) 12kV circuits along the 3 km linac to allow independent utility operation of each segment.
	Install and test 12 kV Sub-station to provide 3.5MVA power.	Install and test 12 kV Sub-station to provide 5MVA power.
	Install and test one new 60MVA (or larger) 230/12kV transformer.	Install and test two new 60MVA (or larger) 230/12kV transformer.
	Provide redundant N+1 (N active and one spare) electrical feeder circuits. Install and test Switchgear to allow feeder cable selection.	
	Replace monitoring equipment to provide AI/ML input at 9 substation relay doors with 1 integration hub.	Replace monitoring equipment to provide AI/ML input at 12 substation relay doors with 1 integration hub. Also integrate data from the substation, backup generator and transformer into the data-analytics platform.
	Install and test 1.5MVA backup generator.	
<b>Subproject 2: Linac Utilities and Equipment</b>		
	Replace and reconfigure medium-voltage equipment for 4 Variable Voltage Substations (VVS).	

Performance Measure	Threshold	Objective
	Replace low voltage sections for 10 K-sub, 10 VVS and 16 Motor Control Centers (MCC).	
	Replace 4 klystron water heat exchangers, 4 controls, and 4 pumps.	
	Replace 12,000 linear feet of domestic/fire water piping. Install submeters, flow and pressure sensors at 2 domestic water main branches.	Replace 18,000 linear feet of domestic/fire water piping. Install submeters, flow and pressure sensors at 4 domestic water main branches.
	Replace 2,700 linear feet of water main, laterals, and valves. Install 5 backflow preventors and 5 fire hydrants. Install submeter flow and pressure sensors at 1 domestic water key node.	
	Replace 1,000 linear feet of sanitary sewer piping. Install sensors to measure sewage flow, Total Dissolved Solids (TDS) at 2 effluent stations.	Install sensors to measure sewage flow, Total Dissolved Solids (TDS) at 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.
		Integrate substation and water-cooling system monitor output into data-analytics platform.
<b>Subproject 3: Sitewide Utilities</b>		
	Replace 11 waveguide water heat exchangers, controls, and pumps.	
	Replace 3 klystron water heat exchangers, controls, and pumps.	
	Replace 11 accelerator, klystron, and waveguide monitoring devices.	

Performance Measure	Threshold	Objective
	Install 2 natural gas main meters, replace 6 existing BTU energy meter, and integrate each into data analytics platform.	Install 4 main gas meters and 8 gas submeters, replace 12 energy BTU meters and integrate each into the data analytics platform.
		Replace 10 programmable logic controller (PLC) to provide AI/ML input.
		Integrate substation and water-cooling system monitor output into data-analytics platform.

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Estimated Cost (TEC)</b>			
Design (TEC)			
Prior Years	1,000	1,000	–
FY 2022	4,000	4,000	3,800
FY 2023	–	–	1,200
Outyears	8,000	8,000	8,000
<b>Total, Design (TEC)</b>	<b>13,000</b>	<b>13,000</b>	<b>13,000</b>
Construction (TEC)			
FY 2022	4,500	4,500	2,500
FY 2023	25,425	25,425	20,000
FY 2024	35,075	35,075	25,000
Outyears	126,000	126,000	143,500
<b>Total, Construction (TEC)</b>	<b>191,000</b>	<b>191,000</b>	<b>191,000</b>
Total Estimated Cost (TEC)			
Prior Years	1,000	1,000	–
FY 2022	8,500	8,500	6,300
FY 2023	25,425	25,425	21,200
FY 2024	35,075	35,075	25,000
Outyears	134,000	134,000	151,500
<b>Total, TEC</b>	<b>204,000</b>	<b>204,000</b>	<b>204,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Other Project Cost (OPC)</b>			
Prior Years	1,894	1,894	1,894
FY 2022	778	778	778
FY 2023	50	50	50
Outyears	1,778	1,778	1,778
<b>Total, OPC</b>	<b>4,500</b>	<b>4,500</b>	<b>4,500</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Project Cost (TPC)</b>			
Prior Years	2,894	2,894	1,894
FY 2022	9,278	9,278	7,078
FY 2023	25,475	25,475	21,250
FY 2024	35,075	35,075	25,000
Outyears	135,778	135,778	153,278
<b>Total, TPC</b>	<b>208,500</b>	<b>208,500</b>	<b>208,500</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	11,400	12,000	N/A
Design - Contingency	1,600	3,000	N/A
<b>Total, Design (TEC)</b>	<b>13,000</b>	<b>15,000</b>	<b>N/A</b>
Construction	152,000	150,000	N/A
Construction - Contingency	39,000	39,000	N/A
<b>Total, Construction (TEC)</b>	<b>191,000</b>	<b>189,000</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>204,000</b>	<b>204,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>40,600</i>	<i>42,000</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	3,200	2,700	N/A
Conceptual Design	1,300	1,800	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>4,500</b>	<b>4,500</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>4,500</b>	<b>4,500</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>208,500</b>	<b>208,500</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>40,600</b>	<b>42,000</b>	<b>N/A</b>

