



Update on our neutrino projects: **LBNF/DUNE and SBN**

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September 22, 2016

Truly Amazing

The LBNF/DUNE collaboration now involves 30 countries, over 900 collaborators and more than 160 institutions around the world, and continues to grow.

It is the largest new project being undertaken in particle physics anywhere in the world since the Large Hadron Collider at CERN.

The DOE has approved CD3a, start of initial construction, approved a starting budget allocation of \$308M, with a project budget profile range for the project of \$1.3-\$1.9B.

Congress has approved construction. We have strong support in both DOE and from Congress.

LBNF: Initial far site construction approved



- On September 1, DOE Under Secretary for Science and Energy **approved** the CD-3a milestone
- Paves the way to start ~\$300M in construction at far site in FY17
- Signifies DOE's **strong commitment** to move the project forward, solidify international partnerships and position DUNE to rapidly pursue its science objectives.

**Critical Decision 3a, Approve Initial Far Site Construction
for the LBNF/DUNE Project**

Recommendations:
The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of Critical Decision 3a, Approve Initial Far Site Construction for the LBNF/DUNE Project at the SURF site as noted below.

 ESAAB Secretariat, Office of Project Assessment	9/1/16 Date	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
 Representative, Non-Proponent SC Program Office	9/1/2016 Date	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Concurrence:

 C. A. Murray Director, Office of Science	9/1/16 Date	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Approval:

Based on the information presented in this document and at the ESAAB review, I approve Critical Decision-3a, Approve Initial Far Site Construction for the LBNF/DUNE Project.

 Franklin M. Orr, Jr. Under Secretary for Science and Energy	9/1/16 Date
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SURF – Sanford Underground Research Facility

- SURF is the site for DUNE far detector
- Fermilab will have two relationship ‘types’ with SURF
 - **Operations Contract Space** – the facility and all it encompasses
 - **Leased Space** – the space we’ll build (& blast) & use for the Project
- In **operations** space, we will hold the services contract that allow the work to continue at SURF. Their rules apply, they manage & have authority.
- In **leased** space, the relationship is different. It’s as if it were here on our site in Batavia. Just like Fermilab, but with a South Dakota flair. Fermi rules apply & DOE has authority.



SURF – Sanford Underground Research Facility

- Understanding this distinction will help as we move forward with work in both the contract space and leased space. Knowing the difference and keeping the lines clear will help avoid errors.
- Below are photos that show some of the underground space and where the test blasting for LBNF took place earlier this year.



- The magnitude of the work Fermilab is doing in South Dakota is important to understand — if you are interested in having a talk to your department, let Chris Mossey know.

Phases of work: Reliability work has already begun

1. Sanford Lab Reliability Projects

FY16 - FY18

- Ross shaft rehab
- Hoist motor rebuilds

2. Pre-Excavation

FY17 - FY18

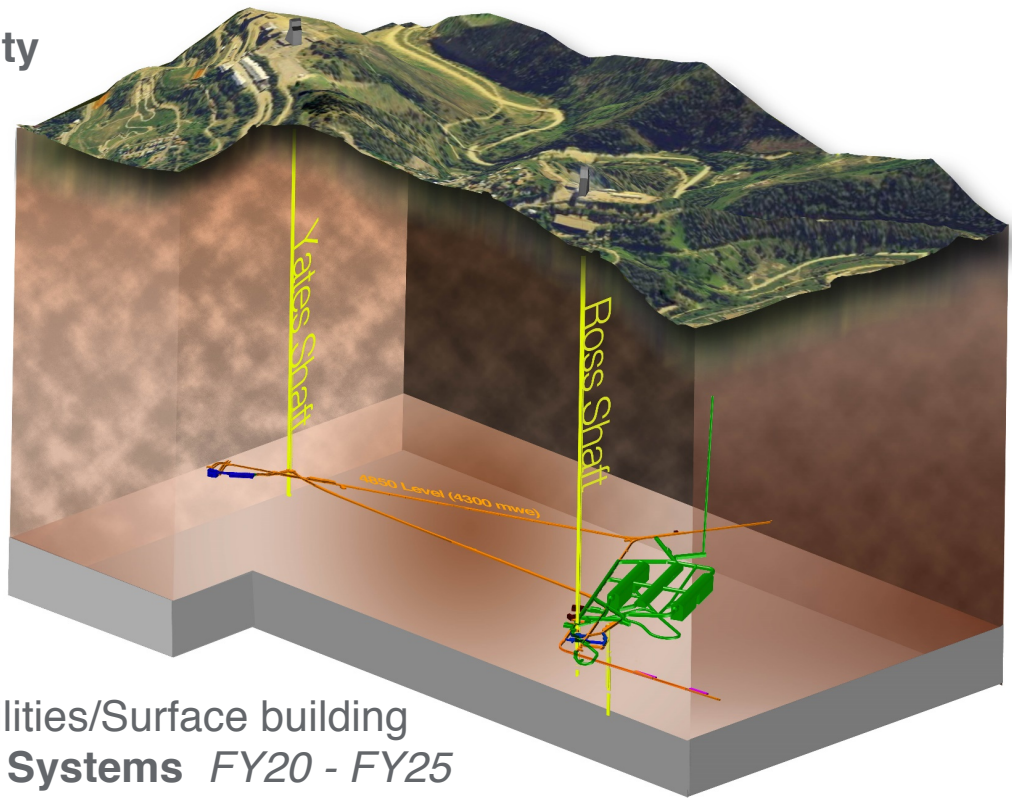
- Rock disposal systems
- Ross headframe upgrade

