LBNF/DUNE Status

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4-7-2016

Outline

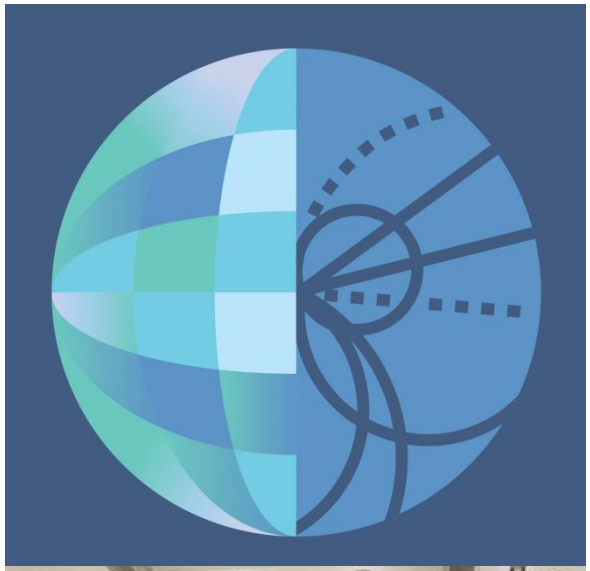
- Key events and actions currently underway for LBNF/DUNE

The P5 Strategy for U.S. Particle Physics

- A strategic plan for U.S. particle physics that maximizes opportunities for breakthroughs in discovery science
- Explicit prioritization presented, framing decisions within realistic budget scenarios
- U.S. Particle physics community unified behind the plan
  - 2,331 signatures on letter sent to Secretary Moniz and NSF Director Córdova

P5 Headline: Particle Physics is Global

- The P5 report emphasized the global nature of particle physics
- U.S. HEP plan is embedded in the context of a global HEP effort
  - P5 states, “The scientific program required to address all of the most compelling questions of the field is beyond the finances and the technical expertise of any one nation or region.”
- International partnerships of growing importance in U.S. science, particle physics seen as a leader of this trend
  - U.S. involvement in LHC at CERN seen as a successful example of international collaboration



The Big Picture

Fermilab is transforming itself to host the first truly international mega-science facility on US soil as per P5 Plan

- LBNF/DUNE/PIP-II is the **highest priority** in the lab
- We have adjusted laboratory management and strengthened project support to host a “billion dollar” scale project
- There is a worldwide **ground swell of interest** in long baseline neutrino science & particle astrophysics with liquid argon detectors
- Nobel Prize **accentuates** the importance of this physics and sets up the physics we wish to pursue

Ambassador Pamela Hamamoto and DG Rolf-Dieter Heuer

Neutrino Protocol…signed today

NEUTRINO PROTOCOL I

between

THE EUROPEAN ORGANIZATION
FOR NUCLEAR RESEARCH (CERN)

and

THE DEPARTMENT OF ENERGY
OF THE UNITED STATES OF AMERICA (DOE)