#### 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	1,000	500	25,425	—	177,075	204,000
	OPC	1,895	—	—	—	2,605	4,500
	TPC	2,895	500	25,425	—	179,680	208,500
FY 2024	TEC	1,000	8,500	25,425	35,075	134,000	204,000
	OPC	1,894	778	50	—	1,778	4,500
	TPC	2,894	9,278	25,475	35,075	135,778	208,500

**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	1Q FY 2034
Expected Useful Life	Average 30 years (based system)
Expected Future Start of D&D of this capital asset	1Q 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	7,805	8,673	885,000	260,176
Utilities	14,940	10,487	158,930	314,624
Maintenance and Repair	5,700	8,461	702,000	253,833
Total, Operations and Maintenance	28,445	27,621	1,745,930	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.....	None
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 <sup>i</sup>
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, will perform 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 M&O contractor is evaluating various acquisition alternatives and project delivery methods. Potential acquisition and project delivery methods include, but are not limited to, firm-fixed-price contracts for design-bid-build, construction management, and design-build subcontracts. The M&O contractor will also evaluate potential benefits of using single or multiple contracts to procure materials, equipment, construction, commissioning, and other project scope elements. Its annual performance and evaluation measurement plan will include project performance metrics for SLAC on which it will be evaluated.

<sup>i</sup> 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**

**Summary**

The FY 2024 Request for the Utilities Infrastructure Project (UIP) is \$45,000,000 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 obsolete and severely deteriorated utilities infrastructure at FNAL and will provide resiliency, reliability, and increased safety of operations to ensure the infrastructure can continue supporting the Laboratory's scientific missions.

To facilitate its execution, UIP is comprised of three subprojects consisting of scope needed to achieve complete and usable assets:

- The New Chilled Water Plant and Central Utility Plant Upgrades Subproject preliminary plans are to 1) remove existing chilled water system from the existing Central Utility Building and relocated it to the new Chilled Water Plant, enabling the expansion of chilled water capacity to support current and future loads, and 2) revitalize the existing Central Utility Building and the associated hot water, and low conductivity water systems. Both the Central Utility Plant and the Chilled Water Plant are being scheduled to support FNAL's FY 2027-2029 Long Accelerator Shutdown to allow the utility systems to be tied in.
- The Kautz Road Substation Replacement Subproject preliminary plans are 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 this Subproject needs to support FNAL's FY 2027-2029 Long Accelerator Shutdown since the substation feeds power to the accelerator complex.
- The Linear Utilities Replacement Subproject preliminary plans are 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.

**Significant Changes**

This project was initiated in FY 2020 Enacted Appropriations. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on February 23, 2022.

FY 2024 funds will support Design, long lead procurement, and early construction activities after the appropriate CD approvals.

A Federal Project Director is working towards the appropriate CD approvals.

### Critical Milestone History

	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 2028	4Q FY 2027	3Q FY 2028	3Q FY 2032
UIP - New Chill Water Plant, Cent Utility Build Upgrades, FNAL	–	–	–	3Q FY 2024	2Q FY 2025	3Q FY 2025	1Q FY 2029
UIP - Kautz Road Substation Replacement, FNAL	–	–	–	1Q FY 2025	4Q FY 2024	3Q FY 2024	2Q FY 2030
UIP - Linear Utilities, FNAL	–	–	–	3Q FY 2028	4Q FY 2027	3Q FY 2028	3Q 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.

