

**Critical Decision 3B, Approve Start of Construction –Phase B
For
The Utilities Upgrade Project (UUP)
At Fermi National Accelerator Laboratory**

Office of Operations Program Management

A. Purpose

The purpose of this paper is to document the review by the Office of Science (SC) Energy Systems Acquisition Advisory Board (ESAAB) equivalent for the Critical Decision (CD), “Approve Start of Construction – Phase B (CD-3B)” for the Utilities Upgrade Project (UUP) at Fermi National Accelerator Laboratory (Fermilab).

B. Mission Need

Using the information in the Laboratory Plan and the Fermilab Strategic Plan, a Statement of Mission Need (SMN) for the UUP was prepared. The SMN details the critical need for upgraded facilities at Fermilab and how the refurbished utilities will help meet that need. The SMN was approved on September 18, 2009.

The May 2014 report of the Particle Physics Project Prioritization Panel (P-5) outlines a strategic plan for the next decade, and beyond, that maintains a set of key research objectives that Fermilab plans to pursue in the future. Of significance was the recommendation 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.” Meeting this mission need will also require increased intellectual collaboration in the design and execution of physics experiments intended to explore advanced accelerator and detector capabilities that are necessary to enable a world-leading neutrino program. This will require closing both capability and infrastructure gaps.

The project’s objective is to provide a dependable utility infrastructure from which science can be accomplished. To fulfill this objective, the scope of this project includes design and construction of an upgraded Industrial Cooling Water System (ICW) and an upgraded High-Voltage (H/V) electrical system. The scope includes replacing components at or near end of service life.

C. Performance Baseline (PB)

Scope

The scope of the project includes design and construction work to replace portions of certain existing utility systems, as summarized in Table 1, below, and graphically depicted in Appendix A of the Project Execution Plan (PEP) - Project KPP’s, Scope and Costs. Table 1 shows the Threshold and Objective Key Performance Parameters (KPPs) for the project. The Threshold KPPs comprise the project performance baseline at CD-2. The Objective KPPs indicate potential project scope additions, consistent with the project’s mission need, that could be executed if the project experiences favorable cost and schedule performance. Objective KPP’s, as prioritized scope additions, are outlined in Appendix A. Some potential scope additions were designed and included in the construction bid packages as options. Any potential additional scope added to the project baseline will be incorporated in accordance with Table 10 in the PEP - Performance Baseline Change Thresholds: Routine Project Change Authority.

The project consists of two phases. The scope of Phase A is the procurement and delivery and installation of the pre-manufactured Master Substation Control Building. This scope was approved at CD-3A on February 18, 2015. The scope of Phase B consists of the remainder of the project, including the substation foundation, wiring and commissioning, as well as replacement of the main cooling water pipeline “backbone” from Casey’s Pond on the North end of the site to the main injector Industrial Cooling Water system near the southern part of the site near Wilson Hall.

At this time, only the Threshold scope of Phase B is being approved. Elements of the Objective KPPs may be approved through the Baseline Change process at the appropriate Authority Level at a later time.

Table 1 – Key Performance Parameters

Element	Threshold KPP (Minimum)	Objective KPP (Maximum)
High-Voltage Electrical (H/V) Upgrade	<ul style="list-style-type: none"> Replace Master Substation Control Building 	Threshold value plus: <ul style="list-style-type: none"> Replace all remaining site-wide oil switches with new air switches Replace the Master Substation 345kV circuit breaker Replace feeder cable > 25 years old Replace all end-of-life unit substations
Industrial Cooling Water (ICW) Upgrade	<ul style="list-style-type: none"> Install new ICW backbone piping network from Casey's Pond to the Main Injector ICW system 	Threshold value plus: <ul style="list-style-type: none"> Perform Pond System Improvements to increase ICW storage capacity Perform Casey’s Pond Pump house Improvements Perform ICW Makeup Water Improvements Replace the existing Main Injector ICW piping network

Cost

The Total Project Cost (TPC) for the project is \$36,000K. CD-3A authorized expenditure of construction funds, not to exceed \$7M for Phase A (including \$630K of contingency). CD-3B will authorize expenditure of the remaining construction funds of \$23,450K for Phase B. The Integrated Project Team (IPT) will apply a “build-to-cost” approach for executing potential work aligned with the Objective KPPs, as project performance and available contingency allows.

