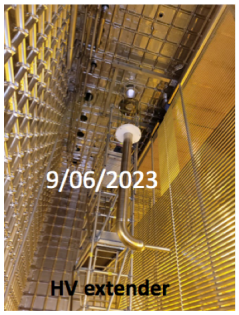
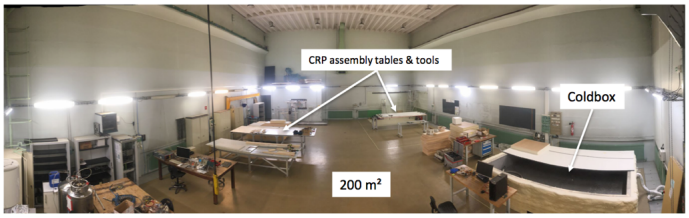
LBNC Meeting Report






Assembly table for prototype

October 2-4, 2023

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Introduction

The LBNC met virtually on October 2-4th, 2023.

The attendees at the meeting, shown in Appendix I, included LBNC members and consultants, DUNE Collaboration spokespeople, Mary Bishai and Sergio Bertolucci, and LBNF/DUNE members, Fermilab Director, Lia Merminga, and Fermilab Deputy Director for Science and Technology and CRO, Bonnie Fleming, Chair of the FNAL Physics Advisory Committee, and representatives of the US DOE.

The LBNC is a review and advisory committee charged by and reporting to the Fermilab Director. This includes making recommendations concerning the Conceptual and Technical Design Reports for DUNE to the Director. The LBNC reviews DUNE from a scientific, technical, schedule, risk and management perspective while the Neutrino Scope Group reviews costs and schedule associated with DUNE construction. Specifically, the purpose of the LBNC is to review the scientific, technical, schedule, risk and management plans and decisions of the DUNE experiment, and to provide reports and recommendations to the Fermilab Director; the reports are made available to the DUNE Collaboration, LBNF/DUNE-US Project and the RRB. The LBNC scope does not include review of LBNF or PIP-II beyond the relevant interfaces impacting DUNE, as these projects are reviewed through the U.S. project management process.The latter is accomplished with a single presentation at the beginning of the meeting: at this meeting the discussion of progress with the beamline is also included in the LBNF report.

The charge for this meeting, prepared by the Deputy Director for Science and Technology, is shown in Appendix II.

For each meeting the LBNC is organized into small groups which concentrate on particular components of the presentations and the discussions. The makeup of the teams for this meeting is shown in an Appendix III. The committee as a whole discusses and reaches a consensus for both the Closeout Report and the Meeting Report.

We hold up to three general meetings a year and intermediate shorter and targeted reviews as the need arises. After the previous LBNC meeting in March of 2023, LBNC continued and completed the review of the Far Detector Vertical Drift Technical Design Report (TDR), and proposed it for endorsement by the Fermilab Directorate in early June 2023. At the end of May 2023 we received a first updated draft of the Far Detector Horizontal Drift Technical Design Report (TDR). LBNC provided detailed comments by the end of June 2023 and after some very productive iterations with DUNE the LBNC proposed the updated TDR for endorsement by the Fermilab Directorate in early September 2023. At each meeting the LBNC makes the Closeout Report open to all, and subsequently prepares this LBNC Meeting Report. The agenda and presentations used for the meeting, the Closeout Report, and this report can be accessed at**:** https://lbnc.fnal.gov/

Again, for this meeting, the presentations have been excellent. The LBNC expresses its appreciation for the work of the DUNE and LBNF participants in preparation and presentation of all the material for this review. Finally, the committee thanks Fermilab, its Directorate, and its support staff, for their assistance and support in making this meeting possible and productive.

Executive Summary

The committee commends DUNE for the completion of the FD1 and FD2 TDRs and their approval by the Directorate in September of 2023, and for the preparations and completion of the FDC CD2/3 DOE review concluding that the detector TPC and detector readout systems are ready for CD2/3 approval with only minor recommendations.

