

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 and environmentally responsible operations. The main priorities of the SLI program are improving SC's existing physical assets and funding new cutting-edge facilities that enable emerging science opportunities. The SLI program also funds Payments in Lieu of Taxes (PILT) to local communities around the Argonne, Brookhaven, and Oak Ridge National Laboratories.

SC laboratories conduct rigorous and consistent analyses of the condition, utilization, and functionality of the facilities and infrastructure that are the most critical to mission accomplishment. SC works with each of its laboratories to use these assessments in developing comprehensive Campus Strategies, which are integrated into the SC Annual Laboratory Planning process. Each laboratory's Campus Strategy identifies activities and infrastructure investments (e.g., Line-Item Construction, General Plant Projects [GPPs]) required to achieve the core capabilities and scientific vision for the laboratory. SC leadership uses these Campus Strategies to establish the corporate facilities and infrastructure priorities, which form the basis for SLI Budget Requests.

A thorough analysis of SC's physical assets reveals the continued need to focus on our deferred maintenance backlog as well as the inadequacies of SC facilities, including the core infrastructure across its laboratory campuses. In FY 2016, SC invested over \$475 million dollars in needed maintenance, repair, and upgrades of general purpose infrastructure. These investment activities were from a variety of funding sources, including federal appropriations for line-item construction projects and GPPs, as well as overhead-funded investments in institutional GPP work and routine maintenance and repair. The SLI program provides two important pieces of this overall strategy—line-item construction projects and a suite of infrastructure support investments that focus on laboratory core infrastructure and operations.

Highlights of the FY 2019 Request

The SLI program continues to focus on improving infrastructure across the SC national laboratory complex. The FY 2019 Request includes funding for two new construction starts, the Electrical Capacity and Distribution Capability project at the Argonne National Laboratory (ANL) and the Science User Support Center at the Brookhaven National Laboratory (BNL). The Electrical Capacity and Distribution Capability project at ANL will retire major risks associated with capacity limitations and single points of failure, and will support the anticipated FY 2021 electrical demands of the exascale computing program, as well as current mission critical operations in multiple facilities across the laboratory complex. The Science User Support Center at BNL will collocate support organization into a single facility, and provide modern, efficient, and collaborative space to support world-class research.

The Request supports five on-going construction projects: the Materials Design Laboratory project at ANL, the Integrative Genomics Building project at Lawrence Berkeley National Laboratory (LBNL), the Core Facility Revitalization project at BNL, the Integrated Engineering Research Center at Fermi National Accelerator Laboratory (FNAL), and the Energy Sciences Capability project at Pacific Northwest National Laboratory (PNNL). These ongoing projects will provide new laboratory buildings, renovated facilities, and upgraded utilities and are proceeding towards on-time completion within budget. The FY 2019 Request includes funding for general purpose infrastructure projects that will address critical core infrastructure issues across SC laboratories and facilities. Funding requested in FY 2019 supports modernizing water and sewer utilities at ANL, removing excess facilities at FNAL, and enhancing and updating ALS Support HVAC systems and utilities at LBNL. Lastly, the Request provides funding to continue de-inventory, removal, and transfer of nuclear material at Building 350, formerly the site of the New Brunswick Laboratory (NBL) on the ANL campus.

**Science Laboratories Infrastructure
Funding (\$K)**

	FY 2017 Enacted	FY 2018 Annualized CR^a	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
Infrastructure Support	66,549	66,097	48,671	-17,878
Construction				
19-SC-71, Science User Support Center, BNL	—	—	2,000	+2,000
19-SC-72, Electrical Capacity and Distribution Capability, ANL	—	—	20,000	+20,000
18-SC-71, Energy Sciences Capability, PNNL	—	—	4,000	+4,000
17-SC-71, Integrated Engineering Research Center, FNAL	2,500	2,483	5,000	+2,500
17-SC-73, Core Facility Revitalization, BNL	1,800	1,788	13,632	+11,832
15-SC-76, Materials Design Laboratory, ANL	19,590	19,457	20,000	+410
15-SC-77, Photon Science Laboratory Building, SLAC	20,000	19,864 ^b	—	-20,000
15-SC-78, Integrative Genomics Building, LBNL	19,561	19,428	13,549	-6,012
Total, Construction	63,451	63,020	78,181	+14,730
Total, Science Laboratories Infrastructure	130,000	129,117	126,852	-3,148

^a A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution. (These amounts are shown only at the Congressional control level and above; below that level, a dash (—) is shown).

^b Photon Science Laboratory Building at SLAC received final year of funding in FY 2017.

**Science Laboratories Infrastructure
Explanation of Major Changes (\$K)**

FY 2019 Request vs FY 2017 Enacted

Science Laboratories Infrastructure

Infrastructure Support: Funding continues to support PILT, nuclear facilities at Oak Ridge National Laboratory (ORNL) and landlord responsibilities at the Oak Ridge Reservation. Support continues for critical core infrastructure at SC laboratories, the Oak Ridge Institute for Science and Education (ORISE), and the Office of Scientific and Technical Information (OSTI). The Request includes funding for the de-inventory, removal, and transfer of nuclear material at Building 350, formerly the site of NBL on the ANL campus.

-17,878

Construction: Funding supports five on-going line-item projects at Argonne National Laboratory (ANL), Lawrence Berkeley National Laboratory, Fermi National Accelerator Laboratory, Brookhaven National Laboratory (BNL), and Pacific Northwest National Laboratory and two new line-item projects at BNL and ANL.

+14,730

Total, Science Laboratories Infrastructure

-3,148

Program Accomplishments

Since FY 2006, the SLI program has invested over \$770 million in infrastructure and has successfully completed 11 line-item projects while garnering eight DOE Secretary's Achievement Awards. These investments occurred following an FY 2006 SC decision to initiate a major effort to modernize infrastructure across the SC-stewarded laboratory complex. With these investments, the SLI program constructed more than 900,000 gross square feet (gsf) of new space and modernized nearly 400,000 gsf of existing space. As a result, an estimated 2,300 laboratory users and researchers now occupy newly constructed and/or modernized buildings that better support scientific and technological innovation in a collaborative environment.

The *Materials Design Laboratory project at ANL* and the *Integrative Genomics Building project at LBNL*. Construction has started and foundation work has been completed for both of these projects.

Removal of Hazard Category 3 Materials from the New Brunswick Laboratory (NBL). The SLI program successfully transferred nuclear material from NBL at the ANL to bring the facility to a state below Hazard Category 3. The SLI program continues to transfer the remaining nuclear materials from NBL so the building can eventually be renovated and re-purposed.

The *Photon Science Laboratory Building (SLAC)*. This project represents a partnership between Stanford University and the Department of Energy to mutually benefit and reduce the capital investment by both parties. In November 2016, Stanford University completed the construction of the building shell and officially turned over the building to DOE. In March 2016, DOE began constructing the fit-out of a portion of the building shell for SLAC use, which will provide a combination of modernized office and laboratory space to enhance science collaboration, productivity, efficiency, and functionality to support simulation, theory and modeling, and materials synthesis and characterization at SLAC.

Core General Plant Project upgrades across SC Laboratories. The SLI program funded a suite of investments in core infrastructure whose efficiency and reliability are critical to the success of SC missions. To date, SLI funded the replacement of nine 12kV -480 V substations (K-subs) serving the SLAC Linac, upgraded approximately 1.5 miles of high voltage electrical cable and associated substation equipment at ANL, and upgraded electrical distribution systems at Ames National Laboratory. At FNAL, SLI funded renovations to Wilson Hall that will provide for increased collaboration space on two of the 15 floors in the lab's largest building and correct deficiencies on the building exterior. At LBNL, SLI funded the enhancement of HVAC systems by adding capacity to provide more cooling for approximately 130,000 square feet and updating controls to approximately 140,000 square feet. Lastly, at the Thomas Jefferson National Accelerator Facility, SLI funded the replacement of the 27 year old SC1 cold box in the Central Helium Liquifier plant serving the accelerator.

**Science Laboratories Infrastructure
Infrastructure Support**

Description

This subprogram funds infrastructure support 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 facilities and utilities are upgraded when they approach end-of-life, systems are improved to increase reliability and performance, and excess space is removed so that it no longer requires operation and maintenance funding. Without this type of investment, SC laboratories would not be able to keep up with the pace of needed upgrades and repairs. Activities include GPP upgrades at various laboratories, general infrastructure support, de-inventory of nuclear material in Building 350 (formerly NBL) at ANL, and support for the nuclear facilities at ORNL.

This subprogram also funds PILT to local communities around ANL, BNL, and ORNL, as well as stewardship-type needs (e.g., roads and grounds maintenance) across the Oak Ridge Reservation.

Funding (\$K)

	FY 2017 Enacted	FY 2018 Annualized CR^a	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
Infrastructure Support				
Facilities and Infrastructure	32,603	32,382	30,724	-1,879
Nuclear Operations	26,000	25,823	10,000	-16,000
Oak Ridge Landlord	6,182	6,140	6,434	+252
Payments in Lieu of Taxes	1,764	1,752	1,513	-251
Total, Infrastructure Support	66,549	66,097	48,671	-17,878

Facilities and Infrastructure

This activity funds infrastructure support investments that focus on laboratory core infrastructure and operations. SC laboratories conduct rigorous condition assessments of their core infrastructure which validate the need for investments in these basic systems that form the backbone of their campuses. Each year, the SLI program continues this focus and collaborates with the SC research programs to review investment needs. This activity also supports general facilities and infrastructure support, as well as operations and maintenance, de-inventory, removal, and transfer of nuclear material in the former NBL building on the site of ANL. SC is working to transfer the DOE Certified Reference Material (CRM) program, formerly operated out of the NBL building, to NNSA.

Nuclear Operations

To support critical DOE nuclear operations, this Request includes funding to manage ORNL's nuclear facilities (i.e., Buildings 7920, 7930, 3525, and 3025E) to current expectations, in accordance with federal regulations and DOE Directives. This funding supports critical nuclear complex equipment and infrastructure to support compliance with safety standards.

Oak Ridge 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, and other infrastructure; support and improvement of environmental protection, safety, and health; and PILT to Oak Ridge communities.

Payments in Lieu of Taxes

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

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is owned by the United States Federal Government and operated by the Department. Under this authorization, PILT is provided to communities around the ANL and BNL 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.