Since approval of CD-2/3A, the construction market in the Chicago area has become more active and costs have increased by approximately 15%. The bids received for the base scope of Phase B; a total of \$16,108K - reflect this trend, coming in at a combined \$1,500K higher than originally estimated and requiring an increase in the CD-2/3A cost baseline of \$1,500K. Despite this reduction in contingency, \$3,088K of cost contingency remains available (12% to go), which is more than sufficient to complete the threshold KPP work based on risk analysis.

The cost contingency will be adjusted once all contracts are awarded and the related risks are retired. As the project moves forward, the IPT will generate a revised detailed Estimate at Completion (EAC).

The TPC breakdown, segregated by funding type and construction phase, is provided in Tables 2 and 3, below. Note that these Tables are updates to the PEP Tables 8 and 2, respectively.

Table 2 – Funding Profile (\$000)

Fiscal Year	FY 10	FY 11- FY13	FY 14	FY 15- FY-16	FY17	Total
Other Project Costs	\$800				\$300	\$1,100
TEC PED			\$4,450			\$4,450
TEC Construction			\$30,450			\$30,450
Total Project Cost (\$K)	\$800		\$34,900		\$300	\$36,000

Table 3 – Project Cost Summary (\$K)

WBS Item		OPC	PED	Const	Total
600.01	Project Management				\$2,738
600.01.01	Preliminary Design Phase		\$519		\$519
600.01.02	Final Design Phase		\$366		\$366
600.01.03	Construction Phase			\$1,471	\$1,471
600.01.04	Closeout Phase			\$382	\$382
600.02	High Voltage Electrical				\$14,580
600.02.01	Engineering		\$1,595	\$1,969	\$3,564
600.02.02	Construction			\$11,016	11,016
600.03	Industrial Cooling Water				\$14,494
600.03.01	Engineering		\$1,919	\$1,469	\$3,388
600.03.02	Construction			\$11,106	\$11,106
Direct TEC					\$31,812
Contingency (12% TO GO)			\$51	\$3,037	\$3,088
TOTAL ESTIMATED COST (TEC)					\$34,900
600.04	Other Project Costs (OPC)	\$1,100			\$1,100
Funding Type Totals		\$1,100	\$4,450	\$30,450	
TOTAL PROJECT COST (TPC)					\$36,000

Schedule

The schedule accommodates all major milestones and the activities under the WBS, including CD approval dates, major procurement approval dates and deliverables. Major milestones are the CD dates that will be controlled as Level 1 milestones in accordance with Table 4, below. The overall project schedule includes 18 months of schedule contingency between the earliest possible CD-4 date (July 2017), based on execution of baseline scope only and the base lined project CD-4 milestone date (January 2019). Risk analysis performed in June of 2015 resulted in 11.29 months of schedule risk. Thus, 18 months of schedule contingency should be sufficient to capture schedule risk and the addition of any possible scope. Adjustments to address schedule implications, if any, from the emerging work will be reflected in the risk register.

Table 4 – DOE Level 1 Schedule Milestones

Milestone Description	Date
CD-0: Approve Mission Need	9/18/2009 (actual)
CD-1: Approve Alternative Selection and Cost Range	11/15/2010 (actual)
CD-2/3A: Approve Performance Baseline and Pre-Procure Substation Building	2/18/2015(actual)
CD-3B: Approve Start of Construction	September 2015 (forecast)
CD-4: Approve Project Completion	January 2019

D. Acquisition Strategy

Acquisition for this project has been performed by the M&O Contractor, Fermi Research Alliance, LLC (FRA). FRA’s used firm fixed-price purchase orders and subcontracts for supplies, equipment and services, to make awards through competitive solicitations. The High Voltage and Industrial cooling water bids were received on June 2015. The sum of the two bids is \$16,108K. These contracts will be awarded after this approval.

