Fermilab

# Final Report

# Director's Independent Design and CD-2/3a Review of Utilities Upgrade Project (SLI)

## October 20-21, 2014

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## Executive Summary

The focus of this Director's Review of the SLI Utility Upgrade Project (SLI-UUP) was to assess the readiness of the project for CD-2/3a including the completeness and self-consistency of the technical scope and final design work, cost estimate, schedule and management systems and staffing. Additionally the review team was tasked in assessing if the SLI-UUP project's scope of work can be accomplished with the approved TPC by the CD-4 date with consideration for project risks.

Significant work has been completed by the project team since obtaining CD-1 approval in November 2010 and in preparation for the DOE CD-2/3a Review scheduled for December 9-10, 2014. The review committee has identified several items that need to be addressed in order to achieve CD-2/3a approval. The main items are conducting an independent design review, further detailing of the resource loaded schedule and begin the planned EVMS reporting.

### Technical

The SLI-UUP scope of work consists of upgrades to the High Voltage Electrical (HV) and Industrial Chilled Water (ICW) systems. A limited review of the preliminary design documents was performed by the committee due to the limited time provided prior to the Director's Review. This committee found that overall the design documents appear to be at the appropriate level of maturity for CD-2/3a; however, a true independent design review is needed to confirm the designs meet the project requirements.

### Schedule

A resource loaded schedule was developed in Primavera P6 and reflected the full scope of the project. The committee found that the schedule was at a higher level than what would be expected at CD-2 due to large duration planning packages. The committee recommends the project further detail the schedule to smaller planning packages to better manage risks, the proposed shut downs and interfaces with the Laboratory.

### Cost

SLI-UUP is a Line-Item project with a Total Project Cost of $35.65M which includes $4.74M of contingency. Development of contingency appeared to be primarily risk based, however additional clarification to how this value was calculated was recommended by the committee to ensure the project has identified adequate funds to reach CD-4.

### ES&H

SLI-UUP has added an experienced ESH Coordinator and QA Coordinator to the project management organization. The project has identified multiple risks related to ES&H factors, however still needs to reflect these hazards in the HAR prior to CD-2/3a.

### Management

SLI-UUP has an experienced management organization that is fully identified. The CD-2/3a project management documents have all been developed and are awaiting final signature. Project reporting was unable to be verified due to EVMS data not being available. The project team was knowledgeable of the reporting process and is expected to be able to provide data for PARS-II reporting. Project generated EVMS data is expected to be available for complete review by the DOE CD-2/3a Review.

# Introduction

A Director's Independent Design and CD-2/3A Review of the Utilities Upgrade Project was held on October 20-21, 2014 at the Fermi National Accelerator Laboratory. The purpose of this review was to assess the level of maturity of the project's design and to determine if the project meets the Critical Decision (CD) 2/3A (CD-2, Approval of Performance Baseline and CD-3, Approval to Start Construction Phase A) requirements as specified in DOE O 413.3B. To meet the design requirements for CD-2 the design must be at the preliminary level or greater, and for CD-3A the design must be at the level of final or near final design.

Additionally, the committee assessed the Project's progress on addressing the recommendations from the Director's and DOE CD-1 reviews

The assessment of the Review Committee is documented in the body of this closeout presentation, which consists of two major sections. The first section provides assessments of design and management. Each area within this first section is organized by Findings, Comments and Recommendations. Findings are statements of fact that summarize noteworthy information presented during the review. Comments are judgment statements about the facts presented during the review and are based on reviewers' experience and expertise. Comments are to be evaluated by the project team and actions taken as deemed appropriate. Recommendations are statements of actions that should be addressed by the project team. The second section of this presentation includes the committee's answers to the review charge questions.

The UUP Project is to develop a response to the review recommendations and present it to the Laboratory Management and regularly report on the progress during the Project's Project Management Group Meetings (PMGs) and at the Performance Oversight Group (POG). The recommendations will be tracked to closure in the iTrack system. Documented status of the project's resolution of the recommendations will need to be available for future reviews.

# 1.0 Assessment of Technical Design Review

## 1.1 High Voltage (HV)

### Findings

- Current master substation building was built in 1971. Age of equipment and cabling poses reliability issues for laboratory and safety during maintenance/repair activities.

- The project presented an upgrade of the existing High Voltage (HV) electrical utility system. The major component (Threshold Key Performance Parameter (KPP)) of this project is the replacement of the Master Substation Control Building and its associated infrastructure.

- There is a prioritized list of Objective KPP's that will be performed if extra funds are available. These include replacement of 13kV oil switches, 345kV breakers, feeder cable, and end-of-life electrical substations.

- A test switchover of the accelerator complex to the Kautz Road Substation is scheduled for multiple days, starting on November 4, 2014 to identify any potential issues with running in this configuration during the construction phase. The goal is to identify any operational issues resulting in running the accelerator complex off one substation (Kautz).

- Various upgrades to the HV system have been performed since CD-1 using GPP and Operating funds. This allows for complete isolation of the Master Substation from the rest of the grid.

### Comments

- Cost and schedule values and development should be included in the plenary presentations by the associated project manager.

- There is a good plan for scope enhancements via the Objective KPP's if extra funds are available. However, for the Master Substation project, minimal reductions of scope exist due to the mission critical needs associated with this replacement project.

- Selecting a competent vendor is key to successful completion. Site visits for inspection and compliance testing should be negotiated with the selected vendor prior to contract award.