**Science Laboratories Infrastructure
Infrastructure Support**

Activities and Explanation of Changes

FY 2017 Enacted	FY 2019 Request	Explanation of Changes FY 2019 Request vs FY 2017 Enacted
Infrastructure Support \$66,549,000	\$48,671,000	-\$17,878,000
Facilities and Infrastructure \$32,603,000	\$30,724,000	-\$1,879,000
Funding supported investments in critical core infrastructure at SLAC, ANL, FNAL, general infrastructure support at OSTI and ORISE, and supported operations, de-inventory and removal of nuclear material at the former NBL Building at ANL.	The FY 2019 Request will continue to support de-inventory and removal of nuclear material at the former NBL Building at ANL, and critical core infrastructure at SC laboratories, ORISE, and OSTI.	Funding decreases overall as a result of completed core infrastructure projects at SLAC, ANL, and FNAL. Funding increases in FY 2019 to support de-inventory, removal, and transfer of nuclear material at Building 350, formerly the site of NBL on the ANL campus. Funding for general purpose infrastructure at OSTI and ORISE is no longer provided on an annual basis as funding for infrastructure at these sites is now included as part of the core infrastructure planning process.
Nuclear Operations \$26,000,000	\$10,000,000	-\$16,000,000
Funding supported critical nuclear operations and provides funding to manage ORNL's nuclear facilities.	The FY 2019 Request will continue to support critical nuclear operations and provides funding to manage ORNL's nuclear facilities.	Funding supports the most critical nuclear operations efforts at ORNL.
Oak Ridge Landlord \$6,182,000	\$6,434,000	+\$252,000
Funding supported landlord responsibilities across the Oak Ridge Reservation. Activities include maintenance of roads, grounds, and other infrastructure; support and improvement of environmental protection, safety, and health; and PILT to Oak Ridge communities.	The FY 2019 Request will provide funding to support landlord responsibilities across the Oak Ridge Reservation. Activities include maintenance of roads, grounds, and other infrastructure; support and improvement of environmental protection, safety, and health; and PILT to Oak Ridge communities.	Funding supports increased PILT requirements at Oak Ridge communities.
Payment in Lieu of Taxes \$1,764,000	\$1,513,000	-\$251,000
Funding supported PILT payments to communities around ANL and BNL.	The FY 2019 Request will provide funding for PILT payments to communities around ANL and BNL.	Funding reflects anticipated PILT payments in FY 2019.

Science Laboratories Infrastructure Construction

Description

The SLI Construction 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 FY 2019 Request includes funding for:

- two new line-item construction projects:
 - Science User Support Center at BNL
 - Electrical Capacity and Distribution Capability project at ANL
- and five ongoing line-item construction projects:
 - Energy Sciences Capability project at PNNL
 - Integrated Engineering Research Center at FNAL
 - Core Facility Revitalization project at BNL
 - Materials Design Laboratory project at ANL
 - Integrative Genomics Building project at LBNL

Science User Support Center, BNL

BNL user facilities and capabilities supported by DOE and partnering agencies attract over 40,000 visiting scientists, guests, users, and contractors annually to conduct research in a broad range of basic and applied sciences. However, the ability to efficiently process and support the needs of this growing community of researchers is limited by the age, condition, and dispersed nature of BNL's current facilities. The scientific impact of BNL can be expanded by an improved user support building that facilitates improved administrative functions and the availability of accessible conferencing and collaboration facilities. BNL also has many World War II-era structures dispersed around the site that house research support organizations in deteriorated facilities that are no longer sustainable and contribute to operational inefficiencies. Construction of the Science User Support Center will provide convenient and efficient facilities for processing and supporting the users of BNL's premier research facilities by replacing the current substandard, dispersed and inefficient facilities. It will also provide conference facilities to support the collaborative science and research agenda for the user community and BNL scientists.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, *Approve Mission Need*, approved on December 12, 2016. This project has a preliminary total project cost range of \$72,000,000 to \$96,000,000. The preliminary total project cost is estimated to be \$85,000,000.

Electrical Capacity and Distribution Capability, ANL

Mission critical improvements to ANL's high voltage electrical distribution systems are needed to address the anticipated 2021 electrical demands of the exascale computing program as well as current mission critical operations in multiple facilities across the laboratory complex. Elements of ANL's high voltage electrical distribution systems are rated in poor condition due to age, limiting the ability to support the electricity requirements of new and expanding facilities and scientific programs. Much of the main electrical supply infrastructure was constructed in the 1960's and is now beyond its useful life. The Electrical Capacity and Distribution Capability project will improve and expand critical electrical distribution systems to support the electrical capacity growth needed to support the Advanced Scientific Computing Research investments in an exascale-capable supercomputer, as part of the DOE Exascale Computing Initiative. Other SC facilities will also be positively impacted by these critical high voltage electrical and distribution upgrades, including the Advanced Photon Source and the Center for Nanoscale Materials, among others.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, *Approve Mission Need*, approved on September 11, 2017. This project has a preliminary total project cost range of \$53,000,000 to \$96,000,000. The preliminary total project cost is estimated to be \$61,000,000.

Energy Sciences Capability, PNNL

The Chemical and Molecular Sciences capability forms the basis for PNNL's fundamental science programs in catalysis science, condensed phase and interfacial molecular science, computational and theoretical chemistry, geosciences, and separations and analysis. This core capability also has strong ties to the Condensed Matter Physics and Materials Science, Computational Science, and the Applied Mathematics core capabilities. Exercise of this core capability is hampered by many infrastructure capability gaps, including insufficient hood space for catalysis synthesis and collaboration; lack of proper environmental controls for state-of-the-art in situ characterization; limited space to integrate experimental capabilities for visualization supporting research in data analytics, modeling, and simulation, and performance modeling (for the Center for Advanced Technology Evaluation/ASCR related capability); and limited collaboration space for users and strategic partners. Closing these gaps will provide for mission-appropriate utility and infrastructure support systems for PNNL research. It will also significantly improve collaboration among researchers, both on-site and remotely.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, *Approve Mission Need*, approved on December 12, 2016. This project has a preliminary total project cost range of \$73,000,000 to \$99,000,000. The preliminary total project cost is estimated to be \$93,000,000.

Integrated Engineering Research Center, FNAL

The Integrated Engineering Research Center project will construct a scientific user support facility to accommodate increased collaboration and interactions among staff at FNAL, who will in turn be working with scientific collaborators and international partners in the design, construction, and operation of physics experiments.

In May 2014, the Particle Physics Project Prioritization Panel (P5) issued a report that included recommendations to "develop a coherent short- and long-baseline neutrino program hosted at Fermilab" and to "reformulate the long-baseline neutrino program as an internationally designed, coordinated, and funded program with [FNAL] as host." SC and the High Energy Physics (HEP) program accepted the recommendations in the P5 report and are committed to implementing a successful program based on this vision.

Implementing these recommendations will require significantly increased collaboration and interactions among FNAL staff, who will in turn be working with scientific collaborators and international partners in the design, construction, and operation of physics experiments. Currently, staff and their associated manufacturing, assembly, engineering, and technical facilities are scattered among three parts of the campus—the Silicon Detector Complex, the Village, and Wilson Hall. As a result, they are unable to efficiently collaborate on ongoing and planned projects in support of the mission of the laboratory. The Integrated Engineering Research Center will provide FNAL with a collaborative, multi-divisional and interdisciplinary research center. This research center will close existing capability and infrastructure gaps by reducing the overall footprint of outdated facilities, and collocating engineering and associated research staff in a new or renovated facility near the central campus. This approach will complement the ongoing and planned renovations of Wilson Hall by establishing the main campus as the anchor point of the site. It will improve operational efficiency and collaboration because groups working on key projects would be in close proximity. Such a facility will provide technical and engineering staff the necessary environment for interdisciplinary collaboration necessary to establish an international neutrino program and support other HEP science opportunities described in the P5 report.

The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, *Approve Alternative Selection and Cost Range*, which was approved on April 18, 2017. The preliminary total project cost is estimated to be \$86,000,000.

Core Facility Revitalization, BNL

A significant amount of computation and data storage is currently conducted within the Relativistic Heavy Ion Collider (RHIC) ATLAS Computing Facility (RACF) that is located on the BNL campus. The RACF directly supports RHIC research operations funded by Nuclear Physics (NP) and the US-ATLAS research operations funded by HEP. The RACF also provides mid-scale computing support to other research programs funded by SC, research efforts funded by strategic partners, and computationally-intensive research that indirectly supports the broader SC mission.

The data volume generated by the RHIC experiments and ATLAS is expected to increase three to six times over the next ten years and will require proportional increases in computation and data storage capacities. Almost half of the current RACF computing and data storage facility is expected become functionally obsolete and unable to accommodate future

generations of computation and data storage technologies over the next five to ten years. Therefore, the projected capability gaps in computing infrastructure are due to a combination of decreases due to degrading capacities and increases in future requirements of mid-scale computing performed by RACF. Increases in computation and data storage will drive increased requirements for space, power, and cooling of computing facilities. A mission need therefore exists to provide sufficient mid-range computation and data storage capabilities to support to current and planned experiments using RHIC and the ATLAS detectors, and potentially other programs.

The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, *Approve Alternative Selection and Cost Range*, was approved on April 18, 2017. This project has a total project cost range of \$68,500,000 to \$84,500,000. The preliminary total project cost is estimated to be \$74,850,000

Materials Design Laboratory, ANL

The Materials Design Laboratory will support research in materials science in energy and a range of other fields. It will entail constructing a new laboratory office building of approximately 100,000 gsf in size and located adjacent to the recently completed Energy Sciences Building. The existing research buildings at ANL dedicated to this SC research mission are all more than 40 years old, some as old as 55 years. These structures require frequent repair, resulting in interruptions to research activities, and they are unable to meet modern standards for instruments requiring vibration, electromagnetic, and/or thermal stability.

This project is currently in construction and will receive final year of funding in FY 2019. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-3, *Approve Start of Construction*, on August 12, 2016. The Total Project Cost (TPC) for this project is \$96,000,000.

Integrative Genomics Building, LBNL

The Integrative Genomics Building will allow the laboratory to relocate a significant fraction of the research and operations currently located in commercially leased space onto the main LBNL campus. Portions of the biosciences program at LBNL are located off-site, away from the main laboratory, and dispersed across multiple locations up to 20 miles apart. Collocation of these programs will increase the synergy and efficiency of biosciences and other research at LBNL and will provide a state-of-the-art facility for biosciences research in a collaborative environment close to other key LBNL facilities and programs.

This project is currently in construction and will receive final year of funding in FY 2019. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-3, *Approve Start of Construction*, which was approved on October 7, 2016. The TPC for this project is \$91,500,000.

