

# ***The Long Baseline Neutrino Facility (LBNF): May 2018 Logistics Meeting***

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LBNF Far Site Conventional Facilities Project Manager

31 May 2018



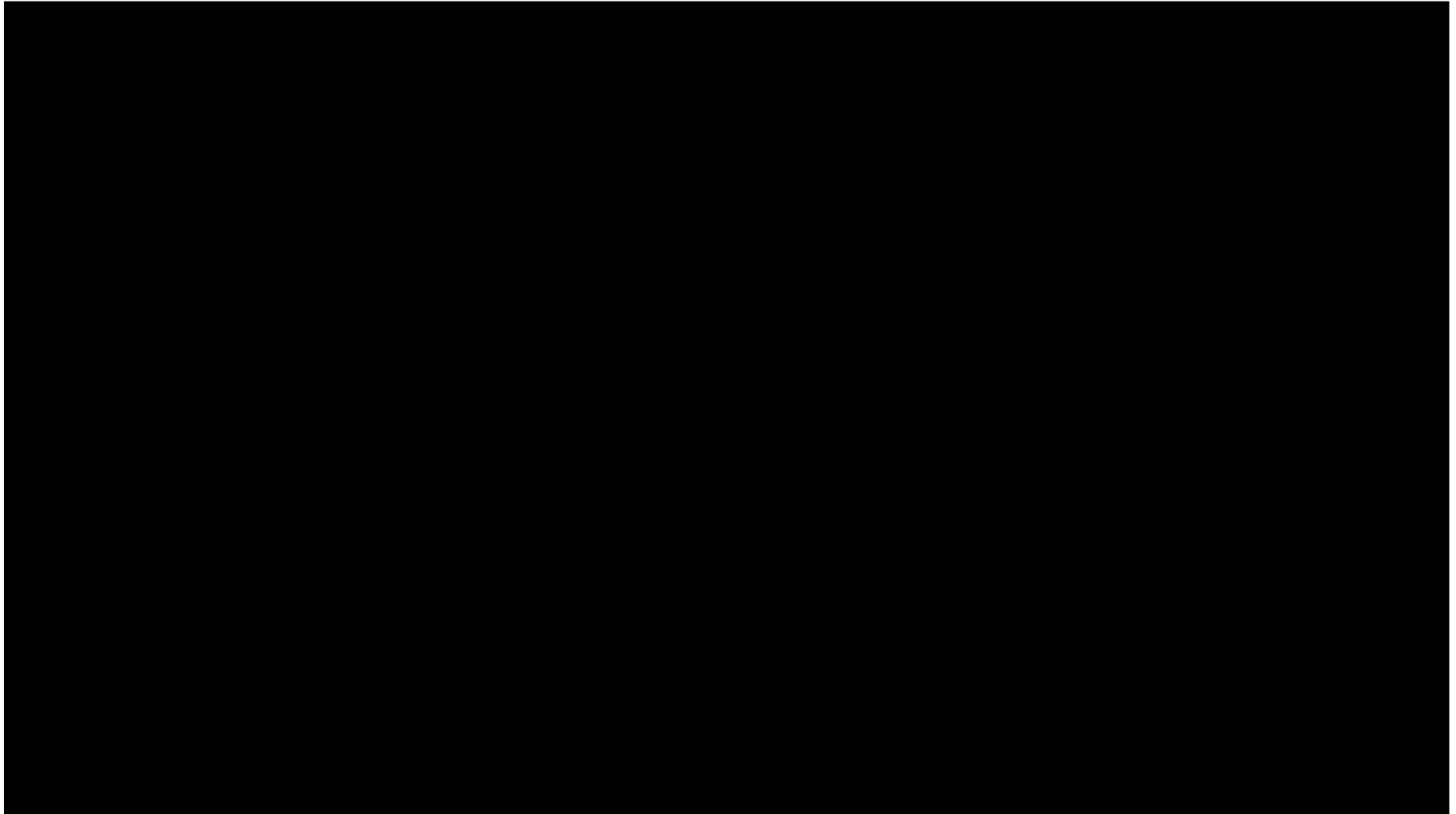
# Who Am I?

