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 a rigorous and consistent analysis 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 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 that laboratory. SC leadership uses these Campus Strategies to establish the corporate facilities and infrastructure priorities and as the basis for SLI Budget Requests.

Thorough analysis of SC's physical assets reveals a continued need to focus on our deferred maintenance backlog as well the number of inadequate facilities and core infrastructure across SC laboratory campuses. In FY 2016, SC invested over $475 million dollars in needed maintenance, repair, and upgrades of general purpose infrastructure. These investments 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 2018 Budget Request

Ongoing projects that will provide new laboratory buildings, renovated facilities, and upgraded utilities are proceeding towards on-time completion within budget. While significant improvements to SC infrastructure have been made, it is important to maintain a strong level of investment and continue making improvements across the SC national laboratory complex.

The FY 2018 Request includes funding for the Materials Design Laboratory project at Argonne National Laboratory (ANL) and the Integrative Genomics Building project at Lawrence Berkeley National Laboratory (LBNL), both currently in construction. In addition, funding is requested for the Core Facility Revitalization project at Brookhaven National Laboratory (BNL) which will provide the scientific computing infrastructure, power, cooling, and space to support the vast streams of data from the Large Hadron Collider as well as on-site user facilities. The Request also includes funding for the Integrated Engineering Research Center at Fermi National Accelerator Laboratory (FNAL), which will bring together researchers by collocating engineers, scientists and technical staff from old, inadequate, locations across the site to the Central Campus. Lastly, funding is requested for the Energy Sciences Capability project at Pacific Northwest National Laboratory (PNNL), which will provide a science nexus in the central campus with collaborative laboratories, offices, meeting rooms, interaction areas, state-of-the-art data visualization and support facilities.

Science Laboratories Infrastructure
Funding ($K)

	FY 2016 Enacted	FY 2017 Annualized CR[a]	FY 2018 Request	FY 2018 vs FY 2016
Infrastructure Support	**44,690**	**44,605**	**22,900**	**-21,790**
Construction				
Energy Sciences Capability at PNNL (18-SC-71)	---	---	1,000	+1,000
Integrated Engineering Research Center at FNAL (17-SC-71)	---	---	1,500	+1,500
Core Facility Revitalization at BNL (17-SC-73)	---	---	1,500	+1,500
Materials Design Laboratory at ANL (15-SC-76)	23,910	23,865	24,500	+590
Photon Science Laboratory Building at SLAC (15-SC-77)	25,000	24,952	0	-25,000
Integrative Genomics Building at LBNL (15-SC-78)	20,000	19,962	24,800	+4,800
Total, Construction	**68,910**	**68,779**	**53,300**	**-15,610**
Total, Science Laboratories Infrastructure	**113,600**	**113,384**	**76,200**	**-37,400**

[a] The FY 2017 Annualized CR amounts reflect the P.L 114-254 continuing resolution level annualized to a full year. These amounts are shown only at the congressional control level and above, below that, a dash (-) is shown. The FY 2017 Annualized Level for SLI is higher than required for the approved project plans for three ongoing projects: the Materials Design Laboratory at ANL, the Photon Science Laboratory Building at SLAC, and the Integrative Genomics Building at LBNL. SC intends to provide only the approved funding profile for each project.

Science Laboratories Infrastructure
Explanation of Major Changes ($K)

	FY 2018 vs FY 2016
Science Laboratories Infrastructure	
Infrastructure Support: Funding continues to support PILT, general facility, and infrastructure support at NBL, as well as landlord responsibilities at the Oak Ridge Reservation. Funding also continues to support nuclear facilities at Oak Ridge National Laboratory (ORNL). Funding to address needs in core general purpose infrastructure at laboratories other than NBL is reduced in FY 2018.	-21,790
Construction: Funding supports line-item projects at Argonne National Laboratory, Lawrence Berkeley National Laboratory, Fermi National Accelerator Laboratory, Brookhaven National Laboratory, and Pacific Northwest National Laboratory in FY 2018. One project received final year funding in FY 2017.	-15,610
Total, Science Laboratories Infrastructure	**-37,400**

Program Accomplishments
Since FY 2006, the SLI program has invested over $770 million in infrastructure and has successfully completed eleven 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 *Science and User Support Building project at SLAC National Accelerator Laboratory (SLAC)*. This project, completed in April of 2015, provides SLAC with 62,000 gsf of new office spaces, conference rooms, a cafeteria, and auditorium. During construction, this project provided nearly 100 construction jobs to the greater San Francisco Bay area. This building serves as the main entrance to SLAC bringing together administrative services, visitors and users from across programmatic boundaries in alignment with the Laboratory's multi-program mission.