Science Laboratories Infrastructure

Activities and Explanation of Changes

FY 2017 Enacted	FY 2019 Request	Explanation of Changes FY 2019 Request vs FY 2017 Enacted
Construction \$63,451,000	\$78,181,000	+\$14,730,000
19-SC-71, Science User Support Center, BNL \$0	\$2,000,000	+\$2,000,000
	Funding will support Project Engineering and Design (PED) activities.	Funding will initiate PED for this new construction project.
19-SC-72, Electrical Capacity and Distribution Capability, ANL \$0	\$20,000,000	+\$20,000,000
	Funding will support PED and construction activities.	Funding will initiate PED as well as construction for this new project.
18-SC-71, Energy Sciences Capability, PNNL \$0	\$4,000,000	+\$4,000,000
	Funding will support PED activities.	Funding will support continued PED activities.
17-SC-71, Integrated Engineering Research Center, FNAL \$2,500,000	\$5,000,000	+\$2,500,000
Funding supported PED activities.	Funding will support PED activities as well as construction activities.	Funding will support PED and construction activities.
17-SC-73, Core Facility Revitalization, BNL \$1,800,000	\$13,632,000	+\$11,832,000
Funding supported Project Engineering and Design activities.	Funding will support PED activities as well as construction activities.	Funding will support PED and construction activities.
15-SC-76, Materials Design Laboratory, ANL \$19,590,000	\$20,000,000	+\$410,000
Funding supported on-going construction of the project.	Funding will support completion of construction of this project.	Funding supports on-going construction activities.
15-SC-77, Photon Science Laboratory Building, SLAC \$20,000,000	\$0	-\$20,000,000
Funding supported completion of construction of the project.	Final year of funding was received in FY 2017.	Final year of funding was received in FY 2017.
15-SC-78, Integrative Genomics Building, LBNL \$19,561,000	\$13,549,000	-\$6,012,000
Funding supported on-going construction of the project.	Funding will support completion of construction of the project.	The decrease in funding is consistent with the project's baseline funding profile.

**Science Laboratories Infrastructure
Capital Summary (\$K)**

	Total	Prior Years	FY 2017 Enacted	FY 2018 Annualized CR^a	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
Capital Operating Expense Summary						
General Plants Projects						
ALS HVAC System Upgrade at LBNL (TEC \$9.0M)	9,000	-	9,000	-	-	-9,000
Electrical Distribution Upgrades at SLAC (TEC \$10.0M)	10,000	-	10,000	-	-	-10,000
Cryogenics Upgrades at TJNAF (TEC \$8.0M)	8,000	-	8,000	-	-	-8,000
Linac K-sub Remediation at SLAC (TEC \$9.8M)	9,800	9,800	-	-	-	-
Wilson Hall Renovations at FNAL (TEC \$9.0M)	9,000	9,000	-	-	-	-
Water and Sewer Utilities Modernization at ANL (TEC \$8.5M)	-	-	-	-	8,500	+8,500
ALS Support HVAC System and Utility Upgrade at LBNL (\$8.5M)	-	-	-	-	8,500	+8,500
Other GPP (TEC <\$5M)	n/a	n/a	3,200	-	3,000	-200
Total, Capital Operating Expenses	n/a	n/a	30,200	-	20,000	-10,200

^a A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution. (These amounts are shown only at the Congressional control level and above; below that level, a dash (—) is shown).

Construction Projects Summary (\$K)

	Total Project Cost (TPC)	Prior Years	FY 2017 Enacted	FY 2018 Annualized CR^a	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
19-SC-71, Science User Support Center, BNL						
TEC	85,000 ^b	0	0	0	2,000	+2,000
OPC ^c	1,000	0	800	–	0	-800
TPC	86,000 ^b	0	800	–	2,000	+1,200
19-SC-72, Electrical Capacity and Distribution Capability, ANL						
TEC	60,000 ^b	0	0	0	20,000	+20,000
OPC ^c	1,000	0	0	–	0	0
TPC	61,000 ^b	0	0	–	20,000	+20,000
18-SC-71, Energy Sciences Capability, PNNL						
TEC	90,000 ^b	0	0	1,000	4,000	+4,000
OPC ^c	3,000	0	1,100	–	0	-1,100
TPC	93,000 ^b	0	1,100	–	4,000	+2,900
17-SC-71, Integrated Engineering Research Center, FNAL						
TEC	85,000 ^b	0	2,500	2,483	5,000	+2,500
OPC ^c	2,000	630	300	–	0	-300
TPC	87,000 ^b	630	2,800	–	5,000	+2,200
17-SC-73, Core Facility Revitalization, BNL						
TEC	74,000 ^b	0	1,800	1,788	13,632	+11,832
OPC ^c	850	850	0	–	0	0
TPC	74,850 ^b	850	1,800	–	13,632	+11,832

^a A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution. (These amounts are shown only at the Congressional control level and above; below that level, a dash (–) is shown).

^b This project has not received CD-2 approval; therefore, preliminary cost estimates are shown for TEC and TPC.

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

	Total Project Cost (TPC)	Prior Years	FY 2017 Enacted	FY 2018 Annualized CR ^a	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
15-SC-76, Materials Design Laboratory, ANL						
TEC	95,000	30,910	19,590	19,457	20,000	+410
OPC ^b	1,000	1,000	0	–	0	0
TPC	96,000	31,910	19,590	–	20,000	+410
15-SC-77, Photon Sciences Laboratory Building, SLAC						
TEC	55,000	35,000	20,000	19,864 ^c	0	-20,000
OPC ^b	2,000	1,541	459	–	0	-459
TPC	57,000	36,541	20,459	–	0	-20,459
15-SC-78, Integrative Genomics Building, LBNL						
TEC	90,000	32,090	19,561	19,428	13,549	-6,012
OPC ^b	1,500	1,500	0	–	0	0
TPC	91,500	33,590	19,561	–	13,549	-6,012
Total, Construction						
TEC	n/a	n/a	63,451	63,020	78,181	+14,730
OPC ^b	n/a	n/a	2,659	–	0	-2,659
TPC	n/a	n/a	66,110	–	78,181	+12,071

^a A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution. (These amounts are shown only at the Congressional control level and above; below that level, a dash (–) is shown).

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

^c Photon Science Laboratory Building at SLAC received final year of funding in FY 2017.

**19-SC-71, Science and User Support Center
Brookhaven National Laboratory (BNL), Upton, NY
Project is for Design and Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) includes a new start for FY 2019.

Summary

The FY 2019 Request for the Science and User Support Center is \$2,000,000. The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, Approve Mission Need, which was approved on December 12, 2016.

This project has a preliminary Total Estimated Cost (TEC) range of \$71,000,000 to \$95,000,000 and a preliminary Total Project Cost (TPC) range of \$72,000,000 to \$96,000,000. These cost ranges encompass the most feasible preliminary alternatives. This preliminary information reflects funding for a project that will provide a facility to serve the research community and improve scientific and operational productivity by consolidating visitor and support services.

A Federal Project Director with the appropriate certification level will be assigned to this project prior to CD-1 approval.

FY 2019 funds will initiate Project Engineering and Design activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	12/12/2016	4Q FY 2018	2Q FY 2019 ^a	4Q FY 2020 ^a	3Q FY 2021	4Q FY 2021 ^a	N/A	4Q FY 2025 ^a

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2 – Approve Performance Baseline

Final Design Complete – Actual date the final design was completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D Work

CD-4 – Approve Project Completion

3. Preliminary Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^b Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	9,400	75,600 ^a	85,000 ^a	1,000	N/A	1,000	86,000 ^a

^a This project is pre-CD-2; schedule and funding estimates are preliminary.

^b Other project costs (OPC) are funded through laboratory overhead.

4. Preliminary Project Scope and Justification

Scope

The Science and User Support Center (SUSC) project is in the pre-conceptual stage of development and several alternatives will be considered in preparation for CD-1. It is currently conceived as a project to construct a multi-story office building of approximately 70,000 – 120,000 gross square feet (gsf) to consolidate and provide space for visitor processing, offices for approximately 200-350 occupants, space for conferences, extension of utilities to the building, and related roadway modifications and parking lot development.

Key Performance Parameters (Preliminary)

The Key Performance Parameters (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.

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Multi-story Building	70,000 gsf	120,000 gsf

Justification

Brookhaven National Laboratory (BNL) has nine user facilities that attract over 40,000 visiting scientists, guests, users, and contractors annually to conduct research in a broad range of basic and applied sciences, however the ability to efficiently process and support the needs of this growing community of researchers is limited by the age, condition and dispersed nature of BNL’s current facilities. The Laboratory’s scientific impact can be improved by a facility that centralizes the administrative support functions and provides easier visitor access to conferencing and collaboration space to support the Office of Science research agenda. BNL also has many World War II era facilities dispersed around the site that house research support organizations in deteriorated facilities that are no longer sustainable and contribute to operational inefficiencies. Construction of the SUSC will provide convenient and efficient facilities for processing and supporting the users of BNL’s premier research facilities, which would enable for the demolition of the current substandard, dispersed, and inefficient facilities. It will also provide conference facilities to support the collaborative science and research agenda for the user community and BNL scientists.

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*.

5. Financial Schedule

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2019	2,000	2,000	2,000
FY 2020	7,400	7,400	7,400
Total, Design	9,400	9,400	9,400
Construction			
FY 2021	20,039	20,039	15,000
FY 2022	30,311	30,311	30,000
FY 2023	25,250	25,250	25,000
FY 2024	0	0	5,600
Total, Construction	75,600	75,600	75,600

^a Costs for FY 2018 and the outyears are estimates.

(dollars in thousands)			
	Appropriations	Obligations	Costs ^a
TEC			
FY 2019	2,000	2,000	2,000
FY 2020	7,400	7,400	7,400
FY 2021	20,039	20,039	15,000
FY 2022	30,311	30,311	30,000
FY 2023	25,250	25,250	25,000
FY 2024	0	0	5,600
Total, TEC	85,000	85,000	85,000
Other Project Cost (OPC) ^b			
OPC except D&D			
FY 2018	1,000	1,000	1,000
Total, OPC	1,000	1,000	1,000
Total Project Cost (TPC)			
FY 2018	1,000	1,000	1,000
FY 2019	2,000	2,000	2,000
FY 2020	7,400	7,400	7,400
FY 2021	20,039	20,039	15,000
FY 2022	30,311	30,311	30,000
FY 2023	25,250	25,250	25,000
FY 2024	0	0	5,600
Total, TPC	86,000	86,000	86,000

6. Details of Project Cost Estimate

(dollars in thousands)			
	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	7,800	N/A	N/A
Contingency	1,600	N/A	N/A
Total, Design	9,400	N/A	N/A
Construction			
Construction	63,000	N/A	N/A
Contingency	12,600	N/A	N/A
Total, Construction	75,600	N/A	N/A
Total, TEC	85,000	N/A	N/A
Contingency, TEC	14,200	N/A	N/A

^a Costs for FY 2018 and the outyears are estimates.

