LBNE Reconfiguration Engineering/Cost Working Group 5th Meeting

May 4, 2012

Present Committee Members:

- Jim Strait, FNAL (deputy chair)
- Bruce Baller, FNAL
- Mike Headley, SURF
- Christopher Mauger, LANL
- Elaine McCluskey, FNAL
- Vaia Papadimitriou, FNAL
- Bob O'Sullivan, FNAL
- Jeffrey Appel, FNAL (Scientific Secretary)

Present Invitees:

- Jeff Dolph (LBNE Systems Engineer)
- Tracy Lundin (LBNE CF project manager)
- Jeff Sefcovic (LBNE project controls for CF)
- Jim Stewart (LBNE (former) WCD project manager and expert-at-large)

<u>Draft Agenda</u>

BRIEF (~5 min each) "around the table" summary of updates to cost estimates

- Christopher Mauger (Near Detector)
- Bruce Baller (LAr-Far Detector)
- Tracy Lundin (Conventional Facilities)
- Vaia Papadimitriou (Beam)

Summary of current costs for various options and staging scenarios (Jim)

... and discussion

Christopher Mauger – Near-Detector Cost Update

Christopher noted that work had begun on seeing if and how a LAr detector would fit in to the NOvA hall. He noted that the NOvA Hall is even narrower than the MINOS Hall at Soudan. There is a meeting following this one to discuss safety issues associated with gas and liquid cryogens in the hall. There could be cost implications coming out of that meeting. It was noted that the discussions involve Mike Andrews who is very familiar with these issues from the stationing of the ArgoNeuT LAr detector in the MINOS Near Detector Hall. Additional issues raised are the possible cost of maintaining existing halls as multipurpose facilities, especially where there are already other experiments running.

There is also work ongoing about the detector-in-a-shaft option. Cost figures are expected in about a week's time.

Finally, a uniform set of cost documentation is being used for all the near-detector systems being considered.

Bruce Baller – Far Detector Cost Update

The only significant change this week is for the 10 kT far detector costs. There are three options in the works. A system with two 5 kT modules was viewed as the best "way to go." The version at depth requires longer drift lengths and a septum. Bruce and Jeff Dolph reviewed the detector costs, which now include surface storage for the underground detector. Project management costs remain a topic of discussion.

Tracy Lundin – Detector Conventional Facilities Cost Update

There is a lot of work going on to review and revise three primary components of the conventional facilities cost models: excavation, underground infrastructure, and surface facilities. The other primary component of the CF estimate was referred to as "systematics". There are about a dozen separate components in the "systematics" list, but costs tend to scale with the above three areas. Elaine McCluskey is helping with the work.

There is a revised cost for both a 5 and a 17 kT LAr detector at depth at Homestake, using the guideline of including only what is needed for the LBNE experiment. West access drift life-safety will be provided by SURF, as well as water supply in the Yates and Ross shafts. Provision of power for LBNE will have to be part of the LBNE Project cost. Drift work in the area of the detector will be an LBNE Project cost. The new estimates have the detector hall back close to the Yates shaft, with phasing near the Ross shaft off the table for now. There have been many steps in arriving at this solution.

Operating costs during the Project period are not yet available. Underground infrastructure costs have been significantly reduced in this exercise.

Excavation cost models for 5, 10, and 17 kT detector halls has been redone for Homestake. David Vardiman (geotechnical engineer with the South Dakota Science and Technology Authority, SDSTA) worked on this which will be used to export of the cost model to Soudan. SURF has arranged for review of these costs by Kiewit, a large construction company that was part of the construction management joint venture for DUSEL, which performed pre-construction estimating/scheduling services for the LBNE conceptual design. All this is in preparation for the meeting in Minneapolis on May 16 and 17. Tracy Lundin, Elaine McCloskey, Joel Sefcovic, David Vardiman, and Kiewit participation is anticipated for that meeting with the two firms hired by the University of Minnesota to develop independent cost models. The meeting will focus on the 5 kT and 17 kT options. The best location of a new cavern underground at Soudan has been chosen, with shafts and surface facilities outside the historic part of the Soudan-mine park.

There will be a meeting with Steve Dixon and Marvin Marshak to review how the “systematics” costs at Soudan and Ash River have been modeled.

Attention is turning to costs for a 5 kT detector at depth, to be followed by the 17 kT cost model. Following that, work will turn to the Soudan option at depth.

Vaia Papadimitriou – Beam and Its Conventional Facilities Cost Update

The potential $62.5M in savings listed earlier has been cut to $51M now, with the least expensive solution being to use the NuMI horn design and horn power supplies. So far, the primary-beam optics design is being kept unchanged. However, John Johnstone may have a solution which allows a shorter primary beamline. It has not been possible to reduce the tritium interception as much as hoped earlier. Also, reusing NuMI strip line does not appear to be an option, and reducing the number of dipoles in the primary beamline is rejected as the lower beam energy would result in more frequent pulsing of the horns to maintain the power level, something that the existing horn and power supply system is not expected to be able to handle. One can consider moving the horns closer in a LBNE Phase 2. However, there is an additional cost in Phase 1 to allow for this.

Work is still ongoing on the costs for continuing to use the NuMI beamline. Also, there is effort to understand the risks associated with tritium mitigation, and associated costs.

The day before the meeting, there was another meeting on the conventional facilities for the beamline. A work list was generated, and savings are thought to be possible. The absorber remote control room has been removed from the design to save cost. While muon counters are being removed from the design, it is thought to be foolish not to include the space for them to be added later.

Jim Strait – Summary Costs of Various Options

Jim went through the current methodology used in his costs spreadsheet. There was discussion of the scaling of the project office cost to the cost of the rest of the project. Risk contingency has been kept fixed to previous estimates, not scaled to the cost of the rest of the project (now reduced). The current spreadsheet has updates surface costs, with prior-year LBNE costs removed. There is no update yet for any of the NuMI options.