to

THE CO-OPERATION AGREEMENT

concerning

SCIENTIFIC AND TECHNICAL CO-OPERATION
IN NUCLEAR AND PARTICLE PHYSICS

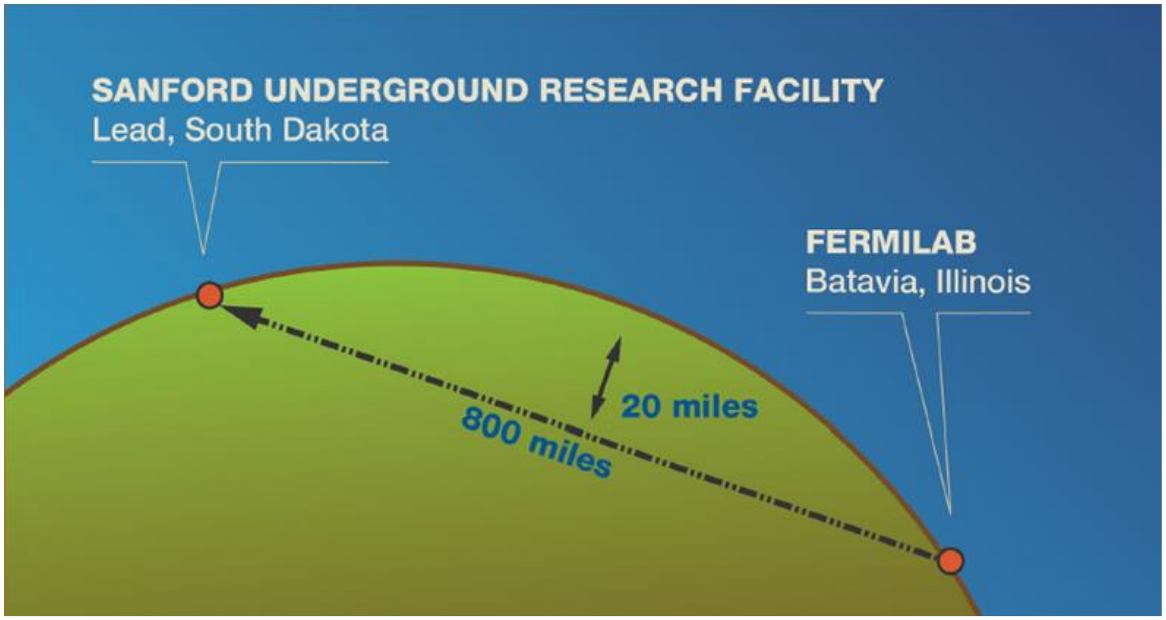
2015

CERN Chiefs Visit Washington…encourage support for LHC

International….John Holdren…offered to help

The Long Baseline Neutrino Facility (LBNF)

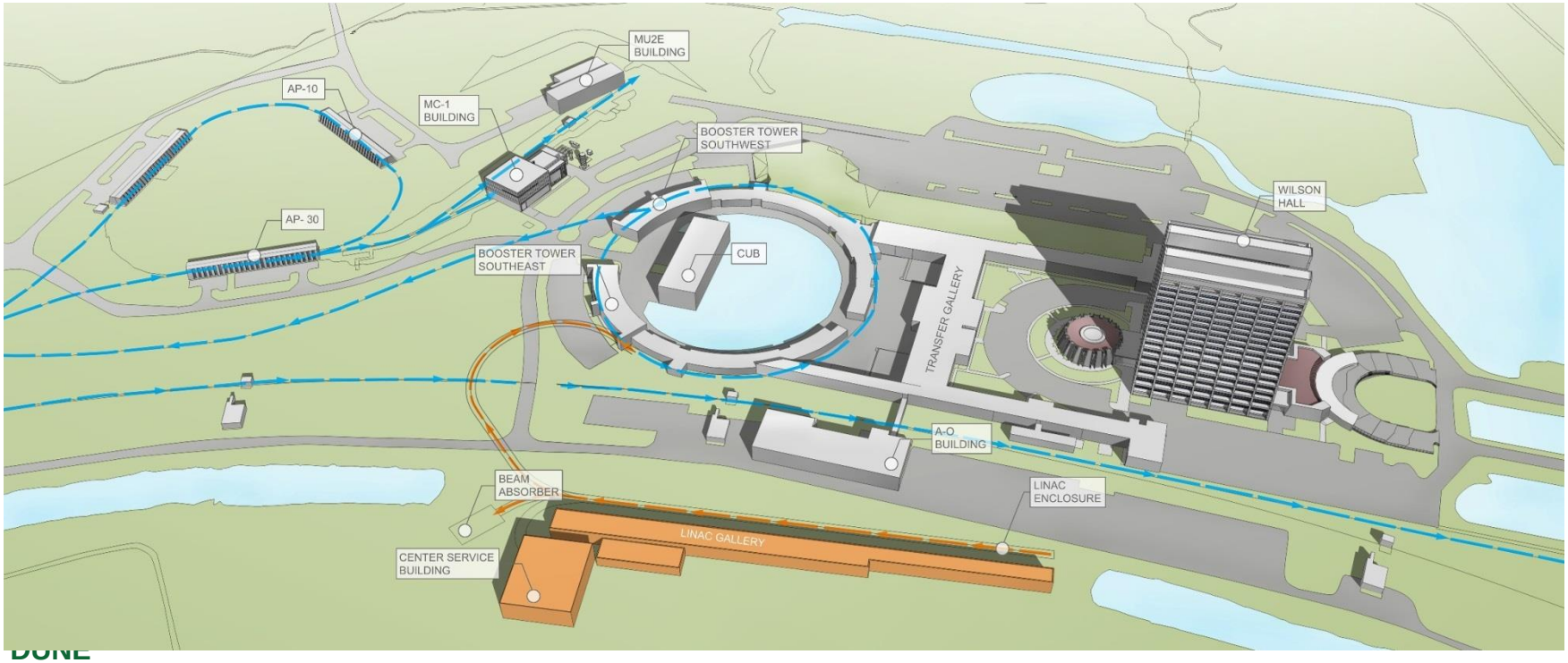
- P5 Recommendation:
  - Form a new international collaboration to design and execute a highly capable Long-Baseline Neutrino Facility (LBNF) hosted by the U.S. To proceed, a project plan and identified resources must exist to meet the minimum requirements in the text [of the report]. LBNF is the highest-priority large project in its timeframe.