- The coordination of initial site switch-over and start-up of the MSS with the Lab's Science program was not presented.

- During this review, there was not sufficient time available to perform a comprehensive independent design review of the project. Nothing was presented to clearly state that the project scope satisfies the future needs of the laboratory (Muon Campus, PIP-II, and LBNF.

## Recommendations

1. The bids for the MSS Control Building are expected later this month. The information received should be incorporated into the project plan (e.g. schedule, cost, risk, etc.) for the CD-2/3a review in December.

2. A technical evaluation document should be prepared to assist in fair and even evaluation of the vendors and ensures selection of a competent vendor.

3. An independent preliminary design review should be conducted prior to the CD-2/3a independent project review (IPR).

4. An independent comprehensive design review should be conducted and comments addressed prior to award of the procurement of the scope of work beyond CD-3a which includes conventional construction and installation. This review should include Fermilab's Accelerator Division.

## 1.2 Industrial Chilled Water (ICW)

### Findings

- The project team presented a series of proposed improvements to the existing Industrial Chilled Water (ICW) system based on existing condition and capacity. The major components of this upgrade include replacing the below grade main "Backbone" piping network, installing two new pump stations (CMTF and Swan Lake), dredging of ponds and make up water improvements.

- There is a prioritized list of Objective Key Performance Parameters (KPP's) that will be performed if extra funds are available. These include Kress Creek flooding improvements, a new deep well at Casey's Pond, and the replacement of the Main Injector ICW piping network.

- Various repairs have been made to the ICW system since CD-1 using GPP and Operating funds.

- Requirements for the ICW system are included in the Preliminary Design Report documentation. Requirements for the High Voltage System are included in the Basis of Design report.

### Comments

- The committee believes the ICW upgrade design information presented is at a maturity level beyond preliminary design. The system has been modeled, alternatives prioritized, and preliminary unit costs are well documented.

- There is a good plan for scope enhancements via the Objective KPP's if extra funds are available. However, it wasn't clear that there was a plan for scope reduction, if there are cost overruns. Design assumptions related to pipe and pump sizing appear adequately conservative and all inclusive of future potential strategic mission targets. During final design, the team may consider reducing some capacity requirements to create scope contingency.

- Cost and schedule values and development should be included in the plenary talks by the associated project manager.

- Engaging the contracting market and building interest in potential vendors is key to successful completion.

- Consider a policy of de-energizing utility systems that are about to be exposed by excavations to reduce risk of injury and ORPS reportability.

- During this Review, there was not sufficient time available to perform a comprehensive independent design review of the project.

### Recommendations

5. An independent preliminary design review should be conducted prior to the CD-2/3a independent project review (IPR).

6. An independent comprehensive design review should be conducted and comments addressed prior to award of the procurement of the scope of work beyond CD-3a which includes conventional construction and installation.

7. Prior to CD-3b, consider engaging the local construction market and building interest with potential vendors by hosting a project introduction meeting.

# 2.0 Cost, Schedule, ESH and Project Management

## 2.1 Cost

### Findings

- Project has received all of its funding, critical decision approvals are required for the release of funds to the project

- Project's Total Project Cost is $35.65M (PMB: $30.91M and Contingency: $4.74M). The total project cost includes escalation, overheads and contingency.

- Project performed a Monte Carlo analysis on its risk register. This analysis coincides with the project's proposed management reserve value

- Project has four control accounts and four active chargeable task codes. If scope enhancements are instituted, the project could reach 21 chargeable cost codes.

- A/Es developed bottom-up cost estimates and an independent consultant completed an independent cost review. These estimates were reconciled, resulting in a consolidated estimate, which was used to develop the Budgeted Cost of Work Scheduled

- Approximately 4% of the Budget-At-Completion has been spent to date.

- Fermilab has a certified EVM System; however no cost performance data is yet available for the project

- Budgeted cost can be separated as follows:

  - Construction: 75%

  - Project Management: 5%

  - Design/ Inspection: 20%

- The project presented a list of scope enhancements. Scope contingency list of potential reductions to the project was not developed.

### Comments

- Many documentation gaps exist: project is missing a dollarized responsibility assignment matrix (RAM), which also reflects the ratio of LOE to discrete activities by control account; change control log (which breaks out cost by control account, as well as a log for undistributed budget, management reserve and contingency), etc.

- Methodology for arriving at the amount of Contingency is was not well understood by the review team.

- Project should review the effort required for Safety and QA/QC resources. They are currently estimated at ~0.15FTE/ year, which maybe too low based on the project scope.

- During the review of the costs, the review team was advised that much of the H/V supporting documentation was uploaded to the review site the Friday prior to the review. The reviewers did not have time to perform independent drilldowns of the cost estimates outside of the drilldown exercises conducted during the review with the project team.

- A risk should be considered to address standing army costs for the time between the Early and Late (18 months) CD-4 date.

- The time from activity "CD-4 documentation ready for review" (August 1, 2017) to the activity "Modify project documentation following DOE CD-4 review" (September 15, 2017), is absent of budget.

- Project should perform practice drilldowns so that the process is ran smoothly during the actual review. The CAM should be prepared to perform their drilldowns.

- Develop a method for collecting and reporting estimate-to-complete (ETC)/estimate-at-complete (EAC). With the project aggressively managing their risk, the project needs to have an effective method for determining their ETCs.