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. This reduces risk and achieves a compliant safety posture. 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.

Utility Infrastructure Upgrades and Modernization at Fermi National Accelerator Laboratory (FNAL) and Thomas Jefferson National Accelerator Facility (TJNAF). The SLI program is upgrading and replacing inadequate core infrastructure critical to mission accomplishment at FNAL and TJNAF. This includes the replacement of 40+ year old industrial cooling water and high voltage electrical systems that reached the end of useful life. In addition, inadequate electrical distribution feeders and cooling tower cells were replaced and communication pathways were upgraded and expanded. These projects are over 90% complete, progressing ahead of schedule and on budget. At peak construction, these projects provided over 100 jobs.

Core General Plant Project upgrades across SC Laboratories. The SLI program funded a suite of investments in core infrastructure whose efficiency and reliability is 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 and upgraded approximately 1.5 miles of high voltage electrical cable and associated substation equipment at ANL. At FNAL, SLI funded renovations to Wilson Hall that will provide for increased collaboration space on 2 of the 15 floors in the lab's largest building and correct deficiencies on the building exterior.

Science Laboratories Infrastructure
Infrastructure Support

Description
This subprogram funds infrastructure support investments that focus on laboratory core infrastructure and operations. Investments in core infrastructure (e.g., utility systems, site-wide services, and general-purpose facilities) are an ongoing need that ensures 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 2016 Enacted	**FY 2017 Annualized CR[a]**	**FY 2018 Request**	**FY 2018 vs FY 2016**
Infrastructure Support				
Facilities and Infrastructure	24,800	24,753	5,105	-19,695
Nuclear Operations	12,000	11,977	10,000	-2,000
Oak Ridge Landlord	6,177	6,165	6,082	-95
Payments in Lieu of Taxes	1,713	1,710	1,713	0
Total, Infrastructure Support	**44,690**	**44,605**	**22,900**	**-21,790**

Facilities and Infrastructure
This subprogram 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 research programs to review investment needs and select the highest priority activities to be included in the Budget Request.

This subprogram also supports general facilities and infrastructure support, as well as de-inventory, removal, and transfer of nuclear material in the NBL on the site of ANL.

Nuclear Operations
To support critical DOE nuclear operations, this funding is provided 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 ensure the facilities meet mission needs and safety standards.

Oak Ridge Landlord
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

[a] FY 2017 Annualized CR amounts reflect the P.L. 114-254 continuing resolution level annualized to a full year. These amounts are shown only at the congressional control level and above, below that level, a dash (-) is shown.

is owned by the United States 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 2016 Enacted	FY 2018 Request	Explanation of Changes FY 2018 vs FY 2016
Infrastructure Support $44,690,000	**$22,900,000**	**-$21,790,000**
Facilities and Infrastructure $24,800,000	**$5,105,000**	**-$19,695,000**
FY 2016 funding provided general facility and infrastructure support at NBL, DOE Office of Scientific and Technical Information (OSTI) and the Oak Ridge Institute for Science and Education (ORISE) as well as critical core infrastructure investments for upgrades to facilities and utility systems at SLAC, ANL, and FNAL.	The FY 2018 Request continues to support de-inventory and removal of nuclear material at the NBL Building at ANL.	Funding decreases as a result of completed funding for core infrastructure investments. No funding for OSTI and ORISE. No new investments are funded this year at any SC site.
Nuclear Operations $12,000,000	**$10,000,000**	**-$2,000,000**
FY 2016 funding supported the management of ORNL's nuclear facilities to current expectations, in accordance with federal regulations and DOE Directives.	The FY 2018 Request continues to support critical nuclear operations and provides funding to manage ORNL's nuclear facilities.	Funding to support ORNL's nuclear facilities decreases.
Oak Ridge Landlord $6,177,000	**$6,082,000**	**-$95,000**
FY 2016 funding supported stewardship needs across the Oak Ridge Reservation as well as PILT to Oak Ridge communities.	The FY 2018 Request provides 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 decreases slightly as a result of efficiencies.
Payments in Lieu of Taxes $1,713,000	**$1,713,000**	**$0**
FY 2016 funding supported PILT payments to communities around ANL and BNL.	The FY 2018 Request provides funding for PILT payments to communities around ANL and BNL.	Funding to support PILT payments remains the same as prior years.