- I'm the Fermilab manager responsible for construction of the “conventional facilities” for LBNF, which includes excavating the spaces underground, constructing a building on surface, providing a means to move rock, and getting utilities where needed.
  - Others are responsible for the more unique parts of the projects, such as cryogen handling and the detectors.
- I was born in Rapid City, and have spent most of my life in the area.
- For the past 8 years I have been associated with DUSEL, LBNE, and LBNF as an engineer and manager, approximately half of which was in this role.
- Prior experience includes 14 years as an engineer or manager for cement manufacturing facilities in various locations, but most recently at GCC Dacotah in Rapid City for 7 years.
- Certified Project Management Professional (PMP)
- Registered Professional Engineer

# Topics

- Project Overview – LBNF and DUNE
- Recent Achievements
- Upcoming Activities

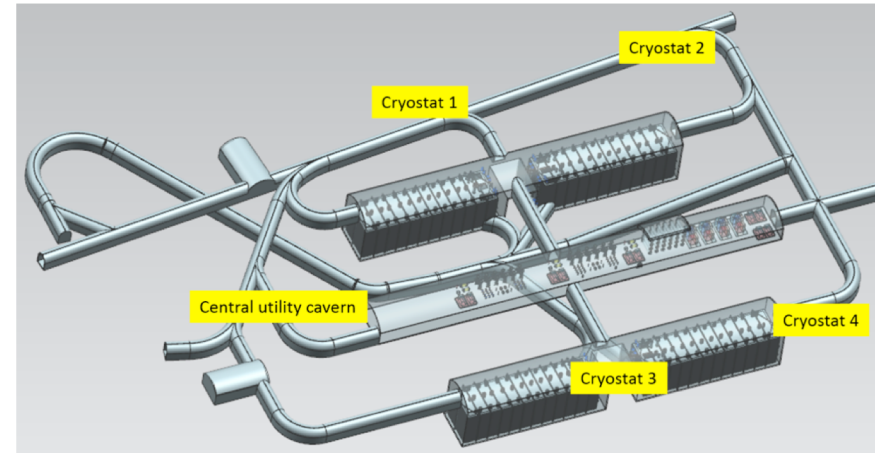
# LBNF / DUNE – The International mega-science project



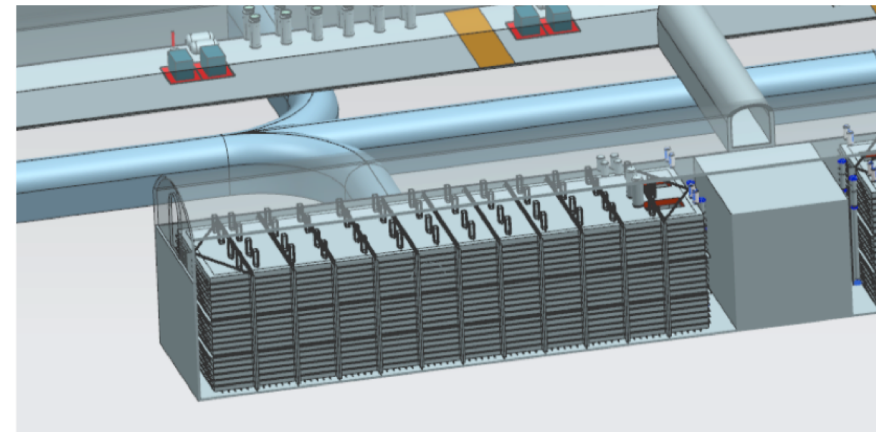


# Overview - “Far Site” - LBNF/DUNE at Sanford Lab, Lead, SD

- **Conventional Facilities:**
  - Surface and shaft infrastructure including utilities
  - Drifts and two caverns for detectors
  - Central utility cavern for conventional and cryogenic equipment
- **Cryostats:**
  - Four membrane cryostats supported by external steel frames
- **Cryogenic Systems:**
  - LN2 refrigeration system for cooling and re-condensing gaseous Argon
  - Systems for purification and recirculation of LAr
- **Argon: 70kt Lar**
- **DUNE LAr-TPC Detectors**