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

(dollars in thousands)

Current Total Estimate	Previous Total Estimate	Original Validated Baseline
------------------------	-------------------------	-----------------------------

Other Project Cost (OPC)^a

OPC except D&D

Conceptual Planning	400	N/A	N/A
Conceptual Design	400	N/A	N/A
Contingency	200	N/A	N/A
Total, OPC	1,000	N/A	N/A
Contingency, OPC	200	N/A	N/A
Total, TPC	86,000	N/A	N/A
Total, Contingency	14,400	N/A	N/A

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
FY 2019	TEC	0	2,000	7,400	20,039	30,311	25,250	85,000
	OPC ^a	1,000	0	0	0	0	0	1,000
	TPC	1,000	2,000	7,400	20,039	30,311	25,250	86,000

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy Expected.....4Q FY 2025

Useful Life50 years

Expected Future Start of D&D of this capital asset.....N/A

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life-Cycle Costs	
	Current Total Estimates	Previous Total Estimates	Current Total Estimates	Previous Total Estimates
Operations	166	N/A	8,307	N/A
Utilities	78	N/A	3,879	N/A
Maintenance and Repair	384	N/A	19,200	N/A
Total – Operations and Maintenance	628	N/A	31,386	N/A

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

9. 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 <i>Brookhaven National Laboratory</i>	70,000 – 120,000
Area of D&D in this project at <i>Brookhaven National Laboratory</i>	None
Area at <i>Brookhaven National Laboratory</i> to be transferred, sold, and/or D&D outside the project including area previously banked”	None ^a
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	70,000 – 120,000

10. Preliminary Acquisition Approach

Acquisition for this project will be performed by the BNL Management and Operating (M&O) Contractor, Brookhaven Science Associates. The M&O Contractor will be responsible for awarding and managing all subcontracts related to the project. The Brookhaven Site Office will be responsible for overseeing the performance of the M&O Contractor. Various acquisition and project delivery methods will be evaluated prior to achieving CD-1. The M&O Contractor will evaluate potential benefits of using a single or multiple contracts to procure materials, equipment, construction, commissioning and other project scope elements. Project performance metrics will be included in the M&O Contractor’s annual performance and evaluation measurement plan.

^a 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.

**19-SC-72, Electrical Capacity and Distribution Capability
Argonne National Laboratory (ANL), Argonne, IL
Project is for Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) includes a new start for FY 2019.

Summary

The FY 2019 Request for the Electrical Capacity and Distribution Capability project is \$20,000,000. The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, Approve Mission Need, which was approved on September 22, 2017.

This project has a Total Estimated Cost (TEC) of \$60,000,000 and a Total Project Cost (TPC) of \$61,000,000. This preliminary information reflects funding for a project to improve high voltage electrical distribution systems to support the anticipated electrical demands of the exascale computing program as well as current mission critical operations in multiple facilities across Argonne National Laboratory (ANL).

A Federal Project Director with the appropriate certification level will be assigned to this project prior to CD-1 approval.

FY 2019 funds will initiate Project Engineering and Design, and Construction activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	09/22/2017	N/A	4Q FY 2018	3Q FY 2019	2Q FY 2019	3Q FY 2019	N/A	4Q FY 2022

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2 – Approve Performance Baseline

Final Design Complete – Actual date the final design was completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D Work (see section 9)

CD-4 – Approve Project Completion

Performance Baseline Validation

FY 2019 N/A

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	6,000	54,000	60,000	1,000	N/A	1,000	61,000

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

4. Project Scope and Justification

Scope

The scope of this project includes the design and construction of a new power supply to the site in a location physically separated from existing location such that redundancy is provided to prevent single point failure. Additionally, increased high voltage electrical capacity will be provided. Upgrades to supply lines and substations as well as redundant electrical connections will be analyzed and provided, if they prove to provide a positive benefit to cost ratio.

Key Performance Parameters (Preliminary)

The Key Performance Parameters 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.

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Provide new power supply	>150MVa	>200MVa
Provide increased high voltage electrical capacity	>60MVa	>110MVa
Upgrade existing 138kV supply line and 549A substation	Maintain 138kV supply line	Support >150MVa
Provide redundant electrical connections	Maintain existing electrical connections between major ANL substations	Between major ANL substations

Justification

The high voltage electrical distribution system consists of substations, transformers, high voltage electrical supply, and distribution cabling. High voltage power is supplied to the laboratory via a single ComEd managed substation facility. Once on site, electricity is distributed through laboratory managed substations, transformers, and finally facilities. Elements of the high voltage electrical distribution system are rated in poor condition due to age, limiting the ability to support the electricity requirements of new and expanding facilities and scientific programs. Much of the main electrical supply infrastructure was constructed in the 1960's and is now beyond its useful life.

Mission critical improvements to the high voltage electrical distribution systems are needed to support ANL's unique competencies and eliminate these gaps. Expansion of the electrical distribution system would significantly reduce the risk of inadequate electrical capacity to support future scientific program growth and/or new initiatives; specifically those associated with advanced computer science, visualization, and data, large scale user facilities/advanced instrumentation and nuclear physics core capabilities. By filling these gaps, there will be a significant reduction in operational risk associated with unplanned outages. The Electrical Capacity and Distribution Capability project will improve and expand critical electrical distribution systems to support the electrical capacity growth needed to support the SC/Advanced Scientific Computing Research program's planned delivery of an exascale computer to the ANL Leadership Computing Facility. Other science facilities will also be positively impacted by these critical high voltage electrical and distribution upgrades such as the Advanced Photo Source and the Center for Nanoscale Materials.

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.

5. Financial Schedule

(dollars in thousands)			
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2019	6,000	6,000	6,000
Total, Design	6,000	6,000	6,000
Construction			
FY 2019	14,000	14,000	10,000
FY 2020	40,000	40,000	27,000
FY 2021	0	0	17,000
Total, Construction	54,000	54,000	54,000
TEC			
FY 2019	20,000	20,000	16,000
FY 2020	40,000	40,000	27,000
FY 2021	0	0	17,000
Total, TEC	60,000	60,000	60,000
Other Project Cost (OPC)^b			
OPC except D&D			
FY 2018	1,000	1,000	1,000
Total, OPC	1,000	1,000	1,000
Total Project Cost (TPC)			
FY 2018	1,000	1,000	1,000
FY 2019	20,000	20,000	16,000
FY 2020	40,000	40,000	27,000
FY 2021	0	0	17,000
Total, TPC	61,000	61,000	61,000

6. Details of Project Cost Estimate

(dollars in thousands)			
	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	5,100	N/A	N/A
Contingency	900	N/A	N/A
Total, Design	6,000	N/A	N/A
Construction			
Construction	45,000	N/A	N/A
Contingency	9,000	N/A	N/A
Total, Construction	54,000	N/A	N/A

^a Costs for FY 2018 and the outyears are estimates.

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

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total, TEC	60,000	N/A	N/A
Contingency, TEC	9,900	N/A	N/A
Other Project Cost (OPC) ^a			
OPC except D&D			
Conceptual Planning	750	N/A	N/A
Conceptual Design	250	N/A	N/A
Contingency	0	N/A	N/A
Total, OPC	1,000	N/A	N/A
Contingency, OPC	0	N/A	N/A
Total, TPC	61,000	N/A	N/A
Total, Contingency	9,900	N/A	N/A

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2019	TEC	0	20,000	40,000	0	0	0	0	60,000
	OPC ^a	1,000	0	0	0	0	0	0	1,000
	TPC	1,000	20,000	40,000	0	0	0	0	61,000

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy Expected.....	4Q FY 2021
Useful Life.....	50 years
Expected Future Start of D&D of this capital asset.....	4Q FY 2071

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life-Cycle Costs	
	Current Total Estimates	Previous Total Estimates	Current Total Estimates	Previous Total Estimates
Operations	1,117	N/A	107,628	N/A
Utilities	162	N/A	21,571	N/A
Maintenance and Repair	536	N/A	51,646	N/A
Total – Operations and Maintenance	1,815	N/A	180,845	N/A

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

9. D&D Information

There is no new area being constructed in this construction project.

	Square Feet
New area being constructed by this project at <i>Argonne National Laboratory</i>	None
Area of D&D in this project at <i>Argonne National Laboratory</i>	None
Area at <i>Argonne National Laboratory</i> to be transferred, sold, and/or D&D outside the project including area previously banked”	None ^a
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

10. Acquisition Approach

Acquisition for this project will be performed by the Management and Operating (M&O) Contractor, UChicago Argonne, LLC, and will be overseen by the Argonne Site Office. Various acquisition approaches and project delivery methods will be evaluated prior to achieving CD-1. A tailored Design-Build approach is being considered as the overall best project delivery method with the lowest risk to DOE. The M&O Contractor is responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O Contractor’s annual performance evaluation and measurement plan.

^a 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.

**18-SC-71, Energy Sciences Capability
Pacific Northwest National Laboratory (PNNL), Richland, WA
Project is for Design and Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2018 CPDS and does not include a new start for FY 2019.

Summary

The FY 2019 Request for the Energy Sciences Capability (ESC) project is \$4,000,000, consistent with the preliminary funding profile. The most recent DOE Order 413.3B Critical Decision (CD) is CD-0, Approve Mission Need, which was approved on December 12, 2016. The Total Estimated Cost (TEC) range for this project is \$70,000,000 to \$96,000,000. The Total Project Cost (TPC) range for this project is \$73,000,000 to \$99,000,000.

A Federal Project Director with the appropriate certification level will be assigned to this project prior to CD-1 approval.

This project will provide a facility for the consolidation of multidisciplinary efforts related to the advancement of catalysis science which are currently located in multiple facilities, on and off the Pacific Northwest National Laboratory (PNNL) Richland campus.

FY 2019 funds will support Project Engineering and Design activities.

2. Critical Milestone History

	(fiscal quarter or date)							
	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	12/12/2016	N/A	4Q FY 2018	4Q FY 2019 ^a	N/A	4Q FY 2020 ^a	N/A	4Q FY 2025 ^a
FY 2019	12/12/2016	3Q FY2018	2Q FY 2018	4Q FY 2019 ^a	4Q FY 2019 ^a	4Q FY 2019 ^a	N/A	4Q FY 2025 ^a

CD-0 – Approve Mission Need

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 completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D work (see Section 9)

CD-4 – Approve Project Completion

^a This project is pre-CD-2 and schedule estimates are preliminary.

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	9,000	81,000	90,000 ^b	3,000	N/A	3,000	93,000 ^b
FY 2019	9,000	81,000	90,000 ^b	3,000	N/A	3,000	93,000 ^b

4. Project Scope and Justification

Scope

The scope of the proposed project is to construct new capital assets, including utilities and infrastructure capabilities. The ESC project will design, construct and turnover facilities and infrastructure that provides nominally 110,000 to 145,000 gross square feet of wet chemistry, instrumentation, and computational space in 40 to 52 laboratory modules along with offices for 150 to 200 research and support staff.

Key Performance Parameters (Preliminary)

The Key Performance Parameters (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.

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Multi-story Laboratory Building	110,000 gross square feet (GSF)	145,000 GSF

Justification

PNNL operates facilities for research in chemistry, materials sciences, subsurface science, biology, physics, medicine, and applied science, as well as for the study of a diverse range of advanced technologies. PNNL's science mission, which supports DOE's mission, is to understand, predict, and control complex adaptive systems for earth, energy, and security missions. PNNL's recognized Core Capabilities are essential to advance and accelerate research sponsored by BES, BER, and ASCR. All of these research areas benefit from multidisciplinary approaches that accelerate scientific advances.

The objective behind the ESC project is to increase the impact of chemical conversion research and development at PNNL and expand the reach of user programs. Ultimately, greater multidisciplinary collaboration, controlled environments, and increasing computational needs beyond current capabilities will be needed to accomplish this end state. Currently, key PNNL staff members and instrumentation driving multidisciplinary efforts are located in multiple facilities, separated miles apart, on and off of the PNNL Richland campus. With less than 0.25% available vacant lab space and less than 1.5% vacant office space scattered across the campus, PNNL needs a new facility to allow for collaboration. This consolidation will free up space that also allows for increased optimization and greater colocation of Environmental Molecular Sciences Laboratories and Atmospheric Radiation Measurement user missions.