LBNC is pleased to see substantial progress from DUNE on several fronts : the re-organization of Software and Computing, work towards completion of the Near and Far Detector prototypes and preparations for data-taking in 2024, ramping-up of the FD production factories, continued advancements on reconstruction, simulation and physics analysis with the Near, Far and Prototype detectors, technical progress on all sub-detectors of the Phase I ND, and growing international efforts on Phase II R&D for both the Near and Far detectors.

The committee notes significant progress made on Computing on several fronts, and highlights the need for the timely definition and a subsequent validation of the future software framework with a review by a team of experts, along with a clear plan for making the final choice.

LBNC commends the collaboration and project on the very substantial efforts and progress made on several fronts in preparation for the FDC CD2/3 DOE review, and urges the collaboration and project to put together a clear strategy, accompanied with a timeline and contingency plans where necessary, with which the remaining CD2/3 recommendations can be satisfied. To that end, LBNC would also like to better understand what the follow up review process will be for the FDC CD2/3 approval.

The committee welcomes the CD3b approach that DUNE plans to follow in order to mitigate effects related with the delay of FDC CD2/3 approval, but would like to better understand its scope.

LBNC is concerned with possible ramifications the delay of PIP II might have on the start of DUNE oscillation physics, and urges DUNE to continue to assess the situation.

LBNC is also concerned on the impact the delay of the NUMI beam delivery will have on the successful completion of the ND two-by-two prototype run and on baselining ND-LAr, and proposes that DUNE work together with the Host Lab in order to develop possible mitigation strategies.

LBNC is pleased to see progress made on the several beamline components. The committee notes the need for advanced planning for spares, and the need to identify critical skills and their near and long-term availability.

The committee is very pleased to see the formation of the FNAL-DUNE Coordination Office with a mission to execute the plan for the FDC construction, and welcomes initial efforts on this front. However, LBNC is concerned with the SURF hiring profile presented, and would like to better understand the staffing profile needed as a function of time, together with a realistic plan and timeline for achieving this, and how that affects the overall schedule. The committee notes

that training and safety considerations should factor in this plan.

LBNC is happy to see repairs taking place at the Yates Shaft, and would like to stress that maintaining this infrastructure is important given the risks its absence might pose to the project execution. Hence, LBNC is looking forward to updates on this front.

The committee acknowledges significant technical progress made on all sub-detector systems of the DUNE Phase I ND, and given this would like to see a clear plan and timeline for the Phase I ND baselining.

LBNC notes the substantial progress made on resolving the APA broken wire issues, and is looking forward to an updated construction plan and schedule. LBNC notes that this must be followed carefully in order to determine the new APA production schedule, and satisfy the FDC CD2/3 DOE review recommendations regarding the optimization of the installation schedule.

The committee acknowledges the great effort and time DUNE and LBNF/DUNE puts into preparing the necessary material for this review. In order to facilitate the process and preserve continuity, the committee would like to kindly request that all talks are uploaded a week ahead of time, they start with a summary of the status of previous recommendations, and in case, for good reasons, they focus only on a specific issue finish with a high level summary of the status on all remaining areas.

LBNF Status

Findings:

Recent progress has been reported, including the status of excavation work at 80% completion, BL at 70% final design, and CF at 100% final design.

The project is working towards receiving budget authority for expenditures as presented at CD-1RR to execute on major deliverables with a steep funding profile over the next two years with a ramp up by $75M to $255M in FY24 and by another $50M to $305M in FY25. The FDC CD-2/3 Review outcome consists of a set of actions before proceeding to CD-3b with about $100M scope towards February 2023.

The outcome of the CD-2/3 ICE is closely aligned with funding figure of FDC at about $1.1B TPC.

CD-3a authority for NS early procurements has been received and FS electrical infrastructure and crane contracts have been awarded.

FDC CD-3a ESAAB approval was granted on 21 February 2023.

Work at the near site remains funding limited.