## Recommendations

8. Perform successful monthly reporting cycle for as many periods as possible prior to the CD-2/3a Review, with documentation reviewed by personnel independent of the project. In order to successfully achieve this requirement, the project should work with their Federal Project Director to develop reporting level requirements (Level 2, control account, etc.), variance threshold requirements, and whether the project will report in PARS-II for the current and/or cumulative periods.

9. Develop a scope contingency list, identifying currently defined base scope of work that can be removed from the project scope while still meeting their threshold KPPs.

10. Document how the Risk Contingency, Unallocated Contingency and Estimate Contingency are used to calculate total contingency.

## 2.2 Schedule

### Findings

- Project schedule has 112 activities with approximately 50 activities containing cost.
- Project schedule reflects LOE activities as task dependent, some of those activities are on the project's critical path because they are coded as task dependent
- Project has 18 months of schedule contingency between its internal aggressive milestone and Level 1 CD-4 milestone.
- Monte Carlo analysis was not performed on the schedule duration.
- No schedule performance data was available at the time of this review.
- Project has identified milestones at various levels within their PEP. Not all milestones are reflected in the project schedule
- Project shutdown for MSS is currently defined as a single large work package in the schedule baseline
- Control building procurement is the project's long lead item requiring a CD-3a approval to obligate, procure, and fabricate prior to CD-3b activities (e.g. delivery and assembly during construction)
- Critical path currently reflected is not indicative of how the work will proceed on the project.

### Comments

- By not performing Monte Carlo analysis on the project's duration, there is no verification/validation that the schedule contingency is adequate to finish the project prior to the L1 CD-4 ESAAB date. An argument can be made that 18 months is more than sufficient, however an analysis should be conducted.
- Project should further define the construction planning packages to reflect a more accurate plan for management. The activities planned now are too high level for the project to gain a better understanding of how project activities will proceed, as well as a clear understanding of the project's critical path and required shutdown length.
- When the project coordinates the major procurements, the project needs to be cognizant of contractual requirements so that those requirements can be planned in the schedule, i.e., EVMS flow-down requirements, progress/milestone payments, schedule of values for A/E efforts, construction work (how cost will be loaded, how work performance will be realized, etc.)
- The project should be reviewed for gaps and inconsistencies. Some Project Management LOE activities have gaps of three week and four weeks, permit activities should be identified and scheduled, resources scheduled to the end of early finish date (September 15, 2017), remove artificial constraints associated with Objective KPP work on the ICW work, etc.

- Confirm adequate time for ESSAB approval for CD-3b sufficient. Currently, the duration reflects two weeks.

- Highlight the work that has been completed in the CD-2/3a presentation to DOE of the anticipated electrical shut down schedule as identified in the preliminary design report.

- The operational schedule for the Muon Campus will not allow for any project slip beyond the planned 18 month schedule assuming a January 2015 start. A contingency plan for early power delivery to the Muon Campus before switch over to full operation of the new MSS may be necessary.

## Recommendations

11. Perform successful monthly reporting cycle for as many periods as possible prior to the CD-2/3a Review, with documentation reviewed by personnel independent of the project. In order to successfully achieve this requirement, the project should work with their Federal Project Director to develop reporting level requirements (Level 2, control account, etc.), variance threshold requirements, and whether the project will report in PARS-II for the current and/or cumulative periods.

12. Perform schedule analysis to ensure the plan is planned low enough to support the approach of execution, i.e., better refine activities being coordinated during the shutdown; the critical path is depicted in detail and is accurate, earned value techniques (PMTs) are appropriately assigned on activities that are not planning packages, add missing milestones that are included in the PEP/PMP, etc.

13. Add a milestone in the schedule identifying the date when Muon Campus requires critical scope of UUP project to be complete.

14. Document how schedule contingency was quantified.

## 2.3 ES&H

### Findings

- An experienced ESH Coordinator and QA Coordinator have been added to the Project Management team.

- The Project Hazard Analysis Report has been developed in draft form for the committee to review.

- The Project Integrated Safety Management Program has been developed and is in draft form for committee review.

- The Project Quality Assurance Plan has been developed and is in draft form for the committee to review.

- The requirement for a Preliminary Security and Vulnerability Assessment Report is addressed in section 8.8 Security & Safeguards section of the Project Execution Plan.

- The Project Risk Register has two ESH related entries including (3-15) Inadequate Attention to Safety and (3-20) Encountering Contaminated Materials during Demolition.

### Comments

- The Project ESH and QA Coordinators are relatively new to the Project team and have not been fully integrated into development of the design requirements and the review process. These responsibilities should be included in the Project Execution Plan.

- The Project Management Plan responsibilities section should include both the Project ESH and QA Coordinators.

- It was unclear if the preliminary Project Fire & Life Safety Assessment had been completed in support of the design phase.

- The ESH and QA coordinators need to be incorporated in the development and review of construction bid documents.

- The final NEPA determination issued by the DOE Site Office was not available for review as required for CD-2 approval.

- The draft Hazard Analysis Report presently does not identify the specific hazards relating to each phase of the Project. The report does not sufficiently address hazards relating to the demolition phase including, but not limited to, PCB and asbestos abatement, electrical, and rigging. The HAR does not address radiation safety, excavation, heavy equipment operation, etc. type hazards. The Hazard Assessment & Evaluation Section 5.0 presently addresses three hazards (oil leakage, soil contamination, & PCB's) and needs to be expanded to address all project hazards.