The geographic separation of scientific capabilities at PNNL creates a capability gap by impacting collaborative work and limits interdisciplinary research required to realize the critical advances offered through integration (i.e., "convergence"). As stated in the report "The Convergence of the Life Sciences, Physical Sciences, and Engineering" from the Massachusetts Institute of Technology, convergence "involves the coming together of different fields of study—particularly engineering, physical sciences, and life sciences—through collaboration among research groups and the integration of approaches" and "is a new paradigm that can yield critical advances in a broad array of sectors, from health care to energy, food, climate, and water." It also entails "a broad rethinking of how all scientific research can be conducted, so that we capitalize on a range of knowledge bases."

^a Other project costs (OPC) are funded through laboratory overhead.

^b This project has not received CD-2 approval, therefore, funding estimates are preliminary. The preliminary TEC range for this project is \$70,000,000 to \$96,000,000. The preliminary TPC range for this project is \$73,000,000 to \$99,000,000.

The ESC project will provide for the needed space of the proper configuration and types to afford acceleration of convergent science—a need that can be achieved only through material means. It also will enable a cascade of moves to enable location of synergistic capabilities in optimal spaces without losing those capabilities for extended time periods and negatively impacting research. The ESC project also further advances the PNNL campus strategy to modernize and increase federal ownership of the Laboratory and seeks to directly impact PNNL’s core capabilities by creating space that enables research in support of BES, BER, and ASCR 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*.

5. Financial Schedule

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2018	1,000	1,000	400
FY 2019	4,000	4,000	4,600
FY 2020	4,000	4,000	4,000
Total, Design	9,000	9,000	9,000
Construction			
FY 2020	4,194	4,194	0
FY 2021	22,209	22,209	12,000
FY 2022	30,500	30,500	18,000
FY 2023	24,097	24,097	22,000
FY 2024	0	0	29,000
Total, Construction	81,000	81,000	81,000
TEC			
FY 2018	1,000	1,000	400
FY 2019	4,000	4,000	4,600
FY 2020	8,194	8,194	4,000
FY 2021	22,209	22,209	12,000
FY 2022	30,500	30,500	18,000
FY 2023	24,097	24,097	22,000
FY 2024	0	0	29,000
Total, TEC^b	90,000	90,000	90,000
Other Project Cost (OPC)^c			
OPC except D&D			
FY 2017	1,100	1,100	1,100
FY 2018	1,500	1,500	1,500
FY 2023	400	400	400
Total, OPC except D&D	3,000	3,000	3,000

^a Costs through 2016 reflect actual Costs; costs for FY 2017 and the outyears are estimates.

^b This project has not received CD-2 approval, therefore, funding estimates are preliminary. The preliminary TEC range for this project is \$70,000,000 to \$96,000,000. The preliminary TPC range for this project is \$73,000,000 to \$99,000,000.

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

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Project Cost (TPC)			
FY 2017	1,100	1,100	1,100
FY 2018	2,500	2,500	1,900
FY 2019	4,000	4,000	4,600
FY 2020	8,194	8,194	4,000
FY 2021	22,209	22,209	12,000
FY 2022	30,500	30,500	18,000
FY 2023	24,497	24,497	22,400
FY 2024	0	0	29,000
Total, TPC ^b	93,000	93,000	93,000

6. Details of Project Cost Estimate

	(dollars in thousands)		
	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	7,500	7,500	N/A
Contingency	1,500	1,500	N/A
Total, Design	9,000	9,000	N/A
Construction			
Construction	70,000	70,000	N/A
Contingency	11,000	11,000	N/A
Total, Construction	81,000	81,000	N/A
Total, TEC ^b	90,000	90,000	N/A
Contingency, TEC	12,500	12,500	N/A
Other Project Cost (OPC) ^c			
OPC except D&D	1,650	1,650	N/A
Conceptual Planning	100	100	N/A
Conceptual Design	1,000	1,000	N/A
Contingency	250	250	N/A
Total, OPC	3,000	3,000	N/A
Contingency, OPC	250	250	N/A
Total, TPC ^b	93,000	93,000	N/A
Total, Contingency	12,750	12,750	N/A

^a Costs through 2016 reflect actual Costs; costs for FY 2017 and the outyears are estimates.

^b This project has not received CD-2 approval, therefore, funding estimates are preliminary. The preliminary TEC range for this project is \$70,000,000 to \$96,000,000. The preliminary TPC range for this project is \$73,000,000 to \$99,000,000.

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

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year		Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2018	TEC	0	1,000	TBD	TBD	TBD	TBD	TBD	TBD	90,000 ^a
	OPC ^b	0	0	0	0	0	0	0	0	3,000
	TPC	0	1,000	TBD	TBD	TBD	TBD	TBD	TBD	93,000 ^a
FY 2019	TEC	0	1,000	4,000	8,194	22,209	30,500	24,097	0	90,000 ^a
	OPC ^b	1,100	1,500	0	0	0	0	400	0	3,000
	TPC	1,100	2,500	4,000	8,194	22,209	30,500	24,497	0	93,000 ^a

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2Q FY 2025
Expected Useful Life.....	50 years
Expected Future Start of D&D of this capital asset.....	2Q FY 2075

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life-Cycle Costs	
	Current Total Estimates	Previous Total Estimates	Current Total Estimates	Previous Total Estimates
Operations	480	N/A	23,989	N/A
Utilities	547	N/A	27,370	N/A
Maintenance and Repair	1,222	N/A	61,121	N/A
Total – Operations and Maintenance	2,249	N/A	112,480	N/A

9. 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 <i>Pacific Northwest National Laboratory</i>	110,000 to 145,000
Area of D&D in this project at <i>Pacific Northwest National Laboratory</i>	None
Area at <i>Pacific Northwest National Laboratory</i> 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 ^c
Total area eliminated.....	None

^a This project has not received CD-2 approval, therefore, funding estimates are preliminary. The preliminary TEC range for this project is \$70,000,000 to \$96,000,000. The preliminary TPC range for this project is \$73,000,000 to \$99,000,000.

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

^c With the implementation of OMB’s Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

10. Preliminary Acquisition Approach

Acquisition for this project will be performed by the Management and Operating (M&O) contractor, Battelle Memorial Institute and overseen by the Pacific Northwest Site Office. Various acquisition approaches and project delivery methods will be considered prior to achieving CD-1. The M&O contractor will be responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O contractor's annual performance evaluation and measurement plan.

**17-SC-71, Integrated Engineering Research Center
Fermi National Accelerator Laboratory (FNAL), Batavia, IL
Project is for Design and Construction**

1. Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2018 CPDS and does not include a new start for FY 2019.

Summary

The FY 2019 Request for the Integrated Engineering Research Center project is \$5,000,000. The most recent DOE Order 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on April 18, 2017. The Total Estimated Cost (TEC) range for this project is \$73,000,000 to \$98,000,000. The Total Project Cost (TPC) range for this project is \$74,000,000 to \$99,000,000.

A Federal Project Director with the appropriate certification level has been assigned to this project.

This project will design and construct new space to accommodate increased collaboration and interactions among FNAL staff. The project is intended to close an infrastructure capability gap which will impede the establishment of an international neutrino campus as recommended by the Particle Physics Project Prioritization Panel (P5).

FY 2019 funds will support Project Engineering and Design activities as well as construction and associated activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	Conceptual Design Complete	CD-1	CD-2/3A	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	07/17/2015	N/A	1Q FY 2017	3Q FY 2018 ^a	N/A	3Q FY 2019 ^a	N/A	4Q FY 2023 ^a
FY 2018	07/17/2015	N/A	4/18/2017	3Q FY 2019 ^a	N/A	3Q FY 2020 ^a	N/A	4Q FY 2024 ^a
FY 2019	07/17/2015	3Q FY 2018	4/18/2017 ^a	3Q FY 2019 ^a	3Q FY 2019 ^a	3Q FY 2020 ^a	N/A	4Q FY 2024 ^a

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2/3A – Approve Performance Baseline/Long Lead Procurement

Final Design Complete – Actual date the final design was completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D Work (see section 9)

CD-4 – Approve Project Completion

Performance Baseline Validation

FY 2017	N/A
FY 2018	N/A
FY 2019	3Q FY 2019

^a This project is pre-CD-2 and schedule estimates are preliminary.

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	10,000	75,000 ^b	85,000 ^b	2,000	N/A	2,000	87,000 ^b
FY 2018	10,000	75,000 ^b	85,000 ^b	1,000	N/A	1,000	86,000 ^b
FY 2019	7,000	78,000 ^b	85,000 ^b	1,000	N/A	1,000	86,000 ^b

4. Project Scope and Justification

Scope

The Integrated Engineering Research Center project will construct a scientific user support facility to accommodate increased collaboration and interactions among staff at Fermilab (FNAL), who will in turn be working with scientific collaborators and international partners in the design, construction, and operation of physics experiments.

This project has not yet received CD-2 approval; therefore the Key Performance Parameters (KPPs) are not yet established. The table below outlines preliminary KPPs.

Key Performance Parameters (Preliminary)

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Multistory Laboratory/Office Building	67,000 gross square feet	134,000 gross square feet

Justification

In May 2014, the Particle Physics Project Prioritization Panel (P5) issued a report that included recommendations to “...develop a coherent short- and long-baseline neutrino program hosted at Fermilab,” and to “reformulate the long-baseline neutrino program as an internationally designed, coordinated, and funded program with [Fermi National Accelerator Laboratory, FNAL or Fermilab] as host.” SC and the High Energy Physics (HEP) program accepted the recommendations in the P5 report and are committed to implementing a successful program based on this new vision.

Implementing these recommendations will require significantly increased collaboration and interactions among FNAL staff, who will in turn be working with scientific collaborators and international partners in the design, construction, and operation of physics experiments. Currently, these staff and their associated manufacturing, assembly, engineering, and technical facilities are scattered among three parts of the campus – the Silicon Detector Complex, the Village, and Wilson Hall. As a result, they are unable to efficiently collaborate on ongoing and planned projects in support of the laboratory’s mission.