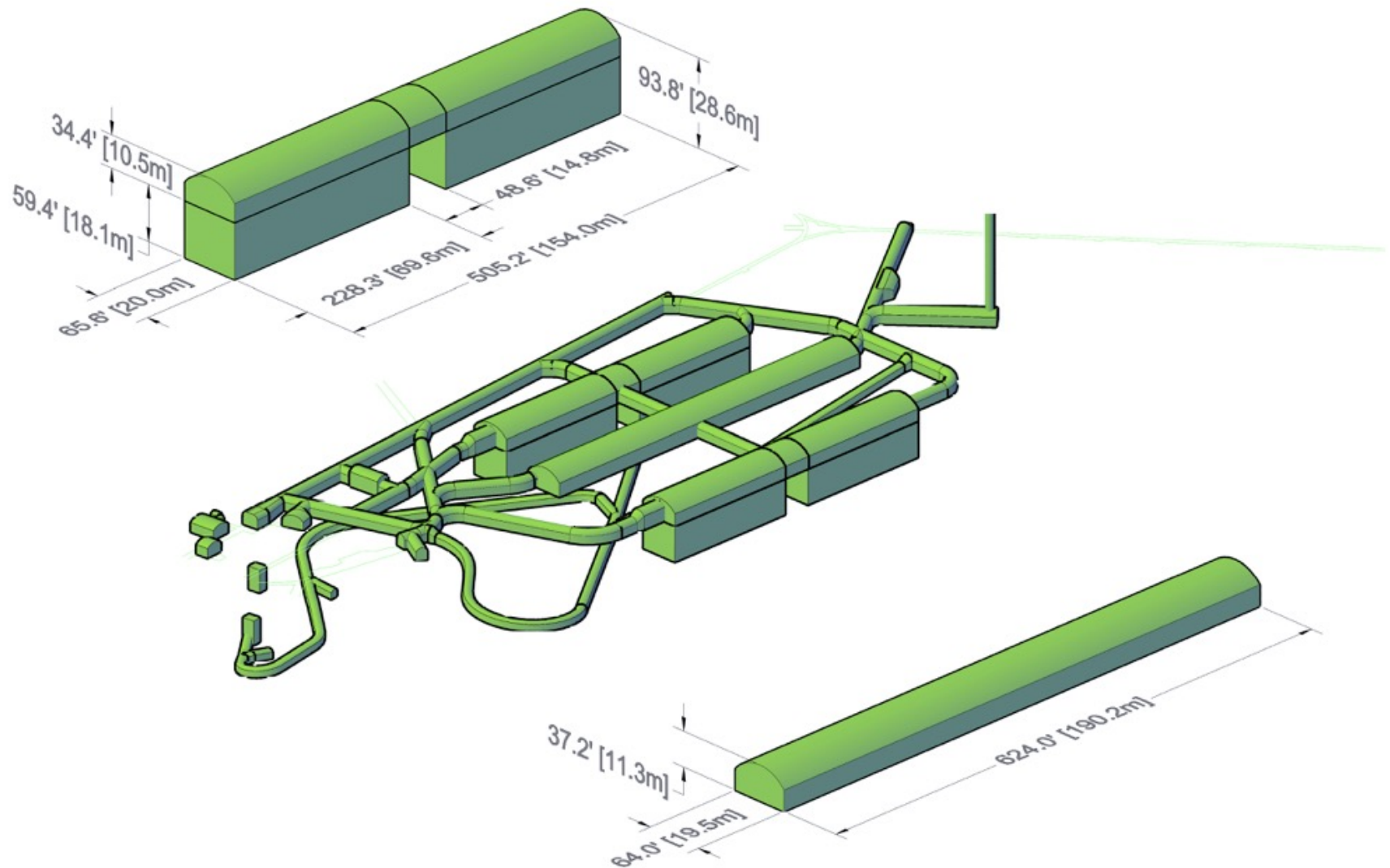


4850L cavern and drift layout

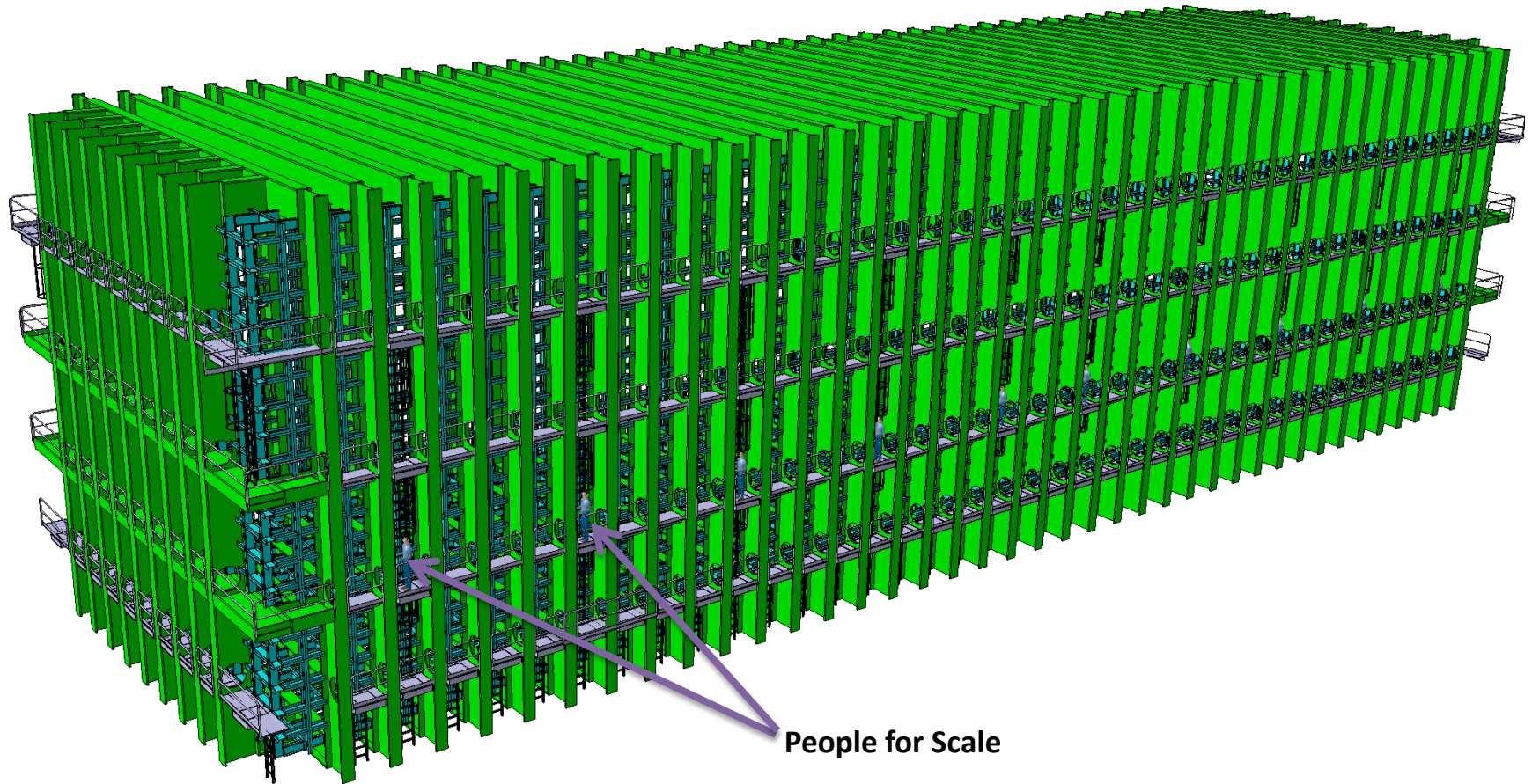


Single cryostat