- The environmental & radiation safety impacts relating to the dredging activities for Andy's & Casey's Ponds and Swan Lake are not clearly understood by the Project Management team.

- The L2 Managers should incorporate ESH and QA slides into their presentations to address their specifics requirements and issues.

## Recommendations

15. Update the Hazard Analysis Report to address the specific hazards relating to each phase of the project prior to the CD 2/3a DOE review.

16. Locate the final NEPA determination documentation from the DOE Site Office and post prior to the CD-2/3a DOE review.

17. Complete a preliminary Fire & Life Safety Assessment in support of the preliminary design phase of the project.

18. Complete preliminary environmental & radiation safety sampling of the Andy's Pond, Casey's Pond, and Swan Lake dredge spoils which will be removed and relocated on site. Verify if any permits are required for this activity.

19. Finalize and sign the Project HAR, ISM Plan, and QA Plan prior to the DOE CD 2/3a review.

## 2.4 Project Management

### Findings

- Project has an experienced team with direct knowledge of all proposed phases of work required to complete the project. Preliminary planning is well developed and the project team has a good understanding of roles, responsibilities, communication, budget, scope and schedule.

- Project has identified adequate FTEs to support all phases of the project

- Project documentation is complete for CD-2/3a. Project risks register appears to be robust and the analysis is appropriate for identified contingency required by the project.

- Appropriate risks have been identified for the project. This includes risks for encountering contaminated materials including asbestos, radiated materials, transite, mineral oil, and PCB's.

- No testing of materials to be dredged has been completed to date.

- The high voltage portion of the project has no interfaces with the City of Batavia substation.

- The CD-3a phase scope of the project is not dependent on any aspect of the final design of the CD-3b phase. However, the CD-3b scope is influenced by the CD-3a scope. This influence is limited to the control building requirements for the building foundation.

- The Acquisition Strategy, Project Execution Plan, Preliminary Design Report, Risk Management Plan, Quality Assurance Plan, Hazards Analysis Report, and Configuration Management Plan are in place and were updated prior to the Directors Review.

- Requirements for the ICW system are included in the Preliminary Design Report documentation. Requirements for the High Voltage System are included in the Basis of Design report.

### Comments

- There was an inconsistency identified between TPC stated in PMP and PEP. The PMP documented $35,650K and the PEP documented $35,645K. Additionally, PEP states OPCs are estimated to be $1.1M however cost tables of both PMP and PEP identified $745K total.

- The project should clarify the breakdown of scope between CD-3a and CD-3b in the DOE CD-2/3a presentation. Further clarify the CD-3b base scope of work (threshold KPP's) and optional scopes (objective KPP's). Clarification should include changes to the Acquisition Strategy and Project Execution Plan documents.

- The assumptions document refers to a November 27, 2009 DOE escalation rate document; however, the project appears to be using some other basis for the escalation

rate assumed. Adjust either the assumptions document or the cost & schedule presentation regarding the basis of the escalation model assumed.

- The response strategy of the risk that the Kautz Road substation goes down during the time that the master substation is down says that this is a Fermilab issue and not a project issue. To increase reviewer level of comfort that the project is well understood and that impacts to science are minimized, update the response strategy to detail how Fermilab would respond to this risk. Also include the "test" shut-down of the master substation that is scheduled for November 2014.

- No documentation was provided regarding Value Engineering. Consider providing reviewers access to any VE documentation available.

- The response strategy for the "Errors & Omissions" risk includes discussion of constructability reviews by the CM. Verify that the response strategy is accurate since FESS staff is the CM.

## Recommendations

20. There are concerns about encountering contaminated dredged materials. Testing of soils to be dredged should be completed with appropriate adjustments made to plans, cost estimates and risks.

21. The project should develop a list of all permits required for CD-3b. Note that if a US Army Corps of Engineers 401/404 permit is required it may take as long as 12 months to receive a permit after the permit application is submitted.

22. Get signatures on all project management plans and reports before the CD-2/3a review.

23. Address the comments from the September 26, 2014 lab-wide review before the CD-2/CD-3a review.

## 3.0 Charge Questions

### 3.1 Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? Are preliminary designs for all project scope, final design for Phase-A scope, and the respective design review reports complete? Similarly, is the CD-3a scope towards achieving the KPP's sufficiently defined and documented?

All Key Performance Parameters (KPP's) are well defined and documented with regard to technical scope to establish the project performance baseline. There are two threshold KPP's that establish the project's scope and various prioritized Objective KPP's that will be executed if excess funds are available. Preliminary designs exist for all project scope and a final design exists for the CD-3a procurement of the MSS Control Building. Comment and Compliance reviews were completed for all baseline scope, however the project team intends to complete an independent design review prior to the DOE CD-2/3a IPR. The CD-3a scope towards achieving the KPP's (ordering the MSS Control Building) is well defined and documented.

### 3.2 Is the Project's design appropriately developed and documented in the UUP Technical Design Report (TDR)? Is the final design sufficiently mature such that the Project can initiate procurements and start construction? What outstanding design risks remain? For those elements of the design that are not yet finalized, has the Project shown that there are no major risks or issues that impede a clear path to a final design?

