

Charge from the LBNF Project Director/Project Manager
Independent Conceptual Design Review of the LBNF Cryostat
27-28 May 2015 at CERN

The Committee is requested to conduct an independent conceptual design review of the Long-Baseline Neutrino Facility (LBNF) cryostat, which will support the operation of the far detector of the Deep Underground Neutrino Experiment (DUNE). This review is a prerequisite for a planned CD-1 Refresh DOE Independent Project Review/Independent Cost Review (IPR/ICR) scheduled for July 2015.

The Long-Baseline Neutrino Facility (LBNF) Project will enable a world-class program in neutrino physics for DUNE focused on precision measurements of neutrino mixing via ν_e appearance and ν_μ disappearance with goals of determining the sign of the mass hierarchy and searching for CP violation in the lepton sector, searches for nucleon decay, and measurement of astrophysical neutrinos. LBNF consists of a high-power, broad-band neutrino beam at Fermilab that will illuminate the DUNE liquid argon TPC far detector at the Sanford Underground Research Facility in Lead, South Dakota and the DUNE near detector on the Fermilab site, the cryogenic infrastructure to support the far detector, and all the necessary conventional facilities.

The U.S. predecessor project, LBNE, achieved CD-1 in Dec 2012. The configuration and scope of DUNE-LBNF represents a substantial evolution from LBNE, involving international partners and enabling a broader physics program. The DUNE far detector will be underground at a depth of 4850 feet (1480 m), and will be deployed sequentially in four modules each with liquid mass of approximately 17.5 kt. Cryostats for the DUNE far detector will be built as part of the LBNF Project and will utilize membrane cryostat technology. The mechanical structure supporting the thermal insulation system and membrane is a free-standing steel-frame rectangular parallelepiped with dimensions on the order of 60 m x 15 m x 15 m. This design is being developed by CERN.

The committee is asked to review the LBNF cryostat design. To meet the requirements for CD-1 the design must be at the conceptual level or greater. The committee will make their assessment based on outcomes of prior design reviews, LBNF's Conceptual Design Report, drawings, specifications, engineering notes, and discussions with the project team. In making its assessment, the review committee should consider factors such as:

- Key requirements/specification: Are the driving requirements adequately defined and do the key design parameters follow from them?
- Does the conceptual design meet the requirements?
- Have risks related to the cryostat design been identified?
- Are engineering analyses adequate to support conceptual design?
- Are major system interface points identified to the LBNF conventional facilities, cryogenic system and the DUNE detector?
- Are safety issues identified and adequately addressed at the conceptual design level?

Design documentation will be provided to the committee for review and evaluation approximately one week before the review meeting. The format of the review meeting itself is planned to include an introductory presentation, but to mainly to involve give and take between the review committee and the LBNF design team, designed to provide the committee with the opportunity to fully understand the design, to pose questions and discuss answers. The review committee is requested to provide a written report with its evaluation of the design and a brief oral summary of the report at the end of the second day of the review.