	Performance Baseline Validation	CD-3A
UIP - Overall, FNAL	–	–
UIP - New Chill Water Plant, Cent Utility Build Upgrades, FNAL	3Q FY 2024	3Q FY 2024
UIP - Kautz Road Substation Replacement, FNAL	1Q FY 2025	4Q FY 2024
UIP - Linear Utilities, FNAL	–	–

**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 2023	43,800	266,200	310,000	4,000	4,000	314,000
FY 2024	43,800	266,200	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

The 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 will then be replaced or upgraded to assure safe, reliable, and efficient service to mission critical facilities. In addition, the project will perform upgrades to obsolete, end-of-life components, which will increase capacity, reliability, and personnel safety for critical utilities. It is anticipated a review and approval for long-lead procurements (e.g., mechanical, and electrical equipment) and site preparation in support of CD-3A.

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 of obsolete and severely deteriorated utilities infrastructure at FNAL. SC has identified a need to recapitalize FNAL’s Central Utilities Building and distributed site utility infrastructure to 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. Efficient, maintainable, and reliable utilities are critical to the success and mission capability of FNAL’s research facilities. Currently, a significant portion of FNAL’s utility infrastructure 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 deliver modern and resilient enabling infrastructure. The project includes installation of a combination of data collection and artificial intelligent monitoring systems that adjust to trends, predict failures, and react to extreme weather events, such as automatically transferring power to minimize impacts to mission critical scientific operations. Additionally, modern utility systems will be more efficient and sustainable. For example, inefficient boilers will be replaced, and electrical metering equipment will be improved in order to identify future energy savings projects.

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 a new building for chilled water production (6,000 tons cooling capacity).	▪ Add additional 25 percent square footage to new chilled water plant for future growth.
	▪ Revitalize the existing Central Utility Building envelope ▪ Replace mechanical infrastructure in the CUB to support the Wilson Hall footprint area.	▪ Upgrade existing CUB envelope and roof with environmentally sustainable improvements.

Performance Measure	Threshold	Objective
Kautz Road Substation	<ul style="list-style-type: none"> <li>Revitalize / Upgrade the KRS to improve arc flash safety requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Install new feeder from KRS to the Accelerator Complex (PIP-II area).</li> </ul>
Linear Utilities Replacement	<ul style="list-style-type: none"> <li>Revitalize 5 miles of the Industrial Cooling Water (ICW) system.</li> </ul>	<ul style="list-style-type: none"> <li>Revitalize 16 miles of the Industrial Cooling Water (ICW) system.</li> </ul>
	<ul style="list-style-type: none"> <li>Revitalize 5 miles of the Domestic Water System (DWS).</li> </ul>	<ul style="list-style-type: none"> <li>Revitalize 19 miles of the Domestic Water System (DWS).</li> </ul>
	<ul style="list-style-type: none"> <li>Revitalize 3.5 miles of the Sanitary Sewer systems.</li> </ul>	<ul style="list-style-type: none"> <li>Revitalize 11 miles of the Sanitary Sewer System.</li> </ul>
	<ul style="list-style-type: none"> <li>Revitalize 2 miles of underground Natural Gas lines.</li> </ul>	<ul style="list-style-type: none"> <li>Revitalize 22 miles of underground Natural Gas lines.</li> </ul>
	<ul style="list-style-type: none"> <li>Revitalize 2 miles of electrical distribution feeders and associated unit substations, transformers, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Revitalize 65 miles of electrical distribution feeders and associated unit substations, transformers, etc.</li> <li>Provide Electrical Code upgrades to Master Substation</li> <li>Revitalize 100 percent of the High-Pressure Sodium exterior lights along sidewalks, roads, and parking lots with LED.</li> </ul>