Comments :

The project progress remains strong. Excavation work is 80% complete, BL design is at 70% and NSCF at 100% design completion.

Current short-term funding uncertainties are mitigated by the availability of funds from a sufficient carry-over from FY2023. However, the spending profile is steeply rising over the next two years and significant budget authority is required in order to exercise the large (~$100M) construction option for the nitrogen refrigeration system manufacturing Q2 FY2024 and to continue work unimpeded through FY2024.

This budget authority has not been provided at the FDC DOE IPR in September 2023 and several recommendations on international agreements, contingency planning, installation and integration planning, as well as risk + project management need to be addressed first. Addressing these recommendations appears to require substantial effort in preparation for an CD-3b ESAAB in early 2024.

Establishment of the FNAL-DUNE Coordination Office in May 2023 is a positive step towards ensuring that Fermilab provides the necessary host lab support for the project, especially for the FDC construction that will begin next year.

Far site staff hiring needs vary over the life of the project with a few very steep ramp-ups. The project acknowledges the staffing challenge and is working to manage it.

The safety record at the far site remains excellent - almost 3 years without Lost Time Incidents. With rapid ramp-up of effort and new types of work coming up at the far site, the attention to safety culture, including training and procedures, must remain at the center of attention.

The LBNC is glad to see that repairs and regular egress exercises are carried out at the Yates

Shaft. The issue remains critical and the effort for maintaining the infrastructure must be adequate in relation to the potential risk that this poses to the project.

Recommendations:

1. Develop a contingency plan that is aligned with FDC CD-3b ESAAB in early 2024 for the case that specific international project contributions cannot be formally secured in time.
2. LBNC would like to better understand the staffing profile needed at SURF vs time for the various required skill sets, along with the associated training and safety considerations, and see a clear strategy and timeline for achieving this challenging hiring campaign.

Beamline Status and Progress

Findings:

CD-3a authority has been granted to purchase capacitors and ferrites of kicker magnets and a design review is planned for next months prior to procurement. The CD-2/3 review is planned in the 3rd quarter of calendar year 2024.

The beamline magnets have been added to project scope and will be produced or acquired by Fermilab. Magnet power supplies are being updated or replaced off-project under the ACORN initiative

Comments:

Like most work at the Near Site, work on target, horn and beamlines is funding limited and the current focus is on items with long lead time or of high technical risks. Many components have already entered a detailed design, prototyping and planning stage and, since the last LBNC meeting, progress has been made on beamline magnets and power supplies, target prototype testing, horn power supply development and conventional infrastructure detailed design.

The team has identified the investments that are required to accommodate the 2 MW beam power coming from the ACE upgrades, specifically the reduced MI cycle time. No showstoppers have been identified and increasing frequency rather than the number of protons per pulse for the power ramp-up might reduce fatigue effects caused by thermal shocks. The BL team is now hoping for a clear path forward in order to take the required integration steps.

NSBL continues to suffer from limited availability of highly specialized expertise, such as high-power pulsed electric engineering. These critical and strategic fields could be identified in order to setup dedicated training and retention programs.

While expected in a long-term and matrixed project such as LBNF/DUNE, turnover of personnel is posing risks to the project schedule. Continued efforts on gauging team morale and taking actions to retain critical resources should remain a priority.

Critical spares are not part of the project envelope. However, the planning and production of spares may compete with project resources. Considering that the production of some spare components can take several years (2-3 years for a horn), a clear understanding on required spares in order to achieve the expected day-1 reliability should be reached so that this can be integrated into the resource-loaded schedule and inform project-external funding requests.

Recommendations:

1. Assemble a list of critical long lead time spare components based on day-1 machine reliability expectations. Use this list to inform resulting resource requirements and competition within the timeline of the project.
2. Present to the laboratory and project leadership a list of niche critical skill sets and potential impact to the project if these skills become unavailable.

DUNE Status

Findings:

Since the last LBNC meeting in March 2023, DUNE successfully completed the Technical Design Reports (TDR) for both FD-HD and FD-VD. Both TDRs were subsequently approved in September 2023 by the Fermilab Directorate. LBNC commends DUNE for this important milestone.