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 2018 Budget Request includes funding for line-item projects at ANL, Lawrence Berkeley National Laboratory (LBNL), FNAL, BNL, and PNNL.

Energy Sciences Capability at PNNL (18-SC-71)
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; and limited collaboration space for "point of research work" for collaborators 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 O 413.3B Critical Decision (CD) is CD-0, *Approve Mission Need,* approved on December 12, 2016. This project has a total project cost range of $73,000,000 to $99,000,000. This cost range encompasses the most feasible preliminary alternatives. The preliminary total project cost is estimated to be $93,000,000. The cost, scope, and schedule for executing the project will be determined at CD-2.

FY 2018 funds support Project Engineering and Design activities.

Preliminary Schedule

CD-0	CD-1	CD-2	CD-3	CD-4
12/12/2016	4Q FY 2018	4Q FY 2019	4Q FY 2020	4Q FY 2025

Preliminary Cost Estimates
(Dollars in Thousands)

	FY 2018 Appropriations	Total Appropriations
Design	$1,000	$9,000
Construction	0	$81,000
Other Project Costs	0	$3,000
Preliminary Total Project Cost	$1,000	$93,000

Integrated Engineering Research Center FNAL (17-SC-71)
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 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, 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 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 most recent DOE O 413.3B approved Critical Decision (CD) is CD-1, *Approve Alternative Selection and Cost Range*, which was approved on April 18, 2017. The estimated preliminary total project cost range for this project is $74,000,000 to $99,000,000. This range encompasses the most feasible preliminary alternatives. The preliminary total project cost is estimated to be $86,000,000. The cost, scope, and schedule for executing the project will be determined at Critical Decision (CD)-2.

FY 2018 funding will support Project Engineering and Design activities.

Preliminary Schedule

CD-0	CD-1	CD-2	CD-3	CD-4
07/17/2015	04/18/2017	3Q FY 2019	3Q FY 2020	2Q FY 2024

Preliminary Cost Estimates
(Dollars in Thousands)

	FY 2018 Appropriations	Total Appropriations
Design	$1,500	$10,000
Construction	0	$75,000
Other Project Costs	0	$1,000
Preliminary Total Project Cost	$1,500	$86,000

Core Facility Revitalization at BNL (17-SC-73)

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 High Energy Physics (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 O 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. This cost range encompasses the most feasible preliminary alternatives. The preliminary total project cost is estimated to be $74,850,000. The cost, scope, and schedule for executing the project will be determined at CD-2.

FY 2018 funds support Project Engineering and Design activities.

Preliminary Schedule

CD-0	CD-1	CD-2	CD-3	CD-4
09/10/2015	04/18/2017	3Q FY 2018	1Q FY 2019	4Q FY 2023

Preliminary Cost Estimates
(Dollars in Thousands)

	FY 2018 Appropriations	Total Appropriations
Design	$1,500	$7,000
Construction	0	$67,000
Other Project Costs	0	$850
Preliminary Total Project Cost	$1,500	$74,850

Materials Design Laboratory at ANL (15-SC-76)
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 gross square feet (gsf) in size and located adjacent to the recently completed Energy Sciences Building. The existing research buildings at Argonne 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.

The most recent DOE O 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.

The FY 2018 Request for the Materials Design Laboratory Project is $24,500,000, which is $590,000 more than the FY 2016 Enacted level and consistent with the baseline funding profile. FY 2018 funds will be used for construction and project management and support activities.

FY 2017 Milestones	FY 2018 Milestones	FY 2019–2022 Key Milestones
Construction Continues	Construction Continues	CD-4 – Approve Project Completion

Integrative Genomics Building at LBNL (15-SC-78)
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.

