



Closeout Report on the DOE/SC CD-2/3a Review of the

Utilities Upgrade Project (UUP)

Fermi National Accelerator Laboratory

December 9-10, 2014

Raymond Won

Committee Chair

Office of Science, U.S. Department of Energy

<http://www.science.doe.gov/opa/>



2. Technical

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Subcommittee 1

1. Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? **YES** Are preliminary designs for all project scope (i.e., for CD-2), final design for Phase A scope (i.e., for CD-3a) **YES**, and the respective design review reports complete? **YES** Similarly, is the Phase A scope towards achieving the KPPs sufficiently defined and documented? **YES**
5. Are there any interdependencies with other projects **YES** or significant research operations? **YES** If so, have they been identified and are there plans in place to mitigate risk for the Phase A scope? **YES**
6. Is the project being managed (i.e., properly organized and adequately staffed) to support the project to successful completion? **YES** Has the Integrated Project Team responded appropriately to recommendations from prior reviews? **YES**



2.1.1 Findings

- Threshold and objective scope preliminary designs for both the High Voltage upgrades and the Industrial Cooling Water upgrades have been completed and are at about the level expected for this stage of the project. The master substation prefabricated control building design has been issued for long-lead procurement proposals. Price proposals from four Vendors have been received.
- Rempe-Sharpe & Associates was contracted by FNAL to perform a design review on the ICW preliminary design, and completed that review on 11/07/14.
- Burns & McDonnell was contracted by FNAL to perform a design review on the technical documents related to the final procurement package for the substation building and the preliminary design of the substation site improvements, dated 11/07/14.
- Currently the existing master substation control building's main electrical loads have been transferred over to the Kautz Road substation for load testing purposes. It will be used to provide power once the existing master substation is taken out of service.
- A Preliminary Design Report (PDR) has been completed and Rev. 2 was signed on 11/21/14.
- A Hazard Analysis Report (HAR) has been completed and Rev. 2 was signed on 11/21/14.



2.1.1 Findings

- A final addendum is to be issued to the bidders later in December in preparation for a best and final offer for the Master substation control building.
- Marshalling cabinets will provide a line of demarcation between the master substation installed scope (CD-3a) and the balance of scope (CD-3b).
- Sustainability and Energy Conservation considerations are addressed in the Preliminary Design Report and will be implemented to the extent practical for the scope of work.
- A list of scope enhancements have been developed with associated cost.



2.1.2 Comments

- Master Substation Prefabricated Control Building
 - In the technical specification emergency lighting is not addressed.
 - Arc flash study and coordination study requirements are not included in the design documents. The project team stated that this will be specified during final design and will be requirements of CD-3b authorized construction.
 - The Technical Specification for the Control Building's front page states Revision A, while the back page states Revision B.
 - No exterior cable tray shown but one is described in the Technical Specification.
 - Drawing E-28 Wireway & Cable Tray Layout – background needs to be updated to match E-23 Equipment Layout.



2.1.2 Comments

- Industrial Cooling Water Upgrades (ICW):
 - There is a disconnect between the baseline scope in the Preliminary Design Report and what was presented by the project team: dredging of Andy's Pond and Swan Lake is part of baseline scope in the Preliminary Design Report, but is included with the Objective KPPs in the presentation.
 - The Objective KPPs should be evaluated for the potential impact of rework on baseline scope (Threshold KPPs) - work at Andy's Pond and Swan Lake.
 - A plan to assess the impact to the scope, costs and risks and disruptions to operations for all piping connections between new and existing ICW piping should be considered.



2.1.3 Recommendations

1. Prioritize Objective KPPs (based on risk and impact) and then finalize the design only on that scope that the project expects to have contingency to fund. Complete this prioritization by CD-2/3a.
2. Contract with an independent commissioning agent for design/constructability reviews, validation of testing of equipment, and overall systems integration within 30 days of CD-2/3a.
3. Recommend CD-2/3a approval.



4. Have Environmental, Safety and Health aspects of the project been adequately addressed? **No. Several recommendations were identified.** Have the Hazard Analysis Report and final National Environmental Policy Act determination been issued? **Yes.** Are the necessary permits in place to allow the Phase A scope to commence? **Yes**

Findings

- Integrated Project Team includes project ESH Coordinator and Fermi ESH&Q Construction Safety Officer.
- Fermi ISM plan is well established and integrated into construction projects.
- NEPA issued as Categorical Exclusion. Illinois Historic Preservation Review complete. No other permits required for CD-3a.



Findings (continued)

- PSVAR complete.
- The HAR was last updated in November and has been signed by project management. The majority of hazards are addressed but we identified several recommended additions.
- Fermi has established policies, processes, and contract requirements to effectively manage the hazards.
- Exhibit A and Addendum A contain a comprehensive list of subcontractor ESH requirements.
- ESH&Q has been actively involved in the MSS and ICW design reviews.
- ESH&Q has been actively assisting the project with the identification of permit requirements for MSS and ICW.
- The design of the new electrical equipment will make it safer to operate and maintain.