The DUNE Collaboration has also made significant progress on several fronts, including: the ramping-up of the FD production factories, both for the FD-HD and the FD-VD, with multiple Production Readiness Reviews being planned for 2024; work towards the completion of the ND and FD prototypes, and preparations for beam data-taking in 2024; technical progress made on all sub-detector systems of the Phase I ND; the growing efforts toward Phase II R&D for both Far (FD3, FD4) and Near detectors (ND) from both US and international institutions; the reorganization of the Software and Computing working group; the continuation of a large effort on reconstruction, simulation and complete physics analysis, both with real and simulated data, for the ND, FDs and Prototype detectors.

Comments:

LBNC received a summary of the outcome of the CD2/3 DOE review concerning FDC, and the recommendations that must be addressed in order to reach approval. LBNC would like to see a clear plan and a realistic timeline on how these recommendations will be satisfied, along with possible alternative approaches where necessary [contingency plan].

The committee understands the causes of the delays of PIP II but is concerned with the impact those might have on the start of DUNE oscillation physics.

LBNC understands the origin of the delays in the NUMI beam delivery but is concerned with the impact these will have on the timeline of the two-by-two ND prototype run and on the baselining of ND-LAr.

The committee is pleased to see technical progress on all sub-detector systems of the DUNE ND for Phase I, but would like to see a clear plan and timeline for the ND baselining. Careful planning and coordination will need to be done to coordinate both in-project and out-project components of the ND.

Recommendations:

1. LBNC would like to see a clear plan and a realistic timeline on how the CD2/3 recommendations will be satisfied, along with alternative approaches where necessary [contingency plan]
2. The committee would like to be presented with a mitigation strategy for delays related to beam delivery and procurement issues induced on the ND 2-by-2 running to minimize their impact on ND-LAr baselining.

FD1 Horizontal Drift

Findings:

Closure of the NP04 TCO for ProtoDUNE-II is expected to begin in October. The detector is expected to operate and take data in 2024, after operation of NP02 (VD).

Production of the "golden APA" was completed at Daresbury in 38 working days, achieving the target of less than 45 working days. This was facilitated by working "split shifts" to achieve 12-hour workdays.

Detailed analyses of the APA issues have led to a number of detailed changes that are expected to lead to improvements in reliability (and therefore also APA production speed), including in tuning of the winding machine, use of wire from only one vendor, modified procedures to completely replace rather than try re-tension out-of-spec wires, specification of soldering temperature and flux, etc.

Following the previous issues experienced with the initial launch of APA production, the APA production management team at Daresbury has been strengthened.

Commissioning of the APA winding machine at U Chicago has progressed to the point that it is expected to start winding the first APA there before the end of October.

The internal review of the APA production plan (recommended in the March LBNC review) is now scheduled for March 2024.

Comments:

The LBNC is pleased to see the technical progress on addressing the issues encountered previously with launching APA production, and the achievement of the "golden APA" production.

The LBNC likewise welcomes the strengthening of the project management at Daresbury, including addition of a senior production engineer as a consultant, involvement of the Head of Technology, and formation of a new APA Technical Board. We note, however, that the consultant will leave after December 2023; the ongoing effort to hire a lead engineer will be a key element of putting a successful plan in place for the duration of the APA production and should be followed carefully.

We commend the progress on the U Chicago APA production site, and note that it will be critical to transfer there the lessons learned at Daresbury, and to ensure that the sites produce APAs of equal quality.

The lessons learned from the golden APA and since need to be incorporated into a new optimization of the planning for APA production. This must be followed carefully, since only after the new planning is available will it be possible to evaluate the new APA production schedule, as well as its impact on the DOE review recommendations regarding optimization of the installation schedule. It is important this issue does not cause further delay in achieving CD2-3/ESAAB approval for the FDC.