In short, asks Fermilab to do for neutrinos what CERN did for the Higgs boson, involving the worldwide community

Proton Improvement Plan II (PIP-II)…CD0 achieved

- PIP-II supports longer term physics research goals by providing increased beam power to LBNF while providing a platform for the future
- Infrastructure and workforce development due to LCLS-II work at Fermilab will be leveraged in support of PIP-II, further advancing superconducting radiofrequency (SRF) accelerator capabilities



Making a Successful International Partnership

- A model for successful international partnership:
  - Start from the beginning designing what you wish to accomplish scientifically with international colleagues
  - Have the funding agencies talk to one another and collectively follow the process from the beginning
  - Funding agencies and scientists define the governance structure
  - Discuss the cost sharing with the major partners from the beginning
    - DUNE is ~75% international, and US a partner
    - Aim for ~25% international support for LBNF…Fermilab is host
    - Aim for ~30% international support for PIP-II
  - Encourage major partners to bring their unique and critical expertise to the table
    - *e.g.* U.S. high field magnets to High Luminosity LHC or liquid argon detector technology from Italy to U.S.

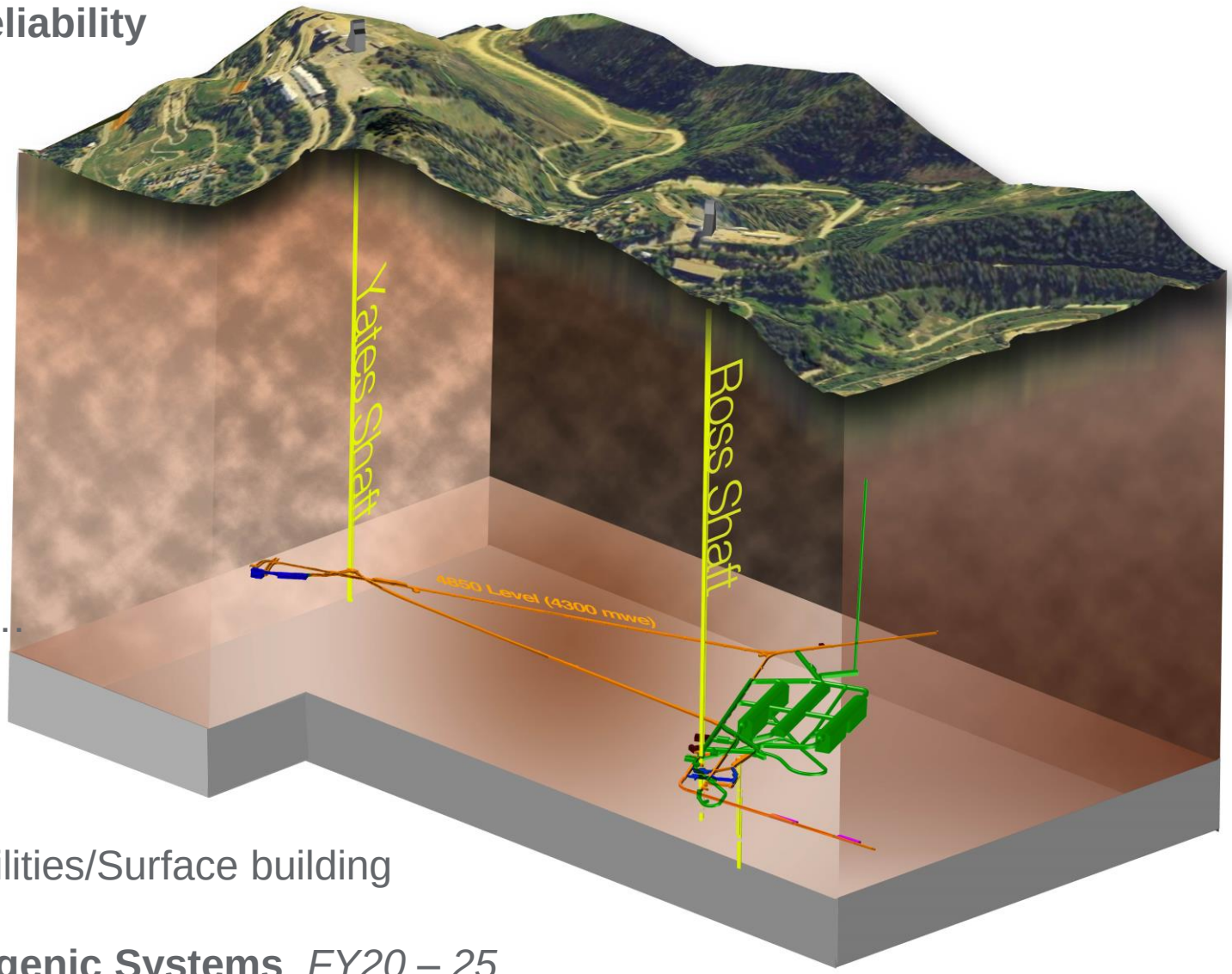
LBNF Far Site – Phases of Work Perspective

1. **Sanford Lab Reliability Projects**
   FY16 – 18
   - Ross shaft rehab
   - Hoist motor rebuilds, more…

2. **Pre-Excavation**
   FY17 - 20
   - Rock disposal systems
   - Ross brow expansion, more…

3. **Excavation/ Construction**
   FY18 – 22
   - Caverns/Drifts/Utilities/Surface building

4. **Cryostats/Cryogenic Systems** *FY20 – 25*



Current Key Events/Actions

- Execute **Final Design process** for Far Site conventional facilities; three parallel tracks:
  - **Pre-excavation design (started last month)**
  - Excavation design (starts July)
  - Buildings, Structures, Infrastructure (BSI) design (starts August)
- President's FY2017 Budget delivered to the hill this week
  - Funding increase ($26M FY16 to $45M FY17)
  - Construction authority requested (pending CD-3a milestone)
- Execute **Lease** for underground and surface areas…signed
  - Lease to go into effect 1 May 2016
  - Environmental assessments complete

Near Term Key Events/Actions

- Achieve CD-3a Milestone (early construction start):
  - DOE PMRC assessment on CD-3a milestone – April 18?
  - ESAAB to approve CD-3a milestone – May
- Award CM/GC contract for phase 1 (pre-award CM services)
  - Complete DOE review process of entire CM/GC contract
  - Select best value proposer and complete award review process