Findings (continued):

- Asbestos is present in the capacitor tree; likely in some other electrical equipment. Fermi to inspect MSS equipment after shutdown to identify ACM. Fermi to abate under their established contract with an abatement company.
- Asbestos-containing transite pipe will be encountered during excavation for ICW tie-ins. Subcontractor will notify Fermi; Fermi to abate with their abatement contractor.
- Radiologically activated soil may be encountered during ICW excavation. Fermi will sample soil in any area where contamination may be found. Negligible impact to excavation and on site transport plan.



Comments:

- Several HAR updates are needed by CD-3b.
 - Demolition hazards (Section 4.2.1 and Appendix A): Add structural collapse, noise, radiological, asbestos, fire, and spills.
 - Construction hazards (Section 4.2.2 and Appendix A): Add noise, radiological (soil density gauge; activated soil), fire, asbestos, and spills.
- Exhibit A should be revised to specifically state that an excavation competent person shall be present at all active excavation locations. (Required by CD-3b).
- Ensure asbestos (transite pipe) and radiological hazard potential locations (soil where direct boring through berm) are described in the ICW specifications. Ensure asbestos locations in MSS (capacitor tree; switchgear; etc.) are mentioned in the MSS specifications. Both specifications should explain Fermi's process for surveying with their own IH and RP staff, abating these items with their own abatement subcontractor, and the number of days this is likely to impact the construction subcontractor's schedule. (Required by CD-3b)
- Scope additions: several have permitting requirements (Army Corps) that could take months to accomplish and would potentially impact schedule and achieving CD-4 in time.



Recommendations:

1. Revise MSS drawings and specs to include an eyewash and shower instead of just an eyewash. [Required for CD-2/3a: MSS design]
2. Include a subcontractor safety representative in the ICW and MSS projects. It would be prudent to have a subcontractor safety representative for the entire project except perhaps low risk phases, if any, of the ICW and MSS projects. Necessary qualifications should be listed in the project specifications. [Required for CD-2/3a as the cost of the subcontractor safety representative would have to be added to the baseline cost estimate.]
3. Revise the HAR to address the operational hazards associated with the MSS that have been incorporated into the design. [Required for CD-2/3a as these are incorporated into the MSS design and specifications.]



4. Cost and Schedule

S. Tuholski, LBNL, Steve Langish, PPPL,
Julia Chaffin, SLAC / Subcommittee 3

1. Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? **Yes**
Are preliminary designs for all project scope (i.e., for CD-2), final design for Phase A scope (i.e., for CD-3a), and the respective design review reports complete? **Yes**
Similarly, is the Phase A scope towards achieving the KPPs sufficiently defined and documented? **Yes**
2. Are the project cost and scope consistent with the draft Project Execution Plan and preliminary performance baseline? **Yes**
Has the schedule been appropriately updated? **No**
Is adequate cost, schedule, and scope contingency identified to mitigate risk prior to and after CD-3a? **Yes**
Is an Earned Value Management System employed and ready to begin monthly PARS-II reporting in a timely manner? **No, PMB is inconsistent.**
3. Are the solicitation documents accurate and sufficiently mature to support the procurement and/or construction of the Phase A scope under CD-3a? **Yes**
Are the Acquisition Strategy and Acquisition Plan updated and approved? **No, see Management Area.**
Are cost estimates reconciled and bids or quotes in-hand? **Yes**



4. Cost and Schedule

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- **Findings**

- There are 3 CAMs managing 3 control accounts. All CAMs were required to complete project-directed training.
- The schedule has 162 activities, 1 level 1 milestones, 6 level 2 milestones, and 14 level 3 milestones. Additional level 3s are anticipated.
- Recommendations for cost and schedule from prior DOE reviews have been addressed and all are closed.
- The plan presented includes budget/schedule to achieve Threshold KPP's. Possible scope additions are outlined totaling \$17M if contingency funds remain.
- The project developed a baseline in October of 2014 with 19% contingency on ETC. The project expects to update and freeze the performance measurement baseline prior to the ESAAB.
- Project team has validated the alternate means of providing site power through a temporary power reconfiguration test this November. Validation in progress.



4. Cost and Schedule

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- **Findings (cont.)**
 - The electrical gear procured in CD-2/3A will likely sit several months prior to final commissioning.
 - The estimate supporting the PMB appears reasonable. An AE estimate was reconciled with an independent cost estimate as a means of validating the total cost. In most cases the higher estimate was carried forward.
 - The PMB for the substation procurement is supported by bids-in-hand.
 - The project team produced a risk registry with 28 itemized entries mapped into the WBS.
 - The schedule shows 18 months of float to CD-4.
 - The PMB entered in COBRA appears inconsistent with the schedule data entered in Primavera (P6).