# Size of Excavations



# Steel Cryostat Design



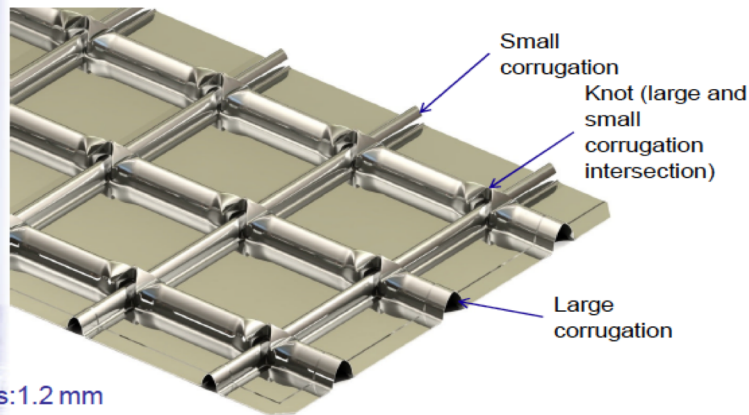
## External Dimensions

62.7' W x 59' H x 216.5' L (19.1m W x 18.0m H x 66.0m L)



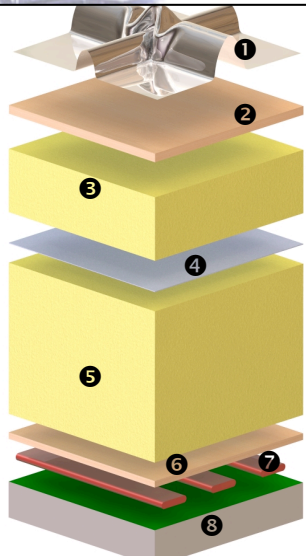
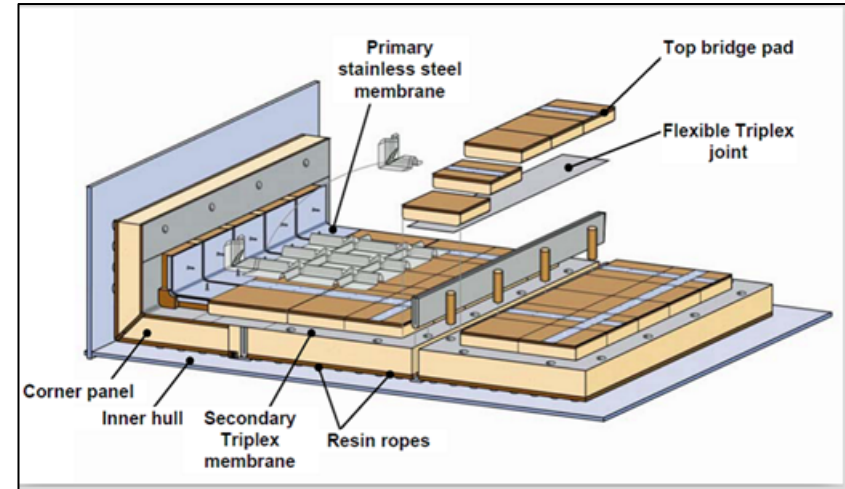
# Membrane Cryostat Design

The corrugated stainless steel primary barrier:



– Thickness: 1.2 mm

– Material: Stainless steel 304L



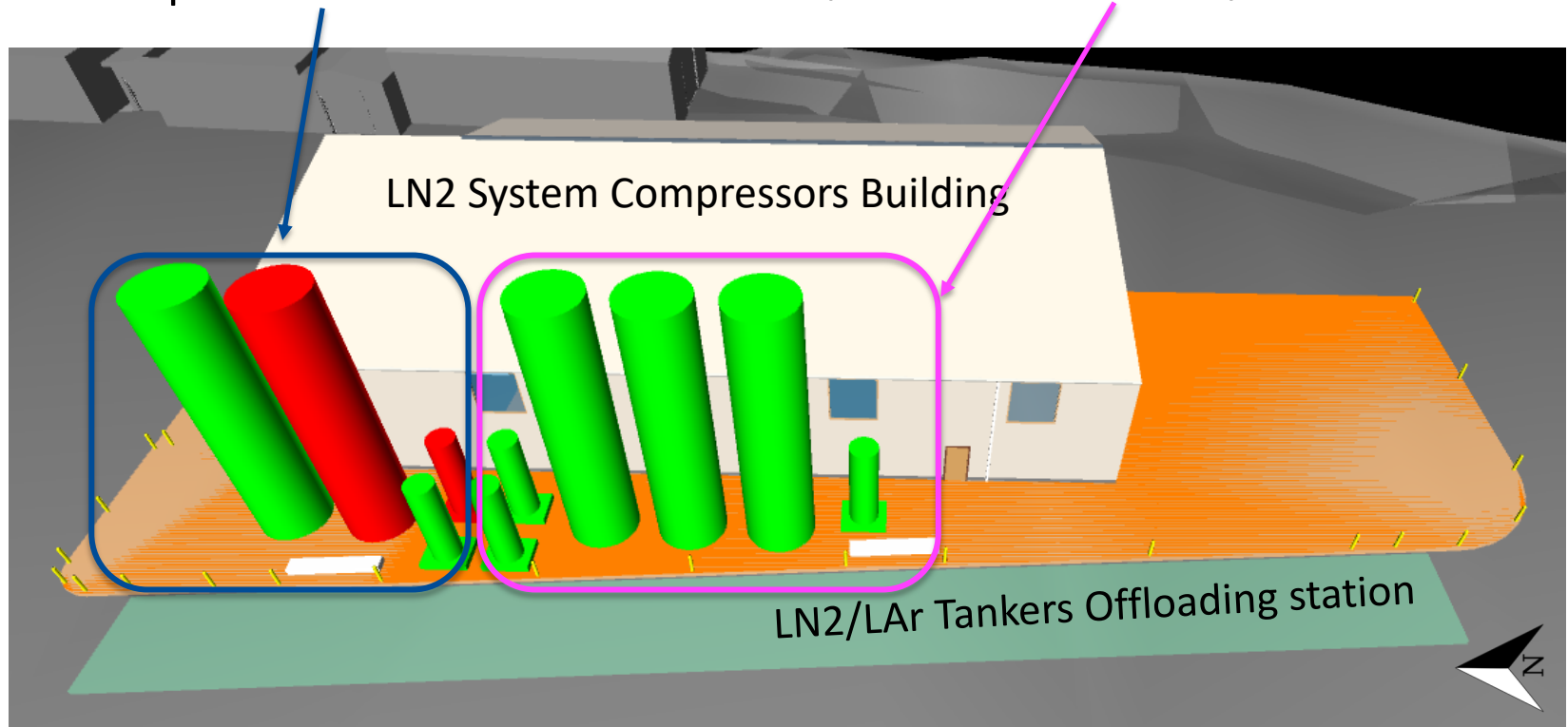
- ❶ Stainless steel primary membrane
- ❷ Plywood board
- ❸ Reinforced polyurethane foam
- ❹ Secondary barrier
- ❺ Reinforced polyurethane foam
- ❻ Plywood board
- ❼ Bearing mastic
- ❽ Steel structure with moisture barrier



# Receiving Facilities

Cryogen Storage and vaporizers: 2x50 m<sup>3</sup>

Additional temporary LAr Storage and Vaporizers (LAr fill only): 3x50 m<sup>3</sup>