Co-location of these staff will improve collaboration because it will increase interactions among the various groups and reduce down-time spent traveling across the site. From an infrastructure standpoint, however, FNAL currently lacks sufficient space to do this. Continuing the previous example, groups from the three Divisions noted above total approximately 300 staff occupying more than 170,000 square feet of laboratories, technical areas, and offices in 15 buildings and trailers. In addition, many of these spaces are inadequate to accommodate current and planned scientific programs because they are obsolete (e.g., leaking roofs, inadequate HVAC systems) and do not support the configuration or specification needs of current and future technical programs. The Integrated Engineering Research Center will provide FNAL with a collaborative, multi-divisional, and interdisciplinary research center. This research center will close existing capability and infrastructure gaps by reducing the overall footprint of outdated facilities, and collocating engineering and associated research staff in a new or renovated facility near the central campus. This approach will complement the ongoing and planned renovations of Wilson Hall by establishing the main campus as the anchor point of the site. It will improve

^a Other project costs (OPC) are funded through laboratory overhead.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$73,000,000 to \$98,000,000. The approved TPC range for this project is \$74,000,000 to \$99,000,000.

operational efficiency and collaboration because groups working on key projects would be in close proximity to one another. Such a facility will provide technical and engineering staff the necessary environment for interdisciplinary collaboration necessary to establish an international neutrino program and support other HEP science opportunities described in the P5 report.

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

5. Financial Schedule

(dollars in thousands)			
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2017	2,500	2,500	38
FY 2018	1,500	1,500	3,962
FY 2019	3,000	3,000	3,000
Total, Design	7,000	7,000	7,000
Construction			
FY 2019	2,000	2,000	0
FY 2020	20,000	20,000	17,000
FY 2021	28,096	28,096	23,000
FY 2022	27,904	27,904	20,000
FY 2023	0	0	18,000
Total, Construction	78,000	78,000	78,000
TEC			
FY 2017	2,500	2,500	38
FY 2018	1,500	1,500	3,962
FY 2019	5,000	5,000	3,000
FY 2020	20,000	20,000	17,000
FY 2021	28,096	28,096	23,000
FY 2022	27,904	27,904	20,000
FY 2023	0	0	18,000
Total, TEC^b	85,000	85,000	85,000
Other Project Cost (OPC)^c			
OPC except D&D			
FY 2015	120	120	120
FY 2016	510	510	510
FY 2017	300	300	300
FY 2022	70	70	70
Total, OPC except D&D	1,000	1,000	1,000

^a Costs through 2017 reflect actual Costs; costs for FY 2018 and the outyears are estimates.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$73,000,000 to \$98,000,000. The approved TPC range for this project is \$74,000,000 to \$99,000,000.

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

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Project Cost (TPC)			
FY 2015	120	120	120
FY 2016	510	510	510
FY 2017	2,800	2,800	338
FY 2018	1,500	1,500	3,962
FY 2019	5,000	5,000	3,000
FY 2020	20,000	20,000	17,000
FY 2021	28,096	28,096	23,000
FY 2022	27,974	27,974	20,070
FY 2023	0	0	18,000
Total, TPC^b	86,000	86,000	86,000

6. Details of Project Cost Estimate

	(dollars in thousands)		
	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	6,000	8,000	N/A
Contingency	1,000	2,000	N/A
Total, Design	7,000	10,000	N/A
Construction			
Construction	63,000	61,000	N/A
Contingency	15,000	14,000	N/A
Total, Construction	78,000	75,000	N/A
Total, TEC^b	85,000	85,000	N/A
Contingency, TEC	16,000	16,000	N/A
Other Project Cost (OPC)^c			
OPC except D&D			
Conceptual Planning	250	250	N/A
Conceptual Design	530	530	N/A
Start-up	150	150	N/A
Contingency	70	70	N/A
Total, OPC	1,000	1,000	N/A
Total, TPC^b	86,000	86,000	N/A
Total, Contingency	16,070	16,070	N/A

^a Costs through 2017 reflect actual Costs; costs for FY 2018 and the outyears are estimates.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$73,000,000 to \$98,000,000. The approved TPC range for this project is \$74,000,000 to \$99,000,000.

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

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year	Prior Years	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total	
FY 2017	TEC	0	2,500	TBD	TBD	TBD	TBD	TBD	85,000 ^a	
	OPC ^b	500	0	TBD	TBD	TBD	TBD	TBD	2,000	
	TPC	0	2,500	TBD	TBD	TBD	TBD	TBD	87,000 ^a	
FY 2018	TEC	0	2,500	1,500	TBD	TBD	TBD	TBD	85,000 ^a	
	OPC ^b	500	0	500	0	0	0	0	1,000	
	TPC	500	2,500	2,000	TBD	TBD	TBD	TBD	86,000 ^a	
FY 2019	TEC	0	2,500	1,500	5,000	20,000	28,096	27,904	0	85,000 ^a
	OPC ^b	630	300	0	0	0	0	70	0	1,000
	TPC	630	2,800	1,500	5,000	20,000	28,096	27,974	0	86,000 ^a

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy Expected.....	4Q FY 2024
Expected Useful Life.....	50 years
Expected Future Start of D&D of this capital asset.....	4Q FY 2074

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life-Cycle Costs	
	Current Total Estimates	Previous Total Estimates	Current Total Estimates	Previous Total Estimates
Operations	508	N/A	25,428	N/A
Utilities	94	N/A	4,670	N/A
Maintenance and Repair	1,525	N/A	76,285	N/A
Total – Operations and Maintenance	2,127	N/A	106,383	N/A

^a This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$73,000,000 to \$98,000,000. The approved TPC range for this project is \$74,000,000 to \$99,000,000.

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

9. 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 <i>Fermi National Accelerator Laboratory</i>	67,000 to 134,000
Area of D&D in this project at <i>Fermi National Accelerator Laboratory</i>	None
Area at <i>Fermi National Accelerator Laboratory</i> to be transferred, sold, and/or D&D outside the project including area previously banked”	55,200
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 ^a
Total area eliminated.....	55,200

10. Preliminary Acquisition Approach

Acquisition for this project will be performed by the Management and Operating (M&O) contractor, Fermi Research Alliance, LLC and overseen by the Fermi Site Office. Various acquisition approaches and project delivery methods were evaluated prior to achieving CD-1. A Construction Manager/General Contractor (CM/GC) project delivery with best value procurement approach was selected as the overall best delivery method with the lowest risk to DOE. The M&O contractor is responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O contractor's annual performance evaluation and measurement plan.

^a 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.

**17-SC-73, Core Facility Revitalization
Brookhaven National Laboratory (BNL), Upton, NY
Project is for Design and Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2018 CPDS and does not include a new start for FY 2019.

Summary

The FY 2019 Request for the Core Facility Revitalization project is \$13,632,000. The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on April 18, 2017.

The Total Estimated Cost (TEC) range for this project is \$67,650,000 to \$83,650,000. The Total Project Cost (TPC) range for this project is \$68,500,000 to \$84,500,000.

A Federal Project Director with the appropriate certification level has been assigned to this project.

This project will provide the most urgent computation and data storage capabilities in time to support BNL’s expanding core mission computing requirements, such as the computationally-intensive research associated with the Relativistic Heavy Ion Collider (RHIC) and the US-A Toroidal Large Hadron Collider Apparatus (US-ATLAS) at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland.

FY 2019 funds will support Project Engineering and Design activities as well as construction and associated activities.

2. Critical Milestone History

(fiscal quarter to date)

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/10/2015	08/05/2016	3Q FY 2017	3Q FY 2019 ^a	3Q FY 2020	3Q FY 2020 ^a	N/A	4Q FY 2024 ^a
FY 2018	9/10/2015	08/05/2016	04/18/2017	3Q FY 2019 ^a	1Q FY 2020	1Q FY 2020 ^a	N/A	4Q FY 2024 ^a
FY 2019	9/10/2015	08/05/2016	04/18/2017	2Q FY 2019 ^a	4Q FY 2019	4Q FY 2019 ^a	N/A	4Q FY 2024 ^a

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2 – Approve Performance Baseline

Final Design Complete – Actual date the final design was completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D Work (see section 9)

CD-4 – Approve Project Completion

	Performance Baseline Validation
FY 2017	N/A
FY 2018	N/A
FY 2019	N/A

^a This project is pre-CD-2 and schedule estimates are preliminary.

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	6,400	57,000 ^b	63,400 ^b	1,100	N/A	1,100	64,500 ^b
FY 2018	7,000	67,000 ^b	74,000 ^b	850	N/A	850	74,850 ^b
FY 2019	7,000	67,000 ^b	74,000 ^b	850	N/A	850	74,850 ^b

4. Project Scope and Justification

Scope

The Core Facility Revitalization project will provide facilities and infrastructure to enable the computational requirements of the Office of Science’s (SC) Nuclear Physics (NP) program, High Energy Physics (HEP) program, and other research programs physically conducted at Brookhaven National Laboratory (BNL) and other locations.

This project has not yet received CD-2 approval; therefore the Key Performance Parameters (KPPs) are not yet established. The table below outlines preliminary KPPs.

Key Performance Parameters (Preliminary)

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Deliver identified Computing Facility IT power and emergency back-up power/cooling capabilities	3.6 MW IT power, 1.2 MW emergency back-up capabilities	3.6 MW IT power, 2.4 MW emergency back-up capabilities
Renovation of space to support the computing equipment and associated infrastructure	40,400 gross square feet	60,600 gross square feet

Justification

BNL is a multi-purpose research institution funded primarily by SC to operate facilities for studies in physics, chemistry, biology, medicine, applied science, and a wide range of advanced technologies. Among BNL’s core capabilities are: nuclear physics, particle physics, large-scale user facilities for advanced instrumentation, and programmatic strengths in data-centric and high-throughput “mid-scale” computational science.

A significant amount of computation and data storage is currently conducted within the RHIC ATLAS Computing Facility (RACF) located on the BNL campus. The RACF directly supports RHIC research operations funded by SC’s NP and US-ATLAS research operations funded by SC’s HEP. The RACF also provides mid-scale computing support to other research programs funded by SC, research efforts funded by strategic partners, and computationally-intensive research, which indirectly supports the broader SC mission. In addition, other SC program offices may conduct additional core mission computing activities enabled by infrastructure upgrades within this project.

The data volume generated by the RHIC experiments and ATLAS is expected to increase three to six times over the next ten years and will require proportional increases in computation and data storage capacities. Almost half of the current RACF computing and data storage facility is expected to become functionally obsolete and incapable of accommodating future generations of computation and data storage technologies over the next five to ten years. Therefore, the projected capability gaps in computing infrastructure are due to a combination of decreases due to degrading capacities and increases

^a Other project costs (OPC) are funded through laboratory overhead.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$67,650,000 to \$83,650,000. The approved TPC range for this project is \$68,500,000 to \$84,500,000.

in future requirements of mid-scale computing performed by RACF. Increases in computation and data storage will drive increased requirements for space, power, and cooling of computing facilities. Similarly, as research experiments utilizing the beamlines at BNL's National Synchrotron Light Source-II, and funded by SC's Basic Energy Science program office are fully developed, additional core mission computing will be required. A mission need therefore exists to provide sufficient, mid-range computation and data storage capabilities to support the current and planned experiments 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.