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Estimated Cost (TEC)</b>			
Design (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,500	10,500	2,000
FY 2023	20,000	20,000	9,000
FY 2024	2,300	2,300	6,000
Outyears	10,000	10,000	26,800
<b>Total, Design (TEC)</b>	<b>43,800</b>	<b>43,800</b>	<b>43,800</b>
Construction (TEC)			
FY 2024	42,700	42,700	15,000
Outyears	223,500	223,500	251,200
<b>Total, Construction (TEC)</b>	<b>266,200</b>	<b>266,200</b>	<b>266,200</b>
Total Estimated Cost (TEC)			
Prior Years	1,000	1,000	–
FY 2022	10,500	10,500	2,000
FY 2023	20,000	20,000	9,000
FY 2024	45,000	45,000	21,000
Outyears	233,500	233,500	278,000
<b>Total, TEC</b>	<b>310,000</b>	<b>310,000</b>	<b>310,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Other Project Cost (OPC)</b>			
Prior Years	1,850	1,850	1,850
FY 2022	200	200	200
Outyears	1,950	1,950	1,950
<b>Total, OPC</b>	<b>4,000</b>	<b>4,000</b>	<b>4,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs
<b>Total Project Cost (TPC)</b>			
Prior Years	2,850	2,850	1,850
FY 2022	10,700	10,700	2,200
FY 2023	20,000	20,000	9,000
FY 2024	45,000	45,000	21,000
Outyears	235,450	235,450	279,950
<b>Total, TPC</b>	<b>314,000</b>	<b>314,000</b>	<b>314,000</b>

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	36,100	33,300	N/A
Design - Contingency	7,700	10,500	N/A
<b>Total, Design (TEC)</b>	<b>43,800</b>	<b>43,800</b>	<b>N/A</b>
Construction	221,300	192,700	N/A
Construction - Contingency	44,900	73,500	N/A
<b>Total, Construction (TEC)</b>	<b>266,200</b>	<b>266,200</b>	<b>N/A</b>
<b>Total, TEC</b>	<b>310,000</b>	<b>310,000</b>	<b>N/A</b>
<i>Contingency, TEC</i>	<i>52,600</i>	<i>84,000</i>	<i>N/A</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	880	2,300	N/A
Conceptual Design	1,170	700	N/A
OPC - Contingency	1,950	1,000	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>4,000</b>	<b>4,000</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>4,000</b>	<b>4,000</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>1,950</i>	<i>1,000</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>314,000</b>	<b>314,000</b>	<b>N/A</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>54,550</b>	<b>85,000</b>	<b>N/A</b>

5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	1,000	500	20,000	—	288,500	310,000
	OPC	2,100	500	—	—	1,400	4,000
	TPC	3,100	1,000	20,000	—	289,900	314,000
FY 2024	TEC	1,000	10,500	20,000	45,000	233,500	310,000
	OPC	1,850	200	—	—	1,950	4,000
	TPC	2,850	10,700	20,000	45,000	235,450	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 2033
Expected Useful Life	30 years
Expected Future Start of D&D of this capital asset	3Q FY 2063

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 <sup>j</sup>
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

<sup>j</sup> 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 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.

**19-SC-74, BioEPIC, LBNL**  
**Lawrence Berkeley National Laboratory, LBNL**  
**Project is for Design and Construction**

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

**Summary**

The FY 2024 Request for the Biological and Environmental Program Integration Center (BioEPIC) project is \$38,000,000 of Total Estimated Cost (TEC) funding. The Total Estimated Cost (TEC) for this project is \$165,000,000. The Total Project Cost (TPC) for the project is \$167,200,000.

This project will construct a new building with high performance laboratory space in close proximity to key LBNL facilities and programs. Research operations currently located in commercially leased space and dispersed across the campus will be co-located into this building, allowing for better facilitation of BER, ASCR, and BES program research activities.

**Significant Changes**

This project was initiated in FY 2019 Enacted Appropriations. The most recent DOE Order 413.3B Critical Decision (CD) is CD-2/3, Approve Baseline and Start of Construction, which was approved on September 13, 2021. The FY 2024 Request will support construction and associated activities after the appropriate CD approvals. The project design is complete. Approximately \$275,000 of the contingent funding is being moved from Design into Construction. The project received \$7,000,000 in Inflation Reduction Act funding which is being used to mitigate the risks of escalation and accelerate the project schedule.