The most recent DOE O 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.

FY 2018 Request for the Integrative Genomics Building is $24,800,000, which is $4,800,000 more than the FY 2016 Enacted level. FY 2018 funds will be used for construction, project management, and support activities.

FY 2017 Milestones	FY 2018 Milestones	FY 2019–2022 Key Milestones
CD-3 – Approve Start of Construction	Construction Continues	CD-4 – Approve Project Completion

Science Laboratories Infrastructure

Activities and Explanation of Changes

FY 2016 Enacted	FY 2018 Request	Explanation of Changes FY 2018 vs FY 2016
Construction $68,910,000	**$53,300,000**	**-$15,610,000**
Energy Sciences Capability at PNNL (18-SC-71) $0	**$1,000,000**	**+$1,000,000**
	Funding in FY 2018 Request supports Project Engineering and Design activities.	Funding will support PED activities.
Integrated Engineering Research Center at FNAL (17-SC-71) $0	**$1,500,000**	**+$1,500,000**
	Funding in FY 2018 Request supports Project Engineering and Design activities.	Funding will support PED activities.
Core Facility Revitalization at BNL (17-SC-73) $0	**$1,500,000** Funding in FY 2018 Request supports Project Engineering and Design activities.	**+$1,500,000** Funding will support PED activities.
Materials Design Laboratory at ANL (15-SC-76) $23,910,000	**$24,500,000**	**+$590,000**
FY 2016 funding initiated construction of the project.	Funding in FY 2018 Request supports on-going construction of the project.	Additional funding needed to support on-going construction.
Photon Sciences Laboratory Building at SLAC (15-SC-77) $25,000,000	**$0**	**-$25,000,000**
FY 2016 funding supported ongoing construction of the project.	No new funding is requested. Project funding was completed in FY 2017.	Project funding completed in FY 2017
Integrative Genomics Building at LBNL (15-SC-78) $20,000,000	**$24,800,000**	**+$4,800,000**
FY 2016 funding supported construction of the project.	Funding in FY 2018 Request supports completion of construction of the project.	Additional funding needed to support on-going construction.

Science Laboratories Infrastructure
Capital Summary ($K)

	Total	Prior Years	FY 2016 Enacted	FY 2017 Annualized CR[a]	FY 2018 Request	FY 2018 vs FY 2016
Capital Operating Expense Summary						
General Plants Projects						
ALS HVAC System Upgrade at LBNL (TEC $9.0M)	9,000	0	0	–	0	0
Electrical Distribution Upgrades at SLAC (TEC $10.0M)	10,000	0	0	–	0	0
Linac K-sub Remediation at SLAC (TEC $9.8M)	9,800	0	9,800	–	0	-9,800
Wilson Hall Renovations at FNAL (TEC $9.0M)	9,000	0	9,000	–	0	-9,000
Other GPP (TEC <$5M)	n/a	n/a	4,500	–	0	-4,500
Total, Capital Operating Expenses	**n/a**	**n/a**	**23,300**	**–**	**0**	**-23,300**

Construction Projects Summary ($K)

	Total Project Cost (TPC)	Prior Years	FY 2016 Enacted	FY 2017 Enacted	FY 2018 Request	FY 2018 vs FY 2016
Energy Sciences Capability at PNNL (18-SC-71)						
TEC	90,000[b]	0	0	0	1,000	+1,000
OPC[c]	3,000	0	0	0	1,000	+1,000
TPC	93,000[b]	0	0	0	2,000	+2,000
Integrated Engineering Research Center at FNAL (17-SC-71)						
TEC	85,000[b]	0	0	2,500	1,500	+1,500
OPC[c]	2,000	500	500	0	0	-500
TPC	87,000[b]	500	500	2,500	1,500	+1,000
Core Facility Revitalization at BNL (17-SC-73)						
TEC	74,000[b]	0	0	1,800	1,500	+1,500
OPC[c]	850	0	850	0	0	-850
TPC	74,850[b]	0	850	1,800	1,500	+650

[a] FY 2017 Annualized CR amounts reflect the P.L. 114-254 continuing resolution level annualized to a full year. 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 shown are funded through laboratory overhead.