Recommendations:

1. Develop an updated APA production plan and schedule, which would then be reviewed and validated at the internal review currently scheduled for March 2024.

FD2 Vertical Drift

Findings:
Following a positive recommendation from LBNC in June, the FD2-VD TDR was approved by the host lab director in September.

The simulation was refined for both FD1 and FD2, and the efficiency predictions are becoming increasingly similar between FD1 and FD2. This addresses a question raised in the previous LBNC meeting.

Preparations for ProtoDUNE-VD are well under way in the NP02 cryostat at CERN. The TPC (field cage, cathode, charge readout planes (CRPs), HV system) was completed on June 9. Remaining work includes remaining installation of the photon detection system, installation of the beam plug, and closure of the construction opening. Meanwhile, the Bottom Drift Electronics cold box results show good noise performance, well within DUNE requirements.

Preparations are being made for CRP production. The setup of the assembly site in Grenoble is in progress, and the Yale assembly facility is being expanded. The project notes that significant scientific involvement is needed in QC testing.

Final Design Reviews have been completed for all FD2 systems. Many FD2 PRRs expected during FY2024, with the goal to have all PRRs passed in Q1 of FY2025.

Comments:
The LBNC was pleased to see the FD2-VD Technical Design Report completed and approved by the host laboratory. We congratulate the FD2-VD group for the impressive development, confirmation, and documentation of the Vertical Drift design in the last three years.

A proposed order of filling NP02 and NP04 with LAr agrees with the previous recommendation of the LBNC, and gives the FD2-VD team more time to react to any finding from the ProtoDUNE-VD run. Given that the operation of ProtoDUNE-VD in NP02 in early 2024 will last only 3-4 months, the cold box tests will be important to understand long-term behavior of detector elements.

Recommendations:
None

Near Detector for Phase I

Findings:
The collaboration has made significant progress on all aspects of the near detector, and the committee commends them for this.

A clear plan is in place for prototyping and building ND-LAr. Currently, the 2x2 demonstrator is installed in the NuMI beam, and a full-scale demonstrator column is being set up in Bern.

The SAND detector is no longer part of the US project yet significant progress on it has been reported at the meeting.

Comments:
Delays in NuMI beam operations are delaying data taking on the 2x2 demonstrator, as are procurement issues with an ODH fan in the MINOS Near Detector hall that is needed for safe operation of the demonstrator. This is of concern as it may delay overall progress on the near detector, and is disrupting PhD projects that rely on this data.

While progress on SAND is continuing unimpeded, the committee is mindful about installation of the detector and the required underground infrastructure that needs to happen together with the other near detectors.

A number of design options for NDLAr, TMS and SAND remain open and need to be clarified before proceeding towards the ND TDR foreseen next year

Recommendations:
1. The collaboration should clarify the plan for a timely installation of the infrastructure required for SAND and closely monitor it, now that SAND is no longer part of the US project.

2. At the next LBNC meeting, the collaboration should outline their plan for baselining and CD-2 approval of the ND.

Computing

The DUNE Computing Consortium demonstrated good progress in commissioning new tools for data and workload management. The recent Monte Carlo production campaign is a clear example. This progress includes the integration of capabilities for the 2x2 subsystem. DUNE is preparing for important computing commissioning exercises. We support this program as it will allow DUNE to test new services at the right scale. We note that the Full Dress Rehearsal will happen in overlap with the (tails of the) LHC Heavy Ion run. We suggest DUNE to liaise with the facilities, particularly CERN and FNAL and understand potential issues with this overlap.