The preliminary design appears to be at an acceptable level of maturity and well documented in the PDR. Most of the project details are not yet finalized, other than the design of the MSS Control Building, which has already entered the procurement process. The remaining design risk is primarily associated with schedule and procurement cost. The final design of the remaining items of the project does not appear to have any major obstacles that would impede achieving final design.

### 3.3 Has the Project developed a resource-loaded schedule that includes the Project's full scope of work? Is the schedule realistic and achievable?

Yes. The project has developed a resource loaded schedule reflecting the full project scope. The plan will be achievable with the suggested modification detailed under the cost and schedule recommendations.

### 3.4 Are the cost and schedule estimates complete and credible? Do they include adequate scope, cost and schedule contingency?

Yes, the cost and schedule estimates are credible; however additional work is required to define the critical path prior to baselining the project. It is also desired that the duration of the one year shutdown be further defined by detailing all work packages down to an adequate level of granularity that must occur during that period. The project also needs to develop a scope reduction list in the event the construction bids are submitted above the engineer's estimate.

### 3.5 Has the Project documented the Basis of Estimate (BOE) that supports the baseline cost and schedule presented?

Yes, the BOEs were developed and significant supporting documentation was available for the drilldown. The information was easily retrieved and easy to trace. Additional supporting H/V documentation was provided the day prior to the review, that the reviewers were unable to review. The Project Team advised that back-up for the unit prices for the major equipment associated with the Control Building were not available, but would be available prior to the DC-2/3a Review.

### 3.6 Are the project cost and scope consistent with the draft Project Execution Plan and preliminary performance baseline? Has the schedule been appropriately updated? Is adequate cost, schedule and scope contingency identified to mitigate risk prior to and after CD-3a? Is an Earned Value Management System employed and ready to begin monthly PARS-II reporting in a timely manner?

Yes, the performance baseline and information in the PEP are consistent.

Yes, the schedule has been updated, but requires additional levels of detail. The project presented cost and schedule contingencies, however the review team had difficulty understanding how those contingencies outside the risk register were calculated and require additional clarification. There is current no scope contingency defined however the project team has several scope reductions in mind that would still meet threshold KPPs.

Yes, the Laboratory has employed an EVMS; however the project did not have this information available at the time of this review. The project will be prepared to present a minimum of two months of EVMS data for the DOE CD-2/3a review.

### 3.7 Has the Project implemented Risk Management by identifying risks, performing a risk assessment (qualitative and quantitative) and developing mitigation plans? Are there any interdependencies with other projects or significant research operations? If so, have they been identified and are there plans in place to mitigate risk for the CD-3a scope?

Yes, the project has implemented risk management and has completed a risk assessment and developed mitigations plans as necessary. For CD-3a there is no other project or significant research operations interdependencies, however the project is aware there are significant interdependencies that will need to be addressed for CD-3b. The project has developed mitigation plans for several scenarios where power could be redirected to minimize impact to scientific operations in the event of an electrical failure from the other supporting substations. A Muon Campus milestone needs to be added to the schedule so that the float relative to scientific operations need for master substation return to operations.

### 3.8 Is CD-4 achievable with the Project's risks and within the DOE approved Total Project Cost?

Yes

**3.9 Has the Project updated required project management documents per DOE Order 413.3B for CD-2/3 and per the Fermilab Project Management System? Are the solicitation documents accurate and sufficiently mature to support the procurement and/or construction of the Phase A scope under CD-3A? Are the Acquisition Strategy and Acquisition Plan updated and approved? Are cost estimates reconciled and bids or quotes in-hand?**

Yes, the project has updated the required documents per DOE Order 413.3B for CD-2/3a and per the Fermilab Project Management System. The Acquisition Plan has been updated but not yet approved. Cost estimates have been performed by the A/E for design and from an independent third party consultant. These costs were reconciled by the project team. Bids for the CD-3a scope were not available at the time of this review however will be available for the DOE CD-2/3a review.

**3.10 Are the Project organization and staffing levels adequate to initiate construction and manage the work to achieve CD-4?**

Yes

**3.11 Are ESH&Q aspects being properly addressed at this stage? Are the Hazard Analysis Report and the final NEPA determination issued and are the permits in place to allow CD-3a scope to commence?**

The HAR is in draft form but needs to be updated by the Project ESH Coordinator prior to the DOE CD-2/3a review. The Project needs to locate the NEPA determination documentation from the DOE Site Office prior to the DOE CD-2/3a review. All permits for CD-3a have been addressed.

**3.12 Does the Project's process for monthly progress reporting satisfy DOE and Laboratory requirements?**

Currently the project is completing monthly one page status reports for progress reporting to the Laboratory and DOE-SLI. At the time of this review EVMS reporting information was not available to confirm if this meets DOE or laboratory requirements. It is recommended the reporting be reevaluated by the FPD to confirm the information reported meets the requirements of the Laboratory and DOE once EVMS data is available prior to CD-2/3a review in December.

**3.13 Has the Project appropriately addressed the recommendations from prior reviews?**

Yes

**3.14 Is the UUP Project ready for a DOE CD-2/3a review in December?**

Yes, once the recommendations contained within this document are completed and implemented the UUP Project should be ready for the DOE CD-2/3a review in December.