	Total Project Cost (TPC)	Prior Years	FY 2016 Enacted	FY 2017 Enacted	FY 2018 Request	FY 2018 vs FY 2016
Materials Design Laboratory at ANL (15-SC-76)						
TEC	95,000	7,000	23,910	19,590	24,500	+590
OPC[c]	1,000	1,000	0	0	0	0
TPC	96,000	8,000	23,910	19,590	24,500	+590

	Total Project Cost(TPC)	Prior Years	FY 2016 Enacted	FY 2017 Enacted	FY 2018 Request	FY 2018 vs FY 2016
Photon Sciences Laboratory Building at SLAC (15-SC-77)						
TEC	55,000	10,000	25,000	20,000	0	-25,000
OPC[a]	2,000	472	0	459	0	0
TPC	57,000	10,472	25,000	20,459	0	-25,000
Integrative Genomics Building at LBNL (15-SC-78)						
TEC	90,000	12,090	20,000	19,561	24,800	+4,800
OPC[b]	1,500	1,500	0	0	0	0
TPC	91,500	13,590	20,000	19,561	24,000	+4,800
Total, Construction						
TEC	n/a	n/a	68,910	63,451	53,300	-15,610
OPC[b]	n/a	n/a	1,350	459	1,000	-350
TPC	n/a	n/a	70,260	63,910	54,300	-15,960

[a] Other Project Costs shown are funded through laboratory overhead.

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

1. Significant Changes and Summary

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2017 CPDS and does not include a new start for FY 2018.

Summary

The most recent DOE O 413.3B approved Critical Decision (CD) is CD-3, Approve Start of Construction, which was approved on August 12, 2016. The Total Estimated Cost (TEC) is $95,000,000. The 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 and the construction general contractor was issued a notice to proceed in December 2016.

FY 2018 funds will be used for construction and associated 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 2015	08/27/2010	N/A	4QFY 2014	4QFY 2015	4QFY 2016	3QFY 2016	N/A	2QFY 2020
FY 2016	08/27/2010	1QFY 2015	2QFY 2015	2QFY 2016	3QFY 2017	1QFY 2017	N/A	3QFY 2020
FY 2017	08/27/2010	11/12/2014	01/30/2015	2QFY 2016	3QFY 2017	1QFY 2017	N/A	3QFY 2020
FY 2018PB	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
PB – Indicates the Performance Baseline

	Performance Baseline Validation
FY 2015	N/A
FY 2016	1QFY 2017
FY 2017	3QFY 2016
FY 2018	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

4. Project Scope and Justification

Scope

The scope of this project includes the design and construction of a Materials Design Laboratory building at least 97,000 gross square feet in size and located adjacent to the recently completed Energy Sciences Building.

The table below outlines the KPPs.

Key Performance Parameters

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

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 O 413.3B, and all appropriate project management requirements have been met.

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
Construction			

[a] OPC are funded through laboratory overhead.

[b] Costs through 2016 reflect actual Costs; costs for FY 2017 and the outyears are estimates.

	(dollars in thousands)		
	Appropriations	Obligations	Costs[b]
FY 2016	23,910	23,910	0
FY 2017	19,590	19,590	10,000
FY 2018	24,500	24,500	44,000
FY 2019	20,000	20,000	23,800
FY 2020	0	0	10,200
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	10,229
FY 2018	24,500	24,500	44,000
FY 2019	20,000	20,000	23,800
FY 2020	0	0	10,200
Total, TEC	95,000	95,000	95,000
Other Project Cost (OPC)[a]			
OPC except D&D			
FY 2010	412	412	412
FY 2011	-30[b]	-30[d]	-30[d]
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	412	412	412
FY 2011	-30[c]	-30[b]	-30[b]
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	10,229
FY 2018	24,500	24,500	44,000
FY 2019	20,000	20,000	23,800
FY 2020	0	0	10,200
Total, TPC	96,000	96,000	96,000

[a] OPC are funded through laboratory overhead.
[b] OPC Funding was adjusted in FY 2011 to reflect FY 2010 actuals ($382,000 for OPC funding in FY 2010).
[c] OPC Funding was adjusted in FY 2011 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	6,647	6,000	6,647
Contingency	353	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	12,349	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	12,349	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.