The US and the international contributions to DUNE computing have been clearly explained. We find the current split and sharing of responsibilities well balanced and we appreciate the good collaboration between the teams. We value the importance of distributed operations teams and the involvement of institutes from different countries in the development of the computing tools and services. We suggest continuing pursuing shared efforts and responsibilities. The new preliminary structure of US DUNE Computing was briefly sketched. As many details are being finalized, it is difficult for us to assess its effectiveness. We note that the model was cloned from the USCMS organization and that proved to be effective in organizing the US contribution to the experiment. We learned that a more formal process of collecting computing hardware commitments (pledges) is being considered. This process will involve the FNAL RRB. We support this evolution in light of the maturity reached by the DUNE computing consortium. We also believe that the formal process can be well supported by the informal process through the existing DUNE Computing Contributions Board. DUNE Computing made considerable progress identifying the computing requirements following from the physics requirements. We were presented a first version of the requirement mapping. While we could not go through the details of each single item, we are convinced that the computing consortium is on the right track to answer the DOE recommendation in this area.

The ND community has shown great progress in the areas of simulation and reconstruction. It identified the workflows and building blocks that should be common with FD and the ones that present novel requirements. The integration of ND and FD efforts where reasonable should be pursued to optimize effort. The computing resource projections were reviewed with a better understanding of the ND needs. The requirements from 2025 will be more challenging than expected, both in terms of volume and type of resources (e.g. GPUs). Active effort in code optimization is important and needed for maximizing efficiency and performance.

The process towards the future software framework(s) needs attention. The requirements from

the FD and ND are different in terms of technology and timescale. A Working Group (ND/FD/Computing) is looking at the requirements and should produce a proposal by the end of the year.

Recommendations:

1. We recommend converging on a plan with milestones to architect and implement the future software framework(s) and present the plan at the next LBNC meeting
2. We recommend an external review of the future software framework(s) proposal produced by the newly formed working group, from a team of HEP software experts.

ProtoDUNEs : Status and Plans

Findings:
Both ProtoDUNE detectors are essentially ready for taking data. The NP04 (HD) installation will in particular include the laser calibration system.

In view of the ongoing difficulties in procuring liquid argon, the collaboration has decided to prioritize ProtoDUNE–VD over HD. A tender is ongoing for procuring argon, and the expectation is to fill ProtoDUNE–VD in early 2024. Beam is expected to be available around April 2024.

Comments:
Given the relative maturities of the detector technologies, the LBNC agrees with the decision to prioritize VD operations.

However, given the delay in ProtoDUNE–VD operations, it is unclear to what extent lessons learned from ProtoDUNE–VD can still be implemented in the FD–VD design. Running detector components in the coldbox at CERN partially mitigates this problem.

In view of the delayed ProtoDUNE operation, it is important to extract critical parameters like purity and track quality soon after filling with LAr

Recommendations:
none

DUNE-ProtoDUNE Physics Program

Findings:
The physics analysis program for ProtoDUNE has made significant progress, with two papers nearing publication and numerous papers in the pipeline.

Monte Carlo samples for the 2x2 LAr demonstrator should be ready in time for this detector's (delayed) data taking. The simulation developments for the 2x2 demonstrator will substantially benefit the later generation of MC samples for the full near detectors. New MC samples for FD1

and FD2 are being produced, as are samples of simulated atmospheric neutrino events.

Analyses are underway studying oscillation physics with full inclusion of PRISM; supernova pointing; physics beyond the Standard model; atmospheric neutrinos; systematic uncertainties in cross-section measurements; solar neutrinos; and nucleon decay.

Comments:
The committee is pleased to see a remarkable increase in the analysis effort and a healthy level of interest within the collaboration in setting up new analyses.

The committee considers analysis efforts towards atmospheric, solar, and supernova neutrinos a high priority given that the far detector will be taking data without beam for several years.

We commend the collaboration for creating a new DUNE Physics group focused on preparing analysis for data-taking with the 2x2 Demonstrator.

We are concerned that the expertise in the reconstruction development and the generation of the crucial MC samples is restricted to a few people, which is a risk.