# 4.0 Appendices

A. Charge

B. Agenda

C. Report Outline and Reviewer Writer Assignments

D. Reviewers Contact Information

E. Table of Recommendations

Appendix A

# Charge

Director's Independent Design and CD-2/3a Review of UUP
October 20-21, 2014

**Overview** The Committee is to conduct a Director's CD-2/3a Review of the Utilities Upgrade Project (UUP) to assess if the project meets the Critical Decision 2/3a (CD-2, Approval of Performance Baseline and CD-3a, Approval to Start Construction, Phase A) requirements as specified in DOE Order 413.3B. UUP received CD-1 Approval on November 15, 2010. The project is scheduled for a DOE CD-2/3a Review on December 9-10, 2014.

**Project Description** The scope of this project includes design and construction of an upgraded High Voltage Electrical System (H/V) and Industrial Cooling Water System (ICW). The High Voltage Electrical Upgrade includes replacing the Master Substation Control Building and all associated interior components, oil switches, obsolete unit transformers and end of life feeder cables. The Industrial Cooling Water Upgrade includes installing and replacing the ICW watermain, upgrading the master pumphouse and adding secondary pumphouses.

**Prior Reviews** A DOE CD-0 Review of the UUP Project was conducted in July 2009, which resulted in CD-0 Approval on September 18, 2009, followed by Director's CD-1 Review of UUP on August 6, 2010, and a DOE CD-1 Review on August 24-25, 2010. The project obtained CD-1 Approval on November 15, 2010. *The Committee shall assess the Project's progress on addressing the recommendations from these prior Reviews.*

**Readiness for CD-2/3a** *The review committee shall assess the readiness of the project for CD-2/3a readiness including the completeness and self-consistency of the technical scope and final design work, cost estimate, schedule and management systems and staffing.* The committee shall evaluate the current schedule, taking risks into consideration, and determine if the Project's scope of work can be accomplished within the approved Total Project Cost (TPC) by the CD-4 date. The committee is to assess if the Project team is in place to implement full construction while providing monthly status/progress reports to DOE and Lab Management on cost/schedule against the Project Plan. The committee shall assess and confirm that ESH&Q has been adequately addressed.

The review committee should address the following specific questions in determining the Project's readiness for CD-2/3a:

**Technical**

1. Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? Are preliminary designs for all project scope, final design for Phase-A scope, and the respective design review reports complete? Similarly, is the CD-3a scope towards achieving the KPP's sufficiently defined and documented?
2. Is the Project's design appropriately developed and documented in the UUP Technical Design Report (TDR)? Is the final design sufficiently mature such that the Project can initiate procurements and start construction? What outstanding design risks remain? For those elements of the design that are not yet finalized, has the Project shown that there are no major risks or issues that impede a clear path to a final design?

**Cost/Schedule/Funding**

3. Has the Project developed a resource-loaded schedule that includes the Project's full scope of work? Is the schedule realistic and achievable?

4. Are the cost and schedule estimates complete and credible? Do they include adequate scope, cost and schedule contingency?
5. Has the Project documented the Basis of Estimate (BOE) that supports the baseline cost and schedule presented?
6. Are the project cost and scope consistent with the draft Project Execution Plan and preliminary performance baseline? Has the schedule been appropriately updated? Is adequate cost, schedule and scope contingency identified to mitigate risk prior to and after CD-3a? Is an Earned Value Management System employed and ready to begin monthly PARS-II reporting in a timely manner?

**Management**

7. Has the Project implemented Risk Management by identifying risks, performing a risk assessment (qualitative and quantitative) and developing mitigation plans? Are there any interdependencies with other projects or significant research operations? If so, have they been identified and are there plans in place to mitigate risk for the CD-3a scope?
8. Is CD-4 achievable with the Project's risks and within the DOE approved Total Project Cost?
9. Has the Project updated required project management documents per DOE Order 413.3B for CD-2/3 and per the Fermilab Project Management System? Are the solicitation documents accurate and sufficiently mature to support the procurement and/or construction of the Phase A scope under CD-3A? Are the Acquisition Strategy and Acquisition Plan updated and approved? Are cost estimates reconciled and bids or quotes in-hand?
10. Are the Project organization and staffing levels adequate to initiate construction and manage the work to achieve CD-4?
11. Are ESH&Q aspects being properly addressed at this stage? Are the Hazard Analysis Report and the final NEPA determination issued and are the permits in place to allow CD-3a scope to commence?
12. Does the Project's process for monthly progress reporting satisfy DOE and Laboratory requirements?
13. Has the Project appropriately addressed the recommendations from prior reviews?
14. Is the UUP Project ready for a DOE CD-2/3a review in December?

In responding to the questions above, the committee should present findings, comments, and recommendations at a closeout meeting with the UUP Project and Fermilab management. A written report is requested within two weeks after the completion of the review.

Approval:

Nigel Lockyer, Director of Fermilab — Date: 9/26/14

Appendix B

# Agenda

Director's Independent Design and CD-2/3a Review of UUP
October 20-21, 2014

## DRAFT AGENDA

**Monday, October 20, 2014**

**EXECUTIVE SESSION – Snake Pit (WH2NE)**

| | | | | |
|---|---|---|---|---|
| 8:00 – 8:45 | AM | 45 | Executive Session | Marc Kaducak/ Randy Ortgiesen |