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy Expected……..	2QFY 2021
Useful Life……..	50 years
Expected Future Start of D&D of this capital asset……..	2QFY 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 *Argonne National Laboratory*…….	97,000 to 130,000
Area of D&D in this project at *Argonne National Laboratory*……..	None
Area at *Argonne National Laboratory* 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[a]
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 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.

[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.

15-SC-78, Integrative Genomics Building
Lawrence Berkeley National Laboratory (LBNL), Berkeley, California
Project is for Construction

1. Significant Changes and Summary

Significant Changes
This Construction Project Data Sheet (CPDS) is an update of the FY 2017 CPDS and does not include a new start for FY 2018.

The project funding profile has changed since the last submitted CPDS. Construction funding has extended by one year to FY 2019. Total project cost has not changed.

Summary
The most recent DOE O 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 LBNL campus. Final Design was completed in May 2016. Construction began in December 2016.

FY 2018 funds will be used for construction and associated tasks.

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	1QFY 2015	3QFY 2016	4QFY 2016	3Q FY 2016	N/A	1QFY 2021
FY 2016	9/17/2013	1QFY 2015	2QFY 2015	2QFY 2016	3QFY 2016	4Q FY 2016	N/A	1QFY 2021
FY 2017	9/17/2013	10/28/2014	02/20/2015	2QFY 2016	3QFY 2016	1Q FY 2017	N/A	1QFY 2021
FY 2018	9/17/2013	10/28/2014	02/20/2015	3/18/2016	5/2/2016	10/7/2016	N/A	1QFY 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	2QFY 2016
FY 2018PB	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

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 at least 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 KPPs.

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 Lawrence Berkeley National Laboratory (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 2018 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 O 413.3B, and all appropriate project management requirements have been met.

[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	18,000
FY 2018	24,800	24,800	41,000
FY 2019	13,549	13,549	24,100
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	18,273
FY 2018	24,800	24,800	41,000
FY 2019	13,549	13,549	24,100
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	18,273
FY 2018	24,800	24,800	41,000
FY 2019	13,549	13,549	24,100
Total, TPC	91,500	91,500	91,500

[a] Costs through FY 2016 reflect actual costs; costs for FY 2017and 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	400	355	355
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

Request Year		(dollars in thousands) 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.

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1QFY 2020
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1QFY 2070

(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 *Lawrence Berkeley National Laboratory*……..	79,000 to 95,000
Area of D&D in this project at *Lawrence Berkeley National Laboratory* ……	None
Area at *Lawrence Berkeley National Laboratory* 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, 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] 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-71 Integrated Engineering Research Center
Fermi National Accelerator Laboratory (FNAL), Batavia, Illinois
Preliminary Information for Design

1. Summary

This document contains preliminary information for a design and construction project requested in FY 2018 and is an update from the FY 2017 Project Data Sheet (PDS).

The FY 2018 Request for this project is $1,500,000. The most recent DOE O 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on April 18, 2017.

This project has a Total Estimated Cost (TEC) range of $73,000,000 to $98,000,000 and a Total Project Cost (TPC) range of $74,000,000 to $99,000,000. These cost ranges encompass the most feasible preliminary alternatives. This preliminary information reflects funding for a project to design and construct new space to accommodate increased collaboration and interactions among FNAL staff. The project is intended improve the infrastructure to support 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).

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

FY 2018 funds will support Project Engineering and Design activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	CD-1	CD-2/3A	CD-3	CD-4
FY 2017	07/17/2015	1Q FY 2017[a]	3Q FY 2018[a]	3Q FY 2019[a]	4Q FY 2023[a]
FY 2018	07/17/2015	4/18/2017	3Q FY 2019[a]	3Q FY 2020[a]	4Q FY 2024[a]

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline/Start of Construction – Site Prep
CD-3 – Approve Start of Construction - Building Construction
CD-4 – Approve Project Completion

3. Current Preliminary Project Cost Estimates

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC[b]	TPC
FY 2017	10,000	75,000	85,000[a]	2,000	87,000[a]
FY 2018	10,000	75,000	85,000[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. 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 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 O 413.3B, and all appropriate project management requirements have been met.