E. Procurement

Procurement actions have been coordinated with the FSO Contracting Officer, as appropriate. All procurements for this project are within the FSO Contracting Officer’s authority. Procurements with value below \$5,000K can be issued by FRA without the FSO Contracting Officer’s approval. Project performance metrics for the M&O Contractor are included in the annual performance evaluation and measurement plan.

Each procurement action was performed in a competitive environment based on the best value approach. The bids were evaluated for technical criteria, such as technical qualifications, approach, past performance, experience, capabilities, personnel qualification, and resource availability, to meet the schedule requirements. Awards will be made to those bidders deemed to offer the best value after this approval

F. Interfaces

Planning for this project is being closely coordinated between the UUP and the laboratory to ensure that this project does not interfere with ongoing laboratory operations. An agreement in scope, timeframes and responsibilities for interfaces between the Utilities Upgrade Project and the Laboratory has been established and included in the Section 8.14 of the PEP to document the commitment of Fermilab management to support all costs associated with additional requirements not currently considered on-project..

G. Environmental, Safety and Health

No environmental issues have been identified to date that would significantly impact this acquisition. All requirements of the National Environmental Policy Act (NEPA) and its implementing regulations will be addressed during this acquisition. A NEPA determination was completed and a Categorical Exclusion was issued. No action will be taken that could have adverse environmental effects.

All project work will be executed in accordance with applicable Public Laws, Executive Orders, OMB Circulars, Federal Property Management Regulations, and DOE Orders. All systems will be designed to applicable ASHRAE standards, and the planning, acquisition, siting, designing,

construction, operating and maintenance decisions for this project will be based on considerations of LEED sustainable and DOE guiding principles as appropriate.

This work will be accomplished at the Fermilab site to fulfill its strategy and mission need. While the physical work will likely cross-organizational landlord boundaries and areas of radiological and environmental concern, the laboratory has well established and institutionalized controls to deal with these issues.

A Hazard Analysis (HA) has been conducted and the report issued. The HA identifies construction hazards and operational hazards and mitigation plans for the hazards. The operational hazards are due to work activities and building design features associated with the usage of the new buildings. The HA report serves as the basis for planning physical and administrative controls to protect the health and safety of workers, contractors, and the environment. The project specific ES&H Plan per 10 CFR 851 addresses all construction activities as necessary.

This project will disturb one or more acres total land area; therefore, a Storm Water Pollution Prevention Plan (SWPPP) document was created and submitted to the Illinois Environmental Protection Agency and approved on June 5, 2015.

As part of the SWPPP, Best Management Practices have been incorporated into the construction documents. These items will consist of silt fences, riprap barriers, inlet protection, and erosion control blankets, to name a few.

Fermilab has employed a Best Value or Technically Acceptable Low Bid procurement policy that includes ES&H performance as a critical parameter to assure that subcontractors can meet the Fermilab ISM requirements. The Fermilab ES&H Manual (FESHM) is utilized as the basis for this evaluation. Subcontractors must have a safety record with demonstrated performance in similar construction activities. Their management team must have a strong commitment to the safety program, in particular, in applying the principles and core functions of Integrated Safety Management, to assure outstanding worker and ES&H and safety performance. Subcontractor management is held accountable for the safety performance of their workers, and will be responsible for ensuring all work is done safely.

H. High Performance Sustainable Building Requirements

The scope of this project does not include conventional buildings so the Executive Order pertaining to High Performance Sustainable Buildings is not applicable. However, the project may improve energy efficiency, conserve water consumption, and otherwise assist in achieving DOE sustainability goals; to the extent such opportunities are cost effective and affordable within the TPC.

I. Risk Management

A Risk Management Plan (RMP) has been issued that identifies the potential risks and provides a comprehensive strategy for management of these risks. The objective of this plan is to proactively identify and manage project related risks throughout the project's life cycle. The mitigation of risks minimizes their impact on the project's cost and schedule as well as on the facility's operational performance. Adequate contingency has been applied for these risks. The RMP consists of a risk registry and indicates assigned responsibilities of the project personnel in performing the risk management actions. The RMP will be maintained to ensure that the project incorporates appropriate, efficient and cost-effective measures to handle project risk.