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- **Comments**
 - The project requires a critical cut-over to alternate power in August 2015. Potential financial and operations impacts to the Lab could be experienced if the window is missed. Fermilab has expressed they will provide any necessary support of off project work required to maintain operations of overall utility systems.
 - The risk registry appears optimistic, however the float to CD-4 and cost contingency appear sufficient.
 - Consider adding entries to the risk register to account for less likely examples, including:
 - Damage to equipment during installation
 - Cable damage developed while sitting dormant for 9 months
 - Interface conflict between the electric and site work general
 - Unforeseen conditions at the new substation basement



4. Cost and Schedule

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- **Comments (cont.)**
 - Consider purchasing additional warranty on the electrical gear purchased in CD2/3A.
 - The working plan currently in use by the project team does not appear to relate to the baseline presented at the Director's review.
 - The milestone dates and levels shown in the schedule appear inconsistent with those described in the PEP. Consider aligning the documents.
 - The schedule has sufficient detail to track and manage the project.
 - The project has not defined threshold values for cost and schedule variance analysis.



4. Cost and Schedule

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- **Recommendations**
 - Before CD-2/3A ESAAB the project should update and freeze the cost performance measurement baseline allowing sufficient time to update associated project documents.
 - Before CD-2/3A ESAAB, document the commitment of Fermilab management to support additional requirements in the event the project misses the planned August shut-down window.
 - Before CD-2/3A ESAAB, define cost and schedule reporting variance thresholds.
 - Proceed to CD-2 ESAAB after cost and schedule recommendations are resolved.



4. Cost and Schedule

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PROJECT STATUS

Project Type	Line Item	
CD-1	Planned: Nov 2010	Actual: 11/15/2010
CD-2/3A	Planned: May 2015	Actual:
CD-3B	Planned: Dec 2015	Actual:
CD-4	Planned: Sep 2018	Actual:
TPC Percent Complete	Planned: 9.1%	Actual: 7.2%
TPC Cost to Date	\$ 2,569,574	
TPC Committed to Date	\$ 3,017,402	
TPC	\$35,645,000	
TEC	\$34,900,000	
Contingency Cost (w/Mgmt Reserve)	\$5,570,000	19% to go
Contingency Schedule on CD-4	18 months	
CPI Cumulative	NA	
SPI Cumulative	NA	



1. Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? **Yes**
Are preliminary designs for all project scope (i.e., for CD-2), final design for Phase A scope (i.e., for CD-3a), and the respective design review reports complete? **Yes**
Similarly, is the Phase A scope towards achieving the KPPs sufficiently defined and documented? **Yes**
3. Are the solicitation documents accurate and sufficiently mature to support the procurement and/or construction of the Phase A scope under CD-3a? **Yes**
Are the Acquisition Strategy and Acquisition Plan updated and approved? **No**
Are cost estimates reconciled and bids or quotes in-hand? **Yes**
5. Are there any interdependencies with other projects or significant research operations? **Yes**
If so, have they been identified and are there plans in place to mitigate risk for the Phase A scope? **Yes**
6. Is the project being managed (i.e., properly organized and adequately staffed) to support the project to successful completion? **Yes**
Has the Integrated Project Team responded appropriately to recommendations from prior reviews? **Yes**



- **Findings**
 - Key Performance Parameters are defined and documented in the project execution plan.
 - Independent design reviews have been performed on the high voltage electrical and industrial cooling water preliminary designs.
 - Quotes for the Phase A scope have been received and are being evaluated.
 - Acquisition strategy was approved on July 23, 2010. Acquisition Plan has not been developed.
 - The utility upgrades of the electrical and cooling water systems will require significant modifications to the current operating mode of the lab to ensure their research is not negatively affected.
 - The project team and IPT have been identified. The project team was well prepared for the review and had excellent presentations to the review team.



- **Comments**

- Acquisition strategy contains an outdated scope description and project milestones that are not consistent with current baseline scope and dates as described in the Project Execution Plan (PEP). This document should describe the current baseline scope and milestones and include a high level description that would cover future scope additions such as “replacement of end of life utility components.” The PEP and other project documents should not include use of the phrase “scope enhancements”.
- Phase A scope will shutdown the Master Substation for replacement. While it is out of service the Kurtz Road and Village Substation will be used to serve the loads. Other operational changes required due to the construction impacts are being coordinated with the lab to avoid impacts to research.
- The project team includes experienced project manager and CAMs that have significant experience and have both PE and PMP certifications. The project is being well managed and has been adequately staffed to support the successful completion of the project.
- The organization chart should be revised to clarify that the associate PMs are managing their respective design and construction scopes and that they report to the PM.



- May be beneficial to request qualifications of significant lower tier subcontractors to be included in General Contractor's offer and evaluated as part of the Best Value selection.
- Pre-briefing to FSO prior to submission of RFP/award package for approval may facilitate approval process.
- Sufficient planning is necessary to develop the solicitation package, obtain appropriate internal reviews, and FSO approval prior to the March 25, 2015 date for issue of the ICW and HV RFP.



- **Recommendations**
 - Revise the Acquisition Strategy prior to CD-2/3a to update the changes in baseline scope and milestones since its approval in July 2010.
 - Develop an Acquisition Plan by January 31, 2015 to meet the March 25, 2015 date to issue the solicitations for ICW and HV. Time frames should be established to include all phases of the procurement process and include time for finishing specifications and drawings, submission of technical and financial documents to Procurement, development of the solicitation package, internal procurement/business reviews and FSO approval, receipt of offers, and evaluation/award requirements.