A Federal Project Director with the appropriate certification level 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 2024	3/13/18	5/9/19	5/9/19	9/13/21	2/22/21	9/13/21	4Q FY 2027

**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
FY 2024	9/22/21

**Project Cost History**

(dollars in thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, Total	TPC
FY 2023	15,000	150,000	165,000	2,200	2,200	167,200
FY 2024	14,725	150,275	165,000	2,200	2,200	167,200

Note:  
- Other Project Costs (OPC) are funded through laboratory overhead.

2. Project Scope and Justification

Scope

The scope of the BioEPIC project is to construct a new, state-of-the-art facility approximately 72,000 gross square feet (gsf) with laboratory space to support high performance research by BER, ASCR, and BES programs. This facility will be constructed in close proximity to key LBNL facilities and programs. Research operations currently located in commercially leased space and dispersed across the campus will be collocated to the BioEPIC building. Co-location of researchers in this unique experimental facility, near other important SC assets, will increase synergy and efficiency, which will better facilitate collaborative research in support of the SC mission.

Justification

The mission need of this project is to increase the synergy and efficiency of biosciences and other SC research at LBNL. LBNL has grown from a pioneering particle and nuclear physics laboratory into a multidisciplinary research facility with broad capabilities in physical, chemical, computational, biological, and environmental systems research in support of the DOE mission. Much of the biological sciences program at LBNL is located off-site, away from the main laboratory, while others are dispersed across several locations on the LBNL campus. This arrangement has resulted in research and operational capability gaps that limit scientific progress and is a significant roadblock to the kind of collaborative science that is required for understanding, predicting, and harnessing the Earth’s microbiome for energy and environmental benefits.

This project will close the present capability gaps by providing a resilient and sustainable state-of-the-art facility that will collocate LBNL’s four BER 'science focus area' programs to focus on how soil-plant-microbe interactions impact growth of alternative energy feedstocks, agricultural productivity, water resources, and terrestrial carbon storage. Understanding and predicting responses to climate change is a central theme of all four programs.

These important SC programs and unique capabilities that are currently housed in leased space and buildings both on and off the LBNL campus that are near 'end-of-life', are not energy efficient, and are prone to prolonged outages in the face of regular wildfire risks that trigger power shutdowns by the LBNL’s local power authority. The experiments hosted within this resilient new facility will not be disrupted by power shutdown events because of the modern systems built into BioEPIC. The BioEPIC building is designed to directly address these issues through pursuit of The Guiding Principles of Highly Sustainable Facility and LEED gold certification including provision of adequate emergency power. BioEPIC will have energy-saving all-electric mechanical and plumbing systems in place of natural gas for space and water heating. BioEPIC will bring together the LBNL’s four BER 'science focus area' programs to focus on how soil-plant-microbe interactions impact growth of alternative energy feedstocks, agricultural productivity, water resources, and terrestrial carbon storage. Understanding and predicting responses to climate change is a central theme of all four programs.

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
Biosciences and other research space	55,000 gsf	90,000 gsf

### 3. Financial Schedule

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Estimated Cost (TEC)</b>				
Design (TEC)				
Prior Years	15,000	15,000	13,801	–
FY 2022	-275	-275	924	–
<b>Total, Design (TEC)</b>	<b>14,725</b>	<b>14,725</b>	<b>14,725</b>	<b>–</b>
Construction (TEC)				
Prior Years	25,000	25,000	3	–
FY 2022	35,275	35,275	40,095	–
FY 2022 - IRA Supp.	7,000	7,000	–	–
FY 2023	45,000	45,000	53,344	7,000
FY 2024	38,000	38,000	26,713	–
Outyears	–	–	23,120	–
<b>Total, Construction (TEC)</b>	<b>150,275</b>	<b>150,275</b>	<b>143,275</b>	<b>7,000</b>
Total Estimated Cost (TEC)				
Prior Years	40,000	40,000	13,804	–
FY 2022	35,000	35,000	41,019	–
FY 2022 - IRA Supp.	7,000	7,000	–	–
FY 2023	45,000	45,000	53,344	7,000
FY 2024	38,000	38,000	26,713	–
Outyears	–	–	23,120	–
<b>Total, TEC</b>	<b>165,000</b>	<b>165,000</b>	<b>158,000</b>	<b>7,000</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Other Project Cost (OPC)</b>				
Prior Years	1,536	1,536	1,536	–
Outyears	664	664	664	–
<b>Total, OPC</b>	<b>2,200</b>	<b>2,200</b>	<b>2,200</b>	<b>–</b>