5. Details of Preliminary Project Cost Estimate

	(dollars in thousands)		
	Total Preliminary Cost Range: Minimum Estimate	Total Preliminary Cost: Current Point Estimate	Total Preliminary Cost Range: Maximum Estimate
Total Estimated Cost (TEC)			
Design			
Design	6,500	8,000	9,000
Contingency	1,500	2,000	2,000
Total, Design	8,000	10,000	11,000
Construction			
Construction	52,000	61,000	70,000
Contingency	13,000	14,000	17,000
Total, Construction	65,000	75,000	87,000
Total, TEC[a]	73,000	85,000	98,000
Contingency, TEC	14,500	16,000	19,000
Other Project Cost (OPC)[b]			
OPC except D&D			
Conceptual Planning	250	250	250
Conceptual Design	450	450	450
Start-up	150	150	150
Contingency	150	150	150
Total, OPC	1,000	1,000	1,000
Contingency, OPC	150	150	150
Total, TPC[a]	74,000	86,000	99,000
Total, Contingency	14,650	16,150	19,150

6. 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] This project is pre-CD-2; schedule and funding estimates are preliminary.
[b] Other project costs (OPC) are funded through laboratory overhead.

17-SC-73 Core Facility Revitalization
Brookhaven National Laboratory (BNL), Upton, New York
Preliminary Information for Design

1. Summary

This document contains preliminary information for a design and construction project requested in FY 2018 and is an update from the FY 2017 Project Data Sheet (PDS).

The FY 2018 Request for this project is $1,500,000. The most recent DOE O 413.3B Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, which was approved on April 18, 2017.

This project has a Total Estimated Cost (TEC) range of $67,650,000 to $83,650,000 and a Total Project Cost (TPC) range of $68,500,000 to $84,500,000. These cost ranges encompass the most feasible preliminary alternatives. This preliminary information reflects funding for a project to 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 CERN.

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

FY 2018 funds will support Project Engineering and Design activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	CD-1	CD-2	CD-3	CD-4
FY 2017	09/10/2015	3Q FY 2017[a]	3Q FY 2019[a]	3Q FY 2020[a]	4Q FY 2024[a]
FY 2018	09/10/2015	04/18/2017	3Q FY 2019[a]	1Q FY 2020[a]	4Q FY 2024[a]

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
CD-3– Approve Start of Construction
CD-4 – Approve Project Completion

3. Current Preliminary Project Cost Estimates

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC[b]	TPC
FY 2017	6,400	57,000	63,400[a]	1,100	64,500[a]
FY 2018	7,000	67,000	74,000[a]	850	74,850[a]

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.

[a] This project is pre-CD-2; schedule and funding estimates are preliminary.
[b] Other project costs (OPC) are funded through laboratory overhead.

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 GSF	60,600 GSF

Justification

BNL is a multi-purpose research institution funded primarily by SC that operates 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 RHIC ATLAS Computing Facility (RACF) that is 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 that indirectly supports the broader SC mission. In addition, other SC program offices may conduction core mission computing that is enabled by the infrastructure upgrades considered 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 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. Similarly, as research experiments are fully developed that utilize the beamlines at BNL's National Synchrotron Light Source-II, which is funded by SC's Basic Energy Science Program Office, additional core mission computing will be required. A mission need therefore exists to provide sufficient, mid-range computation and data storage capabilities to support to current and planned experiments at BNL.

FY 2018 funds will be used for preliminary and final design and project management and support activities.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, and all appropriate project management requirements have been met.

5. Details of Preliminary Project Cost Estimate

	(dollars in thousands)		
	Total Preliminary Cost Range: Minimum Estimate	Total Preliminary Cost: Current Point Estimate	Total Preliminary Cost Range: Maximum Estimate
Total Estimated Cost (TEC)			
Design			
Design	4,700	5,600	6,412
Contingency	940	1,400	1,924
Total, Design	5,640	7,000	8,336
Construction			
Construction	51,670	53,600	57,941
Contingency	10,340	13,400	17,373
Total, Construction	62,010	67,000	75,314
Total, TEC[a]	67,650	74,000	83,650
Contingency, TEC	11,280	14,800	19,297
Other Project Cost (OPC)[b]			
OPC except D&D			
Conceptual Planning	229	229	229
Conceptual Design	451	451	451
Contingency	170	170	170
Total, OPC	850	850	850
Contingency, OPC	170	170	170
Total, TPC[a]	68,500	74,850	84,500
Total, Contingency	11,450	14,970	19,467

6. Preliminary Acquisition Approach

Acquisition for this project will be performed by the 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.