Construction Risk - If major equipment/material is delivered late or damaged, then construction schedule could be impacted. Mitigation strategies include identifying long lead/challenged items early and potentially pre-purchase them; GC contractually responsible for on-schedule deliveries; call out schedule milestones in the contract specification; require all submittals & reviews to be included in GC's critical path schedule; require monthly schedule updates and monitor GC schedule.

J. Safeguards and Security

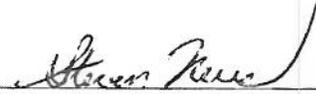
The project will not change the safeguards and security requirements at Fermilab. The site is categorized as a Property Protection Facility with nuclear material graded category IV attractiveness level E facility. No sensitive or classified research is conducted by Fermilab. Currently, the entry gates provide perimeter access, basic visitor services, and traffic management.

K. DOE SC Independent Project Review – CD-3B Readiness Review

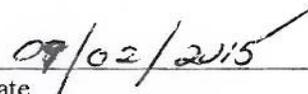
An Independent Project Review (IPR) in support of CD-3B was conducted on August 11-12, 2015. The IPR was conducted by SC Office of Project Assessment (OPA) in response to a charge from the Associate Deputy Director for Field Operations. The committee found the project is ready to start Phase B construction and recommended approval of CD-3B after several documentation changes were completed. The Federal Project Director and the IPT responded to all recommendations.

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Submitted by:



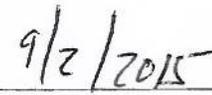
Steven Neus
Federal Project Director
Fermi Site Office, SC-FSO



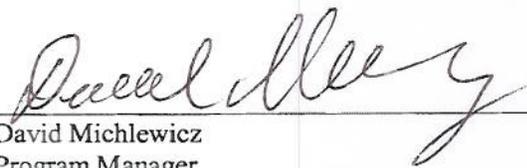
Date



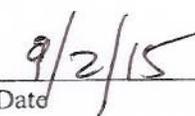
Michael Weis
Manager
Fermi Site Office, SC-FSO



Date



David Michlewicz
Program Manager
Office of Operations Program Management
Office of Science, SC-33

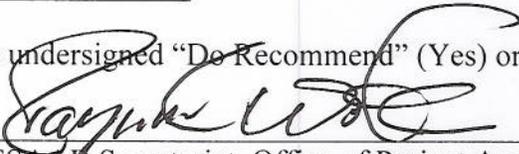


Date

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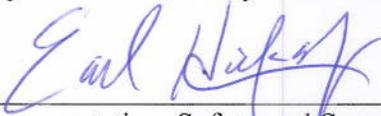
Recommendations:

The undersigned “Do Recommend” (Yes) or “Do Not Recommend” (No) approval of CD-2/3:

 9/3/15 Yes No
ESAAB Secretariat, Office of Project Assessment Date

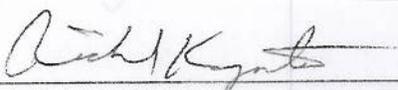
 9/3/15 Yes No
Representative, Office of Budget Date

 9/3/15 Yes No
Representative, Safety and Security Policy (ES&H) Date

 9/3/15 Yes No
Representative, Safety and Security Policy (Security) Date

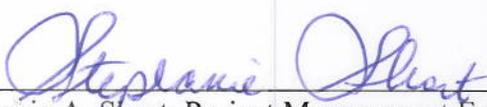
Representative, Operations Program Management Date
(Facilities and Infrastructure) Yes No

 9/3/15 Yes No
Representative, Non-Proponent SC Program Office Date

 9-3-15 Yes No
Representative, Non-Proponent Federal Project Director Date

Approval:

Based on the information presented above and at this review, Critical Decision-3B, the remainder of the project, including the substation foundation, wiring and commissioning, as well as replacement of the main cooling water pipeline “backbone” from Casey’s Pond on the North end of the site to the main injector Industrial Cooling Water system near the southern part of the site near Wilson Hall, is approved.

 9/3/15
Stephanie A. Short, Project Management Executive Date
Associate Deputy Director for Field Operations
Office of Science