Recommendations:
none

Appendix I: Attendees

Committee: Martin Aleksa, Austin Ball, Daniela Bortoletto, Simone Campana, Mark Champion, Andre de Gouvea, Francesco Forti, Alexander Gottberg, Eric Kajfasz, Joachim Kopp, John Parsons, Marco Rescigno, Paolo Rumerio, Vadim Rusu, Niki Saoulidou (Chair), Rainer Wallny, Brigitte Vachon, Darien Wood

Apologies: Marco Delmastro , Adam Para

Scientific Secretary: Joseph Zennamo

Fermilab PAC Chair: Hirohisa Tanaka

Fermilab NSG Chair: Dmitri Denisov

DUNE/LBNF (based mainly on registration): Dario Autiero, Doug Benjamin, Sergio Bertolucci, Mary Bishai, Daniel Dwyer, Hugh Gallagher,Kenneth Herner, Steve Kettell, Jonathan Lewis, Thomas Markiewicz, Christopher Marshall, Andrew McNab, Claudio Montanari, Mathew Muether, Elisabetta Pennacchio, Jennifer Raaf, Srini Rajagopalan, Heidi Schellman, Luca Stanco, Steven Timm, Kurt Vetter, Michael Wilking, Sam Zeller

FNAL Directorate/Management: Lia Merminga, Bonnie Fleming, Kevin Burkett, Stephen Brice

Appendix II:

Charge Letter: LBNC October 2023 Review, October 2-4, 2023

The LBNC is charged by the Fermilab Director to provide external scientific peer review and to monitor the technical progress of the International DUNE collaboration, and those aspects of the facility construction that have direct impact on the DUNE experiment.

For the October 2023 meeting, the LBNC will meet in remote mode to review status and progress of LBNF and DUNE. As with other meetings, the LBNC should construct a report in which it acknowledges, comments on, and where appropriate, makes recommendations following the presentations and discussions during the meeting.

The LBNC should hear about the general status of LBNF and DUNE. In addition to updates on major detector systems, the LBNC should also receive updates on DUNE computing, activities towards ProtoDUNE-II, the neutrino beamline including beamline monitoring and plans for 2MW capable targets, and FDC status following the September IPR. Along with technical progress, presentations should report on issues and concerns related to supply chains and availability of components.

In considering the presentations and material provided for the meeting, attention should be given to prior LBNC recommendations and actions that have been undertaken to address these recommendations. For the DUNE detectors and computing, we would like to continue our work toward uniform and regular reporting and tracking of major DUNE technical milestones.

In this review particular attention should be paid to the Near Detector and Beamline areas. The committee is not being asked specifically for comments on these areas in this review, but it is expected that these two areas will be features of the February 2024 review.

In this review the committee should particularly comment on:

1) Overall status and progress of international DUNE computing
2) The role of the US Computing effort within the international effort
3) Does the DUNE software and computing model and plan meet the physics requirements.
4) The plan for Near Detector computing and its integration with the broader DUNE computing effort

The LBNC should develop a Closeout Report which it should deliver at the end of the meeting. Subsequently this should be refined into a LBNC Meeting report.

Appendix III: Assignments

Plenaries

LBNF Status : Gottberg, Aleksa, Ball, Champion

Summary of FDC CD 2/3 Review & DUNE Status : Vachon, Bortoletto, Gouvea

FD-VD: Overall status, progress and plans : Wood, Aleksa, Ball, Forti, Kajfasz, Resignco

FD-HD: Overall status, progress and plans : Parsons, Rumerio, Wallny

Computing: Status and plans : Campana, Rusu

Near Detector for PhaseI *[Overall status, progress and plans]* : Kopp, Forti, Resignco, Wallny

Status and Plans of ProtoDUNEs *[HD2, VD, ND]* : FD , ND groups with a lead from Wood, Parsons, Kopp

DUNE-ProtoDUNE Physics Program *[Overview, progress and plans]:* Bortoletto, Gouvea, Kopp, Vachon

Breakouts

Beamline Status & Progress : Gottberg, Aleksa, Ball, Champion

Near Detector Status, Progress and Plans including ND-LAr 2x2 Demonstrator: Kopp, Forti, Resignco, Wallny

Computing Status, Progress and Plans : Campana, Rusu