Director's CD-1 Review of the Long-Baseline Neutrino Experiment (LBNE) Project September 25-27, 2012

Charge

The Committee is to conduct a Director's Review of the Long-Baseline Neutrino Experiment (LBNE) Project. The Committee is to assess if the project meets the Critical Decision 1 (CD-1) "Approve Alternative Selection & Cost Range" requirements as specified in DOE O 413.3B. Additionally this review is a preparation for a planned DOE Independent Project Review/Independent Cost Review (IPR/ICR) scheduled for October 30 – November 1, 2012.

The Long-Baseline Neutrino Experiment (LBNE) Project will enable a world-class program in neutrino physics focused on precision measurements of the neutrino mixing matrix via $\nu_\mu \rightarrow \nu_e$ appearance and ν_μ disappearance measurements, with goals of determining the sign of the mass hierarchy and searching for CP violation in the lepton sector. In its original configuration, which was subjected to a Director's Review in March 2012, it was planned to build: a new neutrino beam at Fermilab directed towards a detector complex >1000 km away, planned to be in the Sanford Underground Laboratory at Homestake in Lead, South Dakota; a liquid argon (LAr) TPC detector deep underground at the far site to measure the properties of the neutrinos after they travel 1300 km through the earth; a near detector complex on the Fermilab site to measure the neutrino beam properties at the source; and conventional facilities at Fermilab and Sanford Laboratory required to support the beam and detector systems. The underground LAr TPC detector at the far site, in addition to measuring neutrino oscillation parameters, would also enable a broad program in proton decay and neutrino astrophysics. Fermilab is the lead laboratory for the overall LBNE Project. BNL and LANL are partnering with Fermilab to provide key elements of the Project.

The project has been reconfigured and the scope changed since the March 2012 Director's Review. The scope change was necessary to meet cost objectives provided by DOE OHEP after the design presented at the March Director's Review had been developed. The revised CD-1 scope consists of the neutrino beamline, tertiary muon detectors to monitor the neutrino beam, and a far LAr TPC detector on the surface on the Sanford Laboratory site. An extensive evaluation for additional cost reductions was performed. The significant Near Site configuration changes include re-arrangement of the Target Complex to create a stacked building on one side of the beamline reducing facility size and footprint, reduction in remote handling capabilities, use of NuMI-like targets and NuMI-design horns, shortening the primary proton beamline, and revisions to the size of the Target embankment resulting from the shortening of the beamline and increasing berm slopes. With elimination of the near neutrino detector, the associated surface building, shafts, and underground hall are also eliminated. The revised Far Site scope includes a surface-level detector in a pit with detector modules side-by-side, a NOvA-style surface service building, elimination of the 1kt Prototype, and increased scope for the 35t Prototype. There are several options that may be pursued that could result in future modifications to the Project's scope with non-DOE funding. However, these are not part of the CD-1 scope that is the subject of this review, and they will be presented for background only.

The committee is to review the changes to the project's design since the Director's Independent Conceptual Design and CD-1 Review conducted on March 26-30, 2012 for the scope presented.

This includes the updated LBNE's Conceptual Design Report (CDR) and applicable drawings and specifications.

The main focus of this review is to look at the project's cost, schedule, management, and ES&H. The project will present a Cost Range that the review committee is to assess and determine if it is appropriate based on the following factors: the scope of work; the maturity of the design; the Basis of Estimate (BOE); and the risks associated with the scope of work. The team will also look at the WBS – Work Breakdown Structure, WBS Dictionary, BOE – Basis of Estimate documentation, risk and contingency analyses, RLS – Resource Loaded Schedule, and time phased funding and cost profiles. The committee is asked to review each of these items, for quality, completeness, and accuracy. Furthermore, the committee is asked to review and assess the quality of and comment on the additional formal project management documentation required for CD-1 approval.

In performance of a general assessment of the Project's progress, current status, and the identification of potential issues, the committee should address the specific questions on attachment 1. Additionally the committee is to review and comment on the Project's response and actions taken on the relevant recommendations from the March 2012 Director's Review. Finally, the committee should present answers to the above questions and any recommendations at a closeout meeting with LBNE's and Fermilab's management. A written report will be provided within 1 week after the review.

Attachment 1

Review Charge Questions

1. Does the conceptual design satisfy the performance requirements?
2. Can the design be constructed, inspected, tested, installed, operated and maintained in a satisfactory way?
3. Has value engineering been performed as part of the design development and has it been documented?
4. Is there adequate documentation to support the conceptual design, which will allow the transition to developing the preliminary design?
5. Has the Project developed a quality resource loaded schedule? Has all the work been appropriately identified, estimated and scheduled?
6. Is the estimated cost range and project duration realistic, consistent with the technical and budgetary objectives, and justified by the supporting documentation? Have assumptions been included in developing the proposed cost and schedule range, and are they documented.
7. Has a life-cycle cost estimate been performed, documented, and does it address alternatives? Has the selected alternative been adequately justified on the basis of cost, schedule, and scope?
8. Has the Project implemented a Risk Management Process by identifying risks, performing a risk assessment and started developing mitigation plans at an appropriate level for the CD-1 stage?
9. Does the Project Team have adequate management experience, design skills and laboratory support to produce a credible technical, cost and schedule baseline?
10. Is the current staffing level adequate to complete the work to achieve CD-2? If not, has the appropriate staffing level been identified in the schedule and has a staffing plan been developed to acquire the future staffing needs?
11. Are ES&H aspects being properly addressed and are future plans sufficient for the project's current stage of development?
12. Has the project acceptably addressed the relevant recommendations from the Director's Review conducted in March 2012?
13. Is the documentation required by DOE O 413.3B in order and is the LBNE Project ready for a DOE CD-1 review at the end of this October?