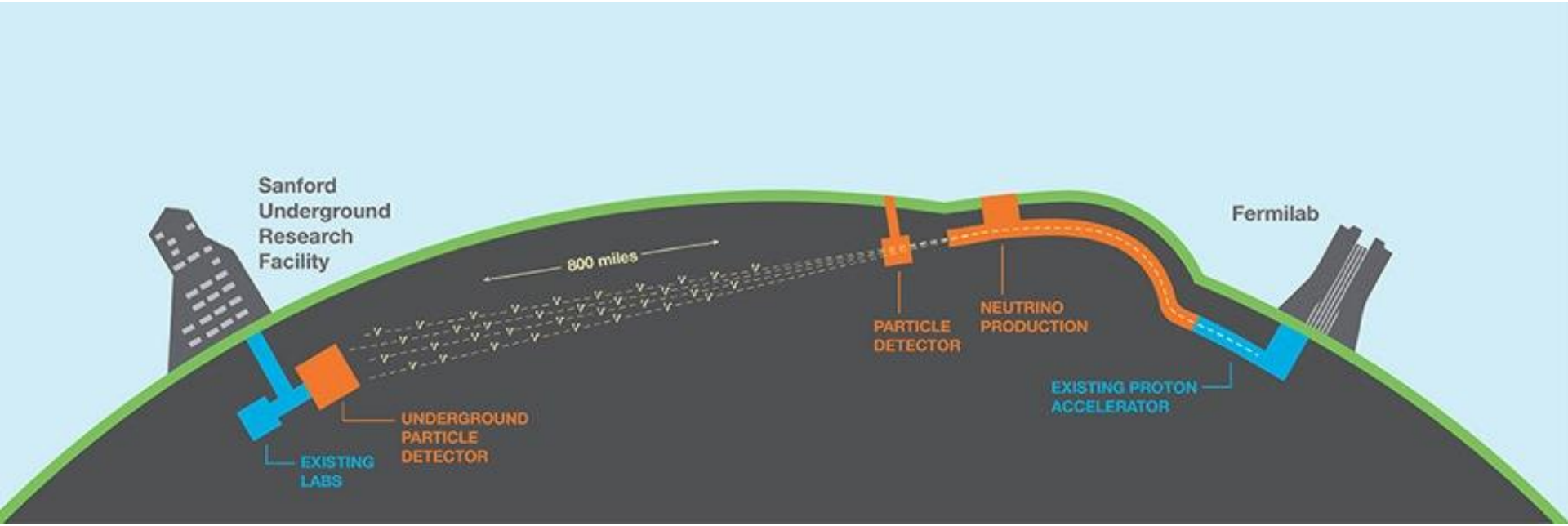
Lines in the Sand

- Working with DOE on three dates to define project
  - End of 2018 to see beam in protodunes
  - Begin installation in 2021 at SURF
  - Deliver beam 1.2MW 2026

Summary

- President's budget supports a construction start FY17
  - DOE is highly supportive of LBNF/DUNE from OHEP, Director of Office of Science up thru Secretary
- Congress is very supportive
  - The LHC model we use is viewed positively in Washington
- DOE ESAAB process for CD3a soon to be scheduled after PMRC …..in roughly next two months
- Budget process moving forward in US….
- US community continues to support P5 plan intertwining CERN/US …..strong support from CERN critically important
- Fermilab fully behind P5 plan
- Strong DUNE leadership appreciated….spokes and technical

Questions?


Sanford
Underground
Research
Facility
800 miles
Fermilab
PARTICLE
DETECTOR
NEUTRINO
PRODUCTION
EXISTING PROTON
ACCELERATOR
UNDERGROUND
PARTICLE
DETECTOR
EXISTING
LABS

LBNF/DUNE – Construction Summary Schedule Overview