5. Financial Schedule

(dollars in thousands)			
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2017	1,800	1,800	28
FY 2018	1,500	1,500	2,500
FY 2019	3,700	3,700	4,472
Total, Design	7,000	7,000	7,000
Construction			
FY 2019	9,932	9,932	8,000
FY 2020	25,000	25,000	20,000
FY 2021	32,068	32,068	25,000
FY 2022	0	0	14,000
Total, Construction	67,000	67,000	67,000
TEC			
FY 2017	1,800	1,800	28
FY 2018	1,500	1,500	2,500
FY 2019	13,632	13,632	12,472
FY 2020	25,000	25,000	20,000
FY 2021	32,068	32,068	25,000
FY 2022	0	0	14,000
Total, TEC^b	74,000	74,000	74,000
Other Project Cost (OPC) ^c			
OPC except D&D			
FY 2016	659	659	659
FY 2017	80	80	80
FY 2023	111	111	111
Total, OPC	850	850	850

^a Costs through FY 2017 reflect actual costs; costs for FY 2018 and the outyears are estimates.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$67,650,000 to \$83,650,000. The approved TPC range for this project is \$68,500,000 to \$84,500,000.

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

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Project Cost (TPC)			
FY 2016	850	850	659
FY 2017	1,800	1,800	108
FY 2018	1,500	1,500	2,500
FY 2019	13,632	13,632	12,472
FY 2020	25,000	25,000	20,000
FY 2021	32,068	32,068	25,000
FY 2022	0	0	14,000
FY 2023	0	0	111
Total, TPC ^b	74,850	74,850	74,850

6. Details of Project Cost Estimate

	(dollars in thousands)		
	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	5,600	5,600	N/A
Contingency	1,400	1,400	N/A
Total, Design	7,000	7,000	N/A
Construction			
Construction	53,600	53,600	N/A
Contingency	13,400	13,400	N/A
Total, Construction	67,000	67,000	N/A
Total, TEC ^b	74,000	74,000	N/A
Contingency, TEC	14,800	14,800	N/A
Other Project Cost (OPC) ^c			
OPC except D&D			
Conceptual Planning	534	229	N/A
Conceptual Design	201	451	N/A
Start-up	72	0	N/A
Contingency	43	170	N/A
Total, OPC	850	850	N/A
Contingency, OPC	43	170	N/A
Total, TPC ^b	74,850	74,850	N/A
Total, Contingency	14,843	14,970	N/A

^a Costs through FY 2017 reflect actual costs; costs for FY 2018 and the outyears are estimates.

^b This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$67,650,000 to \$83,650,000. The approved TPC range for this project is \$68,500,000 to \$84,500,000.

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

7. Schedule of Appropriation Requests

Request		(dollars in thousands)							
Year		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	Total
FY 2017	TEC	0	1,800	TBD	TBD	TBD	TBD	TBD	74,000 ^a
	OPC ^b	850	0	TBD	TBD	TBD	TBD	TBD	850
	TPC	850	1,800	TBD	TBD	TBD	TBD	TBD	74,850 ^a
FY 2018	TEC	0	1,800	1,500	TBD	TBD	TBD	TBD	74,000 ^a
	OPC ^b	850	0	0	TBD	TBD	TBD	TBD	850
	TPC	850	1,800	1,500	TBD	TBD	TBD	TBD	74,850 ^a
FY 2019	TEC	0	1,800	1,500	13,632	25,000	32,068	0	74,000 ^a
	OPC ^b	850	0	0	0	0	0	0	850
	TPC	850	1,800	1,500	13,632	25,000	32,068	0	74,850 ^a

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2024
Expected Useful Life	25 years
Expected Future Start of D&D of this capital asset	N/A

(Related Funding requirements)
(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Current Total Estimate	Previous Total Estimate	Current Total Estimate	Previous Total Estimate
Operations	N/A	N/A	N/A	N/A
Utilities	2,000	N/A	44,284	N/A
Maintenance and Repair	723	N/A	16,011	N/A
Total, Operations & Maintenance	2,723	N/A	60,295	N/A

9. D&D Information

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

	Square Feet
New area being constructed by this project at Brookhaven <i>National Laboratory</i>	None
Area of D&D in this project at Brookhaven <i>National Laboratory</i>	None
Area at Brookhaven <i>National Laboratory</i> to be transferred, sold, and/or D&D outside the project including area previously “banked.....	None ^c
Area of D&D in this project at other sites.....	None
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously “banked.....	None
Total area eliminated.....	None

^a This project has not received CD-2 approval; funding estimates are consistent with the approved cost ranges. The approved TEC for this project is \$67,650,000 to \$83,650,000. The approved TPC range for this project is \$68,500,000 to \$84,500,000.

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

^c With the implementation of OMB’s Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

10. Acquisition Approach

Acquisition for this project will be performed by the BNL Management and Operating (M&O) Contractor, Brookhaven Science Associates, and overseen by the Brookhaven Site Office. Various acquisition and project delivery methods were evaluated prior to achieving CD-1. A Construction Manager/General Contractor (CM/GC) project delivery with best value procurement approach was selected as the overall best delivery method with the lowest risk to DOE. The M&O Contractor is responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O Contractor's annual performance and evaluation measurement plan.

**15-SC-76, Materials Design Laboratory
Argonne National Laboratory (ANL), Argonne, IL
Project is for Design and Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2018 CPDS and does not include a new start for FY 2019.

Summary

The most recent DOE Order 413.3B approved Critical Decision (CD) is CD-3, Approve Start of Construction, which was approved on August 12, 2016. The approved Total Estimated Cost (TEC) for this project is \$95,000,000. The approved Total Project Cost (TPC) for this project is \$96,000,000.

A Federal Project Director with the appropriate certification level has been assigned to this project and has approved this CPDS.

This project will provide new laboratory and office space to support basic energy-related materials science and engineering research. Final Design was completed in May 2016. Construction began in February 2017.

FY 2019 funds represent final funding for the project and will be used to complete construction.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	08/27/2010	N/A	4Q FY 2014	4QFY 2015	4Q FY 2016	3Q FY 2016	N/A	2Q FY 2020
FY 2016	08/27/2010	1Q FY 2015	2Q FY 2015	2Q FY 2016	3Q FY 2017	1Q FY 2017	N/A	3Q FY 2020
FY 2017	08/27/2010	11/12/2014	01/30/2015	2Q FY 2016	3Q FY 2017	1Q FY 2017	N/A	3Q FY 2020
FY 2018	08/27/2010	11/12/2014	01/30/2015	03/18/2016	05/09/2016	08/12/2016	N/A	3Q FY 2021
FY 2019	08/27/2010	11/12/2014	01/30/2015	03/18/2016	05/09/2016	08/12/2016	N/A	3Q FY 2021

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2 – Approve Performance Baseline

Final Design Complete – Actual date the final design was completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D Work (see section 9)

CD-4 – Approve Project Completion

Performance Baseline Validation

FY 2015	N/A
FY 2016	1Q FY 2017
FY 2017	3Q FY 2016
FY 2018	03/18/2016
FY 2019	03/18/2016

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	7,000	88,000	95,000	1,000	N/A	1,000	96,000
FY 2016	7,000	88,000	95,000	1,000	N/A	1,000	96,000
FY 2017	7,000	88,000	95,000	1,000	N/A	1,000	96,000
FY 2018	7,000	88,000	95,000	1,000	N/A	1,000	96,000
FY 2019	7,000	88,000	95,000	1,000	N/A	1,000	96,000

4. Project Scope and Justification

Scope

The scope of this project includes the design and construction of a Materials Design Laboratory building approximately 115,000 gross square feet in size and located adjacent to the recently completed Energy Sciences Building.

Justification

The mission need of this project is to provide flexible and sustainable laboratory and office space needed to support scientific theory/simulation, materials discovery, characterization, and application of new energy-related materials and processes. The Materials Design Laboratory project will provide the modern collaborative scientific environment critical for this initiative to thrive and will focus on four themes central to implementing the Materials for Energy strategy:

- Frontiers of materials and molecular synthesis, and fabrication of devices;
- Interfacial engineering for energy applications;
- Materials under extreme conditions; and
- *In situ* characterization and modeling.

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

The table below outlines the Key Performance Parameters.

Key Performance Parameters

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Multi-story laboratory building	97,000 gross square feet	130,000 gross square feet

5. Financial Schedule

(dollars in thousands)

	Appropriations	Obligations	Costs ^b
Total Estimated Cost (TEC)			
Design			
FY 2015	7,000	7,000	2,773
FY 2016	0	0	3,998
FY 2017	0	0	229
Total, Design	7,000	7,000	7,000

^a Other project costs (OPC) are funded through laboratory overhead.

^b Costs through FY 2017 reflect actual costs; costs for FY 2018 and the outyears are estimates.

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Construction			
FY 2016	23,910	23,910	0
FY 2017	19,590	19,590	17,551
FY 2018	24,500	24,500	27,000
FY 2019	20,000	20,000	32,000
FY 2020	0	0	11,449
Total, Construction	88,000	88,000	88,000
TEC			
FY 2015	7,000	7,000	2,773
FY 2016	23,910	23,910	3,998
FY 2017	19,590	19,590	17,780
FY 2018	24,500	24,500	27,000
FY 2019	20,000	20,000	32,000
FY 2020	0	0	11,449
Total, TEC	95,000	95,000	95,000
Other Project Cost (OPC)^b			
OPC except D&D			
FY 2010	382	382	382
FY 2011	0 ^c	0 ^c	0 ^c
FY 2014	328	328	328
FY 2015	290	290	290
Total, OPC except D&D	1,000	1,000	1,000
Total Project Cost (TPC)			
FY 2010	382	382	382
FY 2011	0 ^c	0 ^c	0 ^c
FY 2014	328	328	328
FY 2015	7,290	7,290	3,063
FY 2016	23,910	23,910	3,998
FY 2017	19,590	19,590	17,780
FY 2018	24,500	24,500	27,000
FY 2019	20,000	20,000	32,000
FY 2020	0	0	11,449
Total, TPC	96,000	96,000	96,000

^a Costs through FY 2017 reflect actual costs; costs for FY 2018 and the outyears are estimates.

^b OPC are funded through laboratory overhead.

^c OPC Funding was adjusted to reflect FY 2010 actuals (\$382,000 for OPC funding in FY 2010).

6. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	7,000	6,000	6,647
Contingency	0	1,000	353
Total, Design	7,000	7,000	7,000
Construction			
Construction	76,004	73,000	76,362
Contingency	11,996	15,000	11,638
Total, Construction	88,000	88,000	88,000
Total, TEC	95,000	95,000	95,000
Contingency, TEC	11,996	16,000	11,991
Other Project Cost (OPC) ^a			
OPC except D&D			
Conceptual Planning	382	382	382
Conceptual Design	618	500	618
Contingency	0	118	0
Total, OPC	1,000	1,000	1,000
Contingency, OPC	0	118	0
Total, TPC	96,000	96,000	96,000
Total, Contingency	11,996	16,118	11,991

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year		Prior Years	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	Total
FY 2015	TEC	0	0	7,000	24,003	36,466	27,531	0	95,000
	OPC ^a	382	500	0	0	0	118	0	1,000
	TPC	382	500	7,000	24,003	36,466	27,649	0	96,000
FY 2016	TEC	0	0	7,000	23,910	25,090	39,000	0	95,000
	OPC ^a	382	300	0	0	0	318	0	1,000
	TPC	382	300	7,000	23,910	25,090	39,318	0	96,000
FY 2017	TEC	0	0	7,000	23,910	25,090	39,000	0	95,000
	OPC ^a	382	300	0	0	0	318	0	1,000
	TPC	382	300	7,000	23,910	25,090	39,318	0	96,000
FY 2018	TEC	0	0	7,000	23,910	19,590	24,500	20,000	95,000
	OPC ^a	382	328	290	0	0	0	0	1,000
	TPC	382	328	7,290	23,910	19,590	24,500	20,000	96,000

^a OPC are funded through laboratory overhead.

