

**Long Baseline Neutrino Committee & Neutrino Cost Group**  
Attachment 1 to DUNE Far Detector Approval Process –  
Guidance for Technical and Costing Documents to the LBNC and NCG  
January 26, 2018

This note is to provide guidance to the DUNE Collaboration in the preparation of technical and costing documentation for review by the Long Baseline Neutrino Committee (LBNC) and the Neutrino Cost Group (NCG). This is an attachment to the overall plan for a phased review process, the “DUNE Far Detector Approval Process.”

The LBNC and NCG will review the DUNE Technical Proposal (TP) and Technical Design Report (TDR) in close coordination, evaluating both the technical aspects of the proposal as well as costs, risks, and schedule. We expect that the DUNE design, responsibility assignments, cost and schedule will be in a preliminary state (possibly with multiple technical options in some cases) at the time of the TP and mature by the time of the TDR. It is expected that first a TP and then a TDR, encompassing all Far Detector systems, will be delivered to the LBNC and NCG in a complete and comprehensive document or set of documents. In a nutshell, the DUNE collaboration needs to make a persuasive case to the LBNC and NCG that they have carefully evaluated and understand the cost, schedule, and manpower required, the risks inherent in the technical approach and how they might be mitigated, and the flow down from physics objectives to system requirements. Detailed information on CORE costs, funding, manpower, schedule and risks are to be prepared in conjunction with the technical documents to assist the NCG in its evaluation.

Our goal is to make the process as interactive, direct and simple as possible, with the realization that “one size probably does not fit all” parts of the project. Given all the work that goes into a TDR we hope the following requests will involve only modest additional effort to the items outlined in the enclosed “DUNE Far Detector approval process” document, while making it easier for the LBNC and NCG to provide a meaningful assessment. Please feel free to ask if you have questions, and know that your comments and suggestions in improving this process are most welcome.

In the above spirit, we should like each volume of the TDR to demonstrate that:

- Physics requirements flow down to system requirements and design criteria and cost sensitivity is understood for key design parameters.
- The work scope is complete, well organized with clear assignment of responsibilities.
- Cost estimates and the impacts of risks are based upon standardized processes.
- A resource-loaded schedule is developed for the TDR and provides a basis for examining the feasibility of the detector construction plan.
- A thorough risk register has been developed and risk management strategies are in place.
- Staffing needs are well identified and achievable.
- Any open design decisions are identified and a clear path and timelines for their resolution is identified, including any additional R&D.

- Where R&D already supports design implementation, the results of this work is described.
- Interfaces with all other systems are documented and defined, and the status of agreements is specified.
- The project is poised to initiate and effectively manage the final detailed design phase of the project as well as begin long lead procurements.

We expect that the Technical Proposals will begin to address these topics at a level appropriate to a preliminary state of the design.

TDR volumes and associated documentation should include, as appropriate, the following discussions or equivalent information:

1. A section near the beginning of each volume outlining the overall design motivation should include (i) a description of the flow down from physics to systems requirements and the results of studies justifying key design decisions; (ii) a description of cost sensitivity to selected key design parameters; and (iii) a basic description of how the construction project is structured and the associated tradeoffs and risks.
2. A Work Breakdown Structure (WBS), showing costs, assignment of responsibilities, expected funding sources, bases for estimates, etc. for the major subsystems (aka parts or components) of the detector. Early in the process (i.e. February 2018) the LBNC and NCG will review the proposed WBS to ensure that it is structured to provide the information needed for successful review of the detector subsystems. We anticipate that a WBS down to at least level 4 will be required for a comprehensive review. We may also want to be able to clearly segregate resources required for the receiving, installation, and commissioning phases of the project.
3. The WBS should indicate the manpower resources needed, e.g. physicists, computing and software professionals, engineers, technicians, technical groups, etc. The WBS is expected to provide the input to a Resource Loaded Schedule (RLS), which will be developed for the TDR to allow assessment of the feasibility of the construction plan. This RLS will include the duration of the major tasks, the labor resources by category to complete each task, and the funding sources for those labor resources.
4. The names of the senior project team, e.g. project leader and leaders of each subsystem and their level of commitment (FTE fraction) to the project. Separately, confidential information sufficient to demonstrate the level of manpower and expertise necessary to execute the construction of the experiment.
5. A set of fixed milestones, that will be used as the means of tracking and measuring progress throughout the project.
6. A risk register, giving the likelihood and impact of each significant risk, and the strategy and plans for mitigation, including estimates of the additional labor or costs involved and where they would come from.
7. The spending profile by year required to complete the project on schedule.

8. A confidential money matrix, and confidential estimate of possible funding profiles, as specified in the DUNE Far Detector Approval Process document.

If you have questions, or suggestions on improving this process, please contact David MacFarlane ([dbmacf@slac.stanford.edu](mailto:dbmacf@slac.stanford.edu)) or Gina Rameika ([rameika@fnal.gov](mailto:rameika@fnal.gov)).