**OVERVIEW PLENARY SESSION – Curia II (WH2SW)**

| | | | | |
|---|---|---|---|---|
| 8:45 – 9:15 | AM | 30 | Welcome and Fermilab Context | Kent Collins |
| 9:15 – 10:15 | AM | 60 | Project Overview | Russ Alber |
| **10:15 – 10:30** | **AM** | **15** | **BREAK – Outside Curia II (WH2SW)** | |
| 10:30 - 11:30 | AM | 60 | Cost & Schedule | Jon Hunt |
| 11:30 – 12:00 | PM | 30 | ES&H | Jack Cassidy |
| **12:00 – 1:00** | **PM** | **60** | **LUNCH – 2nd Floor Cross-Over** | |

**PLENARY SESSION – Comitium (WH2SE)**

| | | | | |
|---|---|---|---|---|
| 1:00 – 2:00 | PM | 60 | WBS 2 High Voltage | Randy Wielgos |
| 2:00 – 3:00 | PM | 60 | WBS 3 Industrial Cooling Water | Chuck Federowicz |
| **3:00 – 3:15** | **PM** | **15** | **BREAK – Snake Pit (WH2NE)** | |

**PARALLEL BREAKOUT SESSIONS**

| | | | |
|---|---|---|---|
| 3:15 – 5:00 | PM | 105 | Session 1: Management, Cost & Schedule – Snake Pit (WH2NE)<br>Session 2: ES&H –Theory (WH3NW)<br>Session 3: Technical (Industrial Cooling Water & High Voltage) – Racetrack (WH7XO) |
| 5:00 – 6:00 | PM | 60 | Executive Session – Snake Pit (WH2NE) |

**Tuesday, October 21, 2014**

| | | | |
|---|---|---|---|
| 8:00 – 8:45 | AM | 45 | Answers to Day 1 Questions – Snake Pit (WH2NE) |
| 8:45 – 10:15 | AM | 90 | Executive Session / Report Writing |
| **10:15 – 10:30** | **AM** | **15** | **BREAK – Snake Pit (WH2NE)** |
| 10:30 – 12:00 | PM | 90 | Executive Session / Report Writing (Box Lunch provided to Reviewers) |
| 12:00 – 1:00 | PM | 60 | Closeout Presentation – Racetrack (WH7XO) |
| 1:00 | PM | | Adjourn |

Appendix C

# Report Outline and Reviewer Writing Assignments

Director's Independent Design and CD-2/3a Review of UUP
October 20-21, 2014

| | |
|---|---|
| Executive Summary | Chair: Jason Budd |
| 1.0 Introduction | |
| 2.0 Management<br><br>Cost & Schedule | Jason Budd*<br>Tracy Lundin<br>Sherese Humphrey*<br>Bob O'Sullivan |
| 3.0 Technical | |
| 3.1 Industrial Cooling Water<br>3.2 High Voltage | Jeff Sims*<br>Jerry Leibfritz<br>Steven Hays<br>John Reid |
| 4.0 ES&H | Mike Andrews* |
| 5.0 Charge Questions | |
| **TECHNICAL** | |
| 1. Are all Key Performance Parameters (KPPs) sufficiently defined and documented to establish the project performance baseline? Are preliminary designs for all project scope, final design for Phase-A scope, and the respective design review reports complete? Similarly, is the CD-3a scope towards achieving the KPP's sufficiently defined and documented? | Jeff Sims<br>Jerry Leibfritz<br>Steven Hays<br>John Reid<br>All |
| 2. Is the Project's design appropriately developed and documented in the UUP Technical Design Report (TDR)? Is the final design sufficiently mature such that the Project can initiate procurements and start construction? What outstanding design risks remain? For those elements of the design that are not yet finalized, has the Project shown that there are no major risks or issues that impede a clear path to a final design? | Jerry Leibfritz<br>Jeff Sims<br>Steven Hays<br>John Reid<br>All |
| **COST/SCHEDULE/FUNDING** | |
| 3. Has the Project developed a resource-loaded schedule that includes the Project's full scope of work? Is the schedule realistic and achievable? | Sherese Humphrey<br>Bob O'Sullivan<br>All |
| 4. Are the cost and schedule estimates complete and credible? Do they include adequate scope, cost and schedule contingency? | Bob O'Sullivan<br>Sherese Humphrey<br>All |
| 5. Has the Project documented the Basis of Estimate (BOE) that supports the baseline cost and schedule presented? | Bob O'Sullivan<br>Sherese Humphrey<br>All |
| 6. Are the project cost and scope consistent with the draft Project Execution Plan and preliminary performance baseline? Has the schedule been appropriately updated? Is adequate cost, schedule and scope contingency identified to mitigate risk prior to and after CD-3a? Is an Earned Value Management System employed and ready to begin monthly PARS-II reporting in a timely manner? | Sherese Humphrey<br>Bob O'Sullivan<br>All |
| **MANAGEMENT** | |