3. Excavation/Construction

FY18 - FY22

- Brow/Caverns/Drifts/Utilities/Surface building

4. Cryostats/Cryogenic Systems *FY20 - FY25*



LBNF: Progress since last all-hands



- ✓ Site to dispose of 800,000 tons of rock finalized and easement to build a conveyor system over public road received from City of Lead.

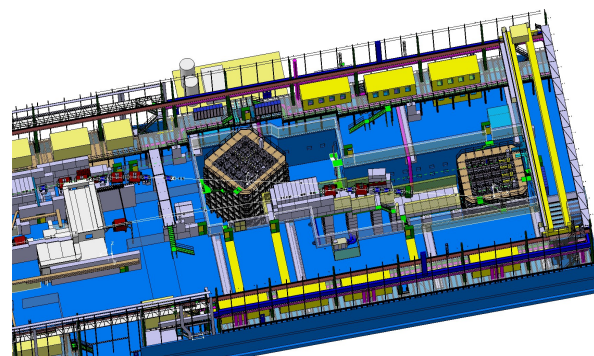


- ✓ Blast vibration study completed – photo at site with Secretary Lynn Orr

- ✓ Contract to do management and construction work being advertised. Photo of the pre-proposal meeting in SD; good turnout from construction industry.

DUNE progress: ProtoDUNE Single-Phase

- Each protoDUNE designated as an official CERN experiment
- Lots of effort to organize team; define CERN-based organization for integration, installation, commissioning and operation
- Design reviews for all subsystems conclude in November 2016
- Conducting tests this fall/winter:
 - High Voltage integration at PC4
 - Cold Electronics at D0 Assembly Building
 - Installation Trial Assembly at Ash River
- Fabrication ongoing
- Next spring: Components arrive at CERN, integration testing begins
- Schedule is very aggressive; need to conclude run prior to CERN LHC LS2



DUNE progress: ProtoDUNE Dual-Phase

- ProtoDune-dual phase construction ongoing (1x1x3 / 25t prototype); Starts taking cosmics in fall 2016
- Cryostat assembly for 6x6x6 beginning in EHN1 experimental hall
- Detector assembly within cryostat begins April 2017
- Common design approach among dual / single phase for Field Cage, High Voltage, Purity Monitors
- Installation procedures to mimic constrained conditions at far site
- 1x1x3 prototyped leak-checking procedure for cryostat membrane

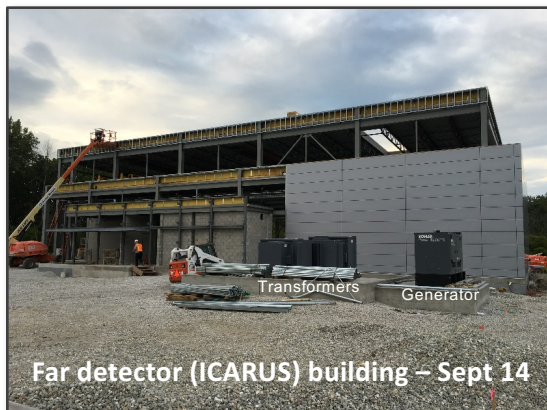


Top cap installation of WA105



EHN1 experimental hall

SBN Progress



- ICARUS refurbishing progressing well at CERN:
 - complete 1st TPC in October, 2nd in early 2017
 - Installation in 2017
- SBND construction started in UK, US and Switzerland
 - Assembly in 2017, installation in 2018
- Buildings progressing well
 - Far complete in December 2016
 - Near complete early in 2017

First SBN Equipment from CERN-INFN



Neutrinos and International

- Continues to be major effort for International team
 - Diplomatic, funding agencies, political, on top of grass roots
- Moniz letter to DAE Chair India
- Italy engagement for PIP-II ...R&D proceeding...production cavity low beta 650 MHz proceeding
- UK proceeding on all fronts
- Switzerland
- Latin America important partners...Brazil, Mexico, Chile...
- ITER is a funding concern (large cost escalation)

Questions?