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Costs	IRA Supp. Costs
<b>Total Project Cost (TPC)</b>				
Prior Years	41,536	41,536	15,340	–
FY 2022	35,000	35,000	41,019	–
FY 2022 - IRA Supp.	7,000	7,000	–	–
FY 2023	45,000	45,000	53,344	7,000
FY 2024	38,000	38,000	26,713	–
Outyears	664	664	23,784	–
<b>Total, TPC</b>	<b>167,200</b>	<b>167,200</b>	<b>160,200</b>	<b>7,000</b>

Note:

- Design funding was completed and remaining contingency funding was redirected for Construction.

#### 4. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
<b>Total Estimated Cost (TEC)</b>			
Design	14,725	15,000	15,000
<b>Total, Design (TEC)</b>	<b>14,725</b>	<b>15,000</b>	<b>15,000</b>
Construction	125,000	125,000	125,000
Construction - Contingency	25,275	25,000	25,000
<b>Total, Construction (TEC)</b>	<b>150,275</b>	<b>150,000</b>	<b>150,000</b>
<b>Total, TEC</b>	<b>165,000</b>	<b>165,000</b>	<b>165,000</b>
<i>Contingency, TEC</i>	<i>25,275</i>	<i>25,000</i>	<i>25,000</i>
<b>Other Project Cost (OPC)</b>			
Conceptual Planning	1,500	1,500	N/A
Conceptual Design	600	600	N/A
OPC - Contingency	100	100	N/A
<b>Total, Except D&amp;D (OPC)</b>	<b>2,200</b>	<b>2,200</b>	<b>N/A</b>
<b>Total, OPC</b>	<b>2,200</b>	<b>2,200</b>	<b>N/A</b>
<i>Contingency, OPC</i>	<i>100</i>	<i>100</i>	<i>N/A</i>
<b>Total, TPC</b>	<b>167,200</b>	<b>167,200</b>	<b>165,000</b>
<b>Total, Contingency (TEC+OPC)</b>	<b>25,375</b>	<b>25,100</b>	<b>25,000</b>

## 5. Schedule of Appropriations Requests

(dollars in thousands)

Fiscal Year	Type	Prior Years	FY 2022	FY 2022 IRA Supp.	FY 2023	FY 2024	Outyears	Total
FY 2023	TEC	40,000	35,000	—	45,000	—	45,000	165,000
	OPC	1,536	—	—	—	—	664	2,200
	TPC	41,536	35,000	—	45,000	—	45,664	167,200
FY 2024	TEC	40,000	35,000	7,000	45,000	38,000	—	165,000
	OPC	1,536	—	—	—	—	664	2,200
	TPC	41,536	35,000	7,000	45,000	38,000	664	167,200

Note:

- Other Project Costs (OPC) are funded through laboratory overhead.

## 6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2027
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	4Q FY 2077

Related Funding Requirements  
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	150	150	5,700	5,700
Utilities	270	270	11,900	11,900
Maintenance and Repair	530	530	20,600	20,600
Total, Operations and Maintenance	950	950	38,200	38,200

## 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 LBNL .....	72,000
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 <sup>k</sup>
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

<sup>k</sup> 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 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 evaluated various acquisition approaches and project delivery methods prior to achieving CD-1 and selected a tailored Design-Bid-Build approach with a Construction Manager as General Contractor as the overall best project delivery method with the lowest risk to DOE. The M&O contractor is also responsible for awarding and administering all subcontracts related to this project. The M&O contractor's annual performance evaluation and measurement plan includes project performance metrics on which it will be evaluated.