| | |
|---|---|
| 7. Has the Project implemented Risk Management by identifying risks, performing a risk assessment (qualitative and quantitative) and developing mitigation plans? Are there any interdependencies with other projects or significant research operations? If so, have they been identified and are there plans in place to mitigate risk for the CD-3a scope? | Tracy Lundin<br>Jason Budd<br>All |
| 8. Is CD-4 achievable with the Project's risks and within the DOE approved Total Project Cost? | Jason Budd<br>Tracy Lundin<br>All |
| 9. Has the Project updated required project management documents per DOE Order 413.3B for CD-2/3 and per the Fermilab Project Management System? Are the solicitation documents accurate and sufficiently mature to support the procurement and/or construction of the Phase A scope under CD-3A? Are the Acquisition Strategy and Acquisition Plan updated and approved? Are cost estimates reconciled and bids or quotes in-hand? | Jason Budd<br>Tracy Lundin<br>All |
| 10. Are the Project organization and staffing levels adequate to initiate construction and manage the work to achieve CD-4? | Tracy Lundin<br>Jason Budd<br>All |
| 11. Are ESH&Q aspects being properly addressed at this stage? Are the Hazard Analysis Report and the final NEPA determination issued and are the permits in place to allow CD-3a scope to commence? | Mike Andrews<br>All |
| 12. Does the Project's process for monthly progress reporting satisfy DOE and Laboratory requirements? | Bob O'Sullivan<br>All |
| 13. Has the Project appropriately addressed the recommendations from prior reviews? | Tracy Lundin<br>All |
| 14. Is the UUP Project ready for a DOE CD-2/3a review in December? | Jason Budd<br>All |

Note: * Indicates Subcommittee Lead and integrator of write-ups
Underlined names are the primary writer.

Appendix D

# Reviewers' Contact Information

Director's Independent Design and CD-2/3a Review of UUP
October 20-21, 2014

Mike Andrews
Fermilab
mandrews@fnal.gov
630-840-8472

Jason Budd - Chair
Argonne National Laboratory
jbudd@anl.gov
630-252-5648

Steven Hays
Fermilab
slh@fnal.gov
630-840-2337

Sherese Humphrey
Argonne National Laboratory
sbrown@anl.gov
630-252-6484

Jerry Leibfritz
Fermilab
leibfritz@fnal.gov
630-840-8779

Tracy Lundin
Fermilab
tlundin@fnal.gov
630-840-5407

Bob O'Sullivan
Fermilab
bobo@fnal.gov
630-840-8094

John Reid
Fermilab
jsreid@fnal.gov
(630) 840-4984

Jeff Sims
Stanford University, SLAC
jsims@stanford.slac.edu
650-926-2068

Appendix E

# Table of Recommendations

Director's Independent Design and CD-2/3a Review of UUP

October 20-21, 2014

| # | Recommendations | Assigned to | Status / Action | Date |
|---|---|---|---|---|
| 1 | The bids for the MSS Control Building are expected later this month. The information received should be incorporated into the project plan (e.g. schedule, cost, risk, etc.) for the CD-2/3a review in December. | | | |
| 2 | A technical evaluation document should be prepared to assist in fair and even evaluation of the vendors and ensures selection of a competent vendor. | | | |
| 3 | An independent preliminary design review should be conducted prior to the CD-2/3a independent project review (IPR). | | | |
| 4 | An independent comprehensive design review should be conducted and comments addressed prior to award of the procurement of the scope of work beyond CD-3a which includes conventional construction and installation. This review should include Fermilab's Accelerator Division. | | | |
| 5 | Prior to CD-3b, consider engaging the local construction market and building interest with potential vendors by hosting a project introduction meeting. | | | |
| 6 | Perform successful monthly reporting cycle for as many periods as possible prior to the CD-2/3a Review, with documentation reviewed by personnel independent of the project. In order to successfully achieve this requirement, the project should work with their Federal Project Director to develop reporting level requirements (Level 2, control account, etc.), variance threshold requirements, and whether the project will report in PARS-II for the current and/or cumulative periods. | | | |
| 7 | Develop a scope contingency list, identifying currently defined base scope of work that can be removed from the project scope while still meeting their threshold KPPs. | | | |
| 8 | Document how the Risk Contingency, Unallocated Contingency and Estimate Contingency are used to calculate total contingency. | | | |
| 9 | Perform schedule analysis to ensure the plan is planned low enough to support the approach of execution, i.e., better refine activities being coordinated during the shutdown; the critical path is depicted in detail and is accurate, earned value techniques (PMTs) are appropriately assigned on activities that are not planning packages, add missing milestones that are included in the PEP/PMP, etc. | | | |
| 10 | Add a milestone in the schedule identifying the date when Muon Campus requires critical scope of UUP project to be complete. | | | |
| 11 | Document how schedule contingency was quantified. | | | |
| 12 | Update the Hazard Analysis Report to address the specific hazards relating to each phase of the project prior to the CD 2/3a DOE review. | | | |
| 13 | Locate the final NEPA determination documentation from the DOE Site Office and post prior to the CD-2/3a DOE review. | | | |
| 14 | Complete a preliminary Fire & Life Safety Assessment in support of the preliminary design phase of the project. | | | |
| 15 | Complete preliminary environmental & radiation safety sampling of the Andy's Pond, Casey's Pond, and Swan Lake dredge spoils which will be removed and relocated on site. Verify if any permits are required for this activity. | | | |
| 16 | Finalize and sign the Project HAR, ISM Plan, and QA Plan prior to the DOE CD 2/3a review. | | | |
| 17 | There are concerns about encountering contaminated dredged materials. Testing of soils to be dredged should be completed with appropriate adjustments made to plans, cost estimates and risks. | | | |
| 18 | The project should develop a list of all permits required for CD-3b. Note that if a US Army Corps of Engineers 401/404 permit is required it may take as long as 12 months to receive a permit after the permit application is submitted. | | | |
| 19 | Get signatures on all project management plans and reports before the CD-2/3a review. | | | |

| | | | | |
|---|---|---|---|---|
| 20 | Address the comments from the September 26, 2014 lab-wide review before the CD-2/CD-3a review. | | | |