(dollars in thousands)

Request Year		Prior Years	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	Total
FY 2019	TEC	0	0	7,000	23,910	19,590	24,500	20,000	95,000
	OPC ^a	382	328	290	0	0	0	0	1,000
	TPC	382	328	7,290	23,910	19,590	24,500	20,000	96,000

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy Expected.....	2Q FY 2021
Useful Life.....	50 years
Expected Future Start of D&D of this capital asset.....	2Q FY 2071

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life-Cycle Costs	
	Current Total Estimates	Previous Total Estimates	Current Total Estimates	Previous Total Estimates
Operations	376	376	18,800	18,800
Utilities	429	429	21,450	21,450
Maintenance and Repair	958	958	47,900	47,900
Total – Operations and Maintenance	1,763	1,763	88,150	88,150

9. 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 <i>Argonne National Laboratory</i>	115,000
Area of D&D in this project at <i>Argonne National Laboratory</i>	None
Area at <i>Argonne National Laboratory</i> 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 ^b
Total area eliminated.....	None

^a OPC are funded through laboratory overhead.

^b With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.

10. Acquisition Approach

Acquisition for this project will be performed by the Management and Operating (M&O) Contractor, UChicago Argonne, LLC, and will be overseen by the Argonne Site Office. Various acquisition approaches and project delivery methods were evaluated prior to achieving CD-1. A tailored Design-Bid-Build approach was selected as the overall best project delivery method with the lowest risk to DOE. The M&O Contractor is responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O Contractor's annual performance evaluation and measurement plan.

**15-SC-78, Integrative Genomics Building
Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA
Project is for Design and Construction**

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2018 CPDS and does not include a new start for FY 2019.

Summary

The most recent DOE Order 413.3B Critical Decision (CD) is CD-3, Approve Start of Construction, was approved on October 7, 2016. The approved Total Estimated Cost (TEC) for this project is \$90,000,000. The approved Total Project Cost (TPC) for this project is \$91,500,000.

A Federal Project Director with the appropriate certification level has been assigned to this project and has approved this CPDS.

This project will provide new space necessary to relocate a significant fraction of biosciences research currently occupying leased commercial space onto the main Lawrence Berkeley National Laboratory (LBNL) campus. Final Design was completed in May 2016. Construction started in December 2016.

FY 2019 funds represent final funding for the project and will be used to complete construction.

2. Critical Milestone History

(fiscal quarter to date)

	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	9/17/2013	N/A	1Q FY 2015	3Q FY 2016	4Q FY 2016	3Q FY 2016	N/A	1Q FY 2021
FY 2016	9/17/2013	1Q FY 2015	2Q FY 2015	2Q FY 2016	3Q FY 2016	4Q FY 2016	N/A	1Q FY 2021
FY 2017	9/17/2013	10/28/2014	02/20/2015	2Q FY 2016	3Q FY 2016	1Q FY 2017	N/A	1Q FY 2021
FY 2018	9/17/2013	10/28/2014	02/20/2015	3/18/2016	5/2/2016	10/7/2016	N/A	1Q FY 2021
FY 2019	9/17/2013	10/28/2014	02/20/2015	3/18/2016	5/2/2016	10/7/2016	N/A	1Q FY 2021

CD-0 – Approve Mission Need

Conceptual Design Complete – Actual date the conceptual design was completed

CD-1 – Approve Alternative Selection and Cost Range

CD-2 – Approve Performance Baseline

Final Design Complete – Estimated date the project design will be completed

CD-3 – Approve Start of Construction

D&D Complete – Completion of D&D work (see Section 9)

CD-4 – Approve Project Completion

Performance Baseline Validation

FY 2015	N/A
FY 2016	N/A
FY 2017	2Q FY 2016
FY 2018PB	3/18/2016
FY 2019	3/18/2016

3. Project Cost History

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC ^a Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	12,090	77,910	90,000	1,500	0	1,500	91,500
FY 2016	9,590	80,410	90,000	1,500	0	1,500	91,500
FY 2017	6,500	83,500	90,000	1,500	0	1,500	91,500
FY 2018	6,900	83,100	90,000	1,500	0	1,500	91,500
FY 2019	6,900	83,100	90,000	1,500	0	1,500	91,500

4. Project Scope and Justification

Scope

The scope of this project includes the design and construction of a new state-of-the-art facility for bioscience research approximately 80,800 gross square feet in size and located on the main LBNL campus in Berkeley, California. The facility will be physically located on the former site of the demolished Bevatron particle accelerator.

The table below outlines the Key Performance Parameters.

Key Performance Parameters

Description	Threshold Value (Minimum)	Objective Value (Maximum)
Biosciences and other research space	79,000 gross square feet	95,000 gross square feet

Justification

The mission need of this project is to increase the synergy and efficiency of biosciences and other 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 Department of Energy (DOE) mission. Portions of the biosciences program at LBNL are located off-site, away from the main laboratory, and dispersed across several locations approximately twenty miles apart. This arrangement has produced research and operational capability gaps that limit scientific progress, in genomics-based biology related to energy and the environment. This project will close the present capability gaps by providing a state-of-the-art facility that will collocate biosciences research and other programs.

FY 2019 funds will be used for construction and project management and support activities.

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

^a Other project costs (OPC) are funded through laboratory overhead.

5. Financial Schedule

	(dollars in thousands)		
	Appropriations	Obligations	Costs ^a
Total Estimated Cost (TEC)			
Design			
FY 2015	6,900	6,900	2,086
FY 2016	0	0	4,541
FY 2017	0	0	273
Total, Design	6,900	6,900	6,900
Construction			
FY 2015	5,190	5,190	0
FY 2016	20,000	20,000	0
FY 2017	19,561	19,561	18,077
FY 2018	24,800	24,800	50,000
FY 2019	13,549	13,549	15,023
Total, Construction	83,100	83,100	83,100
TEC			
FY 2015	12,090	12,090	2,086
FY 2016	20,000	20,000	4,541
FY 2017	19,561	19,561	18,350
FY 2018	24,800	24,800	50,000
FY 2019	13,549	13,549	15,023
Total, TEC	90,000	90,000	90,000
Other Project Cost (OPC)^b			
OPC except D&D			
FY 2014	1,145	1,145	1,145
FY 2015	355	355	355
Total, OPC	1,500	1,500	1,500
Total Project Cost (TPC)			
FY 2014	1,145	1,145	1,145
FY 2015	12,445	12,445	2,441
FY 2016	20,000	20,000	4,541
FY 2017	19,561	19,561	18,350
FY 2018	24,800	24,800	50,000
FY 2019	13,549	13,549	15,023
Total, TPC	91,500	91,500	91,500

^a Costs through FY 2017 reflect actual costs; costs for FY 2018 and the outyears are estimates.

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

6. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	6,900	5,964	6,216
Contingency	0	536	684
Total, Design	6,900	6,500	6,900
Construction			
Construction	73,950	71,265	71,495
Contingency	9,150	12,235	11,605
Total, Construction	83,100	83,500	83,100
Total, TEC	90,000	90,000	90,000
Contingency, TEC	9,150	12,771	12,289
Other Project Cost (OPC)^a			
OPC except D&D			
Conceptual Planning			
Conceptual Planning	400	355	355
Conceptual Design			
Conceptual Design	1,000	1,145	1,145
Contingency	100	0	0
Total, OPC	1,500	1,500	1,500
Contingency, OPC	100	0	0
Total, TPC	91,500	91,500	91,500
Total, Contingency	9,250	12,771	12,289

7. Schedule of Appropriation Requests

(dollars in thousands)

Request Year		FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	Total
FY 2015	TEC	0	12,090	17,299	30,148	30,463	0	90,000
	OPC ^a	1,300	0	0	0	0	200	1,500
	TPC	1,300	12,090	17,299	30,148	30,463	200	91,500
FY 2016	TEC	0	12,090	20,000	25,064	32,846	0	90,000
	OPC ^a	1,500	0	0	0	0	0	1,500
	TPC	1,500	12,090	20,000	25,064	32,846	0	91,500
FY 2017	TEC	0	12,090	20,000	19,561	38,349	0	90,000
	OPC ^a	1,145	355	0	0	0	0	1,500
	TPC	1,145	12,445	20,000	19,561	38,349	0	91,500
FY 2018	TEC	0	12,090	20,000	19,561	24,800	13,549	90,000
	OPC ^a	1,500	0	0	0	0	0	1,500
	TPC	1,500	12,090	20,000	19,561	24,800	13,549	91,500

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

Request		(dollars in thousands)						
Year		FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	Total
FY 2019	TEC	0	12,090	20,000	19,561	24,800	13,549	90,000
	OPC ^a	1,500	0	0	0	0	0	1,500
	TPC	1,500	12,090	20,000	19,561	24,800	13,549	91,500

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1QFY 2021
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1QFY 2071

(Related Funding requirements)

(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Current Total Estimate	Previous Total Estimate	Current Total Estimate	Previous Total Estimate
Operations	179	179	5,735	5,735
Utilities	324	324	11,919	11,919
Maintenance and Repair	644	644	20,662	20,662
Total, Operations & Maintenance	1,147	1,147	38,316	38,316

9. D&D Information

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

	Square Feet
New area being constructed by this project at <i>Lawrence Berkeley National Laboratory</i>	80,880
Area of D&D in this project at <i>Lawrence Berkeley National Laboratory</i>	None
Area at <i>Lawrence Berkeley National Laboratory</i> to be transferred, sold, and/or D&D outside the project including area previously "banked"	None ^b
Area of D&D in this project at other sites.....	None
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	None
Total area eliminated.....	None

10. Acquisition Approach

Acquisition for this project will be performed by the Management and Operating (M&O) Contractor, University of California, and overseen by the Berkeley Site Office. Various acquisition approaches and project delivery methods were evaluated prior to achieving CD-1. A tailored Design-Bid-Build approach with a Construction Manager as General Contractor was selected as the overall best project delivery method with the lowest risk to DOE. The M&O contractor is responsible for awarding and administering all subcontracts related to this project. Project performance metrics are included in the M&O contractor's annual performance evaluation and measurement plan.

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

^b With the implementation of OMB's Reduce the Footprint initiative, DOE no longer maintains the space bank. Footprint is managed using the Facility Information Management System, with decisions on additions and offsets made in accordance with the DOE Real Property Efficiency Plan.