[a] This project is pre-CD-2; schedule and funding estimates are preliminary.
[b] Other project costs (OPC) are funded through laboratory overhead.

18-SC-71 Energy Sciences Capability
Pacific Northwest National Laboratory (PNNL), Richland, Washington
Preliminary Information for Design

1. Significant Changes and Summary

Significant Changes
This project is a proposed new start for FY 2018.

Summary
The FY 2018 Request for this project is $1,000,000. The most recent DOE O 413.3B Critical Decision (CD) is CD-0, Approve Mission Need, which was approved on December 12, 2016.

This project has a Total Estimated Cost (TEC) range of $70,000,000 to $96,000,000 and a Total Project Cost (TPC) range of $73,000,000 to $99,000,000. These cost ranges encompass the most feasible preliminary alternatives. This preliminary information reflects funding for a project that 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 PNNL Richland campus.

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

FY 2018 funds will support Project Engineering and Design activities.

2. Critical Milestone History

(fiscal quarter or date)

	CD-0	CD-1	CD-2	CD-3	CD-4
FY 2018	12/12/2016	4Q FY 2018	4Q FY 2019[a]	4Q FY 2020[a]	4Q FY 2025[a]

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
CD-3– Approve Start of Construction
CD-4 – Approve Project Completion

3. Current Preliminary Project Cost Estimates

(dollars in thousands)

	TEC, Design	TEC, Construction	TEC, Total	OPC[b]	TPC
FY 2018	9,000	81,000	90,000[a]	3,000	93,000[a]

4. Project Scope and Justification

Scope
The objective of the Energy Sciences Capability (ESC) project is to increase the impact of chemical conversions research and development at PNNL, and expand the reach of user programs in EMSL. To accomplish these goals 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 80,000 to 120,000 net square feet of wet chemistry, instrumentation, and computational space in 40 to 45 laboratory modules along with offices for 150 to 200 research and support staff.

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[a] This project is pre-CD-2; schedule and funding estimates are preliminary.
[b] Other project costs (OPC) are funded through laboratory overhead.

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)
Multi-story Laboratory Building	80,000 net square feet (NSF)	120,000 NSF

Justification

Pacific Northwest National Laboratory (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 Energy Sciences Capability project at PNNL is to enable the transformation of catalysis science and how catalysts are designed, synthesized, and engineered. 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 EMSL and ARM 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."

The Energy Sciences Capability 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 Energy Sciences Capability 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.

FY 2018 funds will be used for preliminary and final design and project management and support activities.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, and all appropriate project management requirements have been met.

5. Details of Preliminary Project Cost Estimate

	(dollars in thousands)		
	Total Preliminary Cost Range: Minimum Estimate	Total Preliminary Cost: Current Point Estimate	Total Preliminary Cost Range: Maximum Estimate
Total Estimated Cost (TEC)			
Design			
Design	6,000	7,500	8,000
Contingency	1,000	1,500	2,000
Total, Design	7,000	9,000	10,000
Construction			
Construction	54,000	70,000	73,000
Contingency	9,000	11,000	13,000
Total, Construction	63,000	81,000	86,000
Total, TEC[a]	70,000	90,000	96,000
Contingency, TEC	10,000	12,500	15,000
Other Project Cost (OPC)[b]			
OPC except D&D	1,650	1,650	1,650
Conceptual Planning	100	100	100
Conceptual Design	1,000	1,000	1,000
Contingency	250	250	250
Total, OPC	3,000	3,000	3,000
Contingency, OPC	250	250	250
Total, TPC[a]	73,000	93,000	99,000
Total, Contingency	10,250	12,750	15,250

6. 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.

[a] This project is pre-CD-2; schedule and funding estimates are preliminary.
[b] Other project costs (OPC) are funded through laboratory overhead.