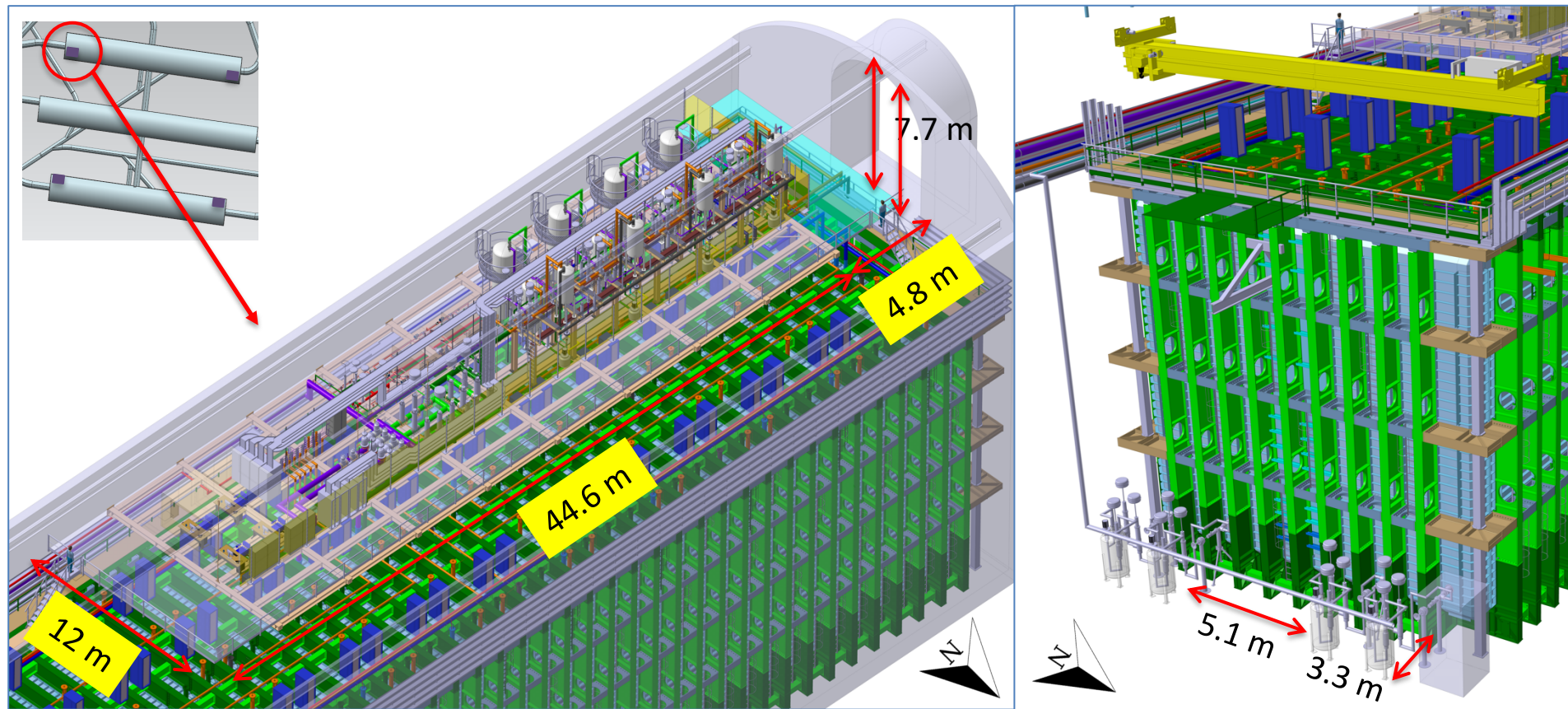


LN2 Storage Tank and Vaporizer (1x50 m<sup>3</sup>)

LAr Storage Tanks and Vaporizers (4x50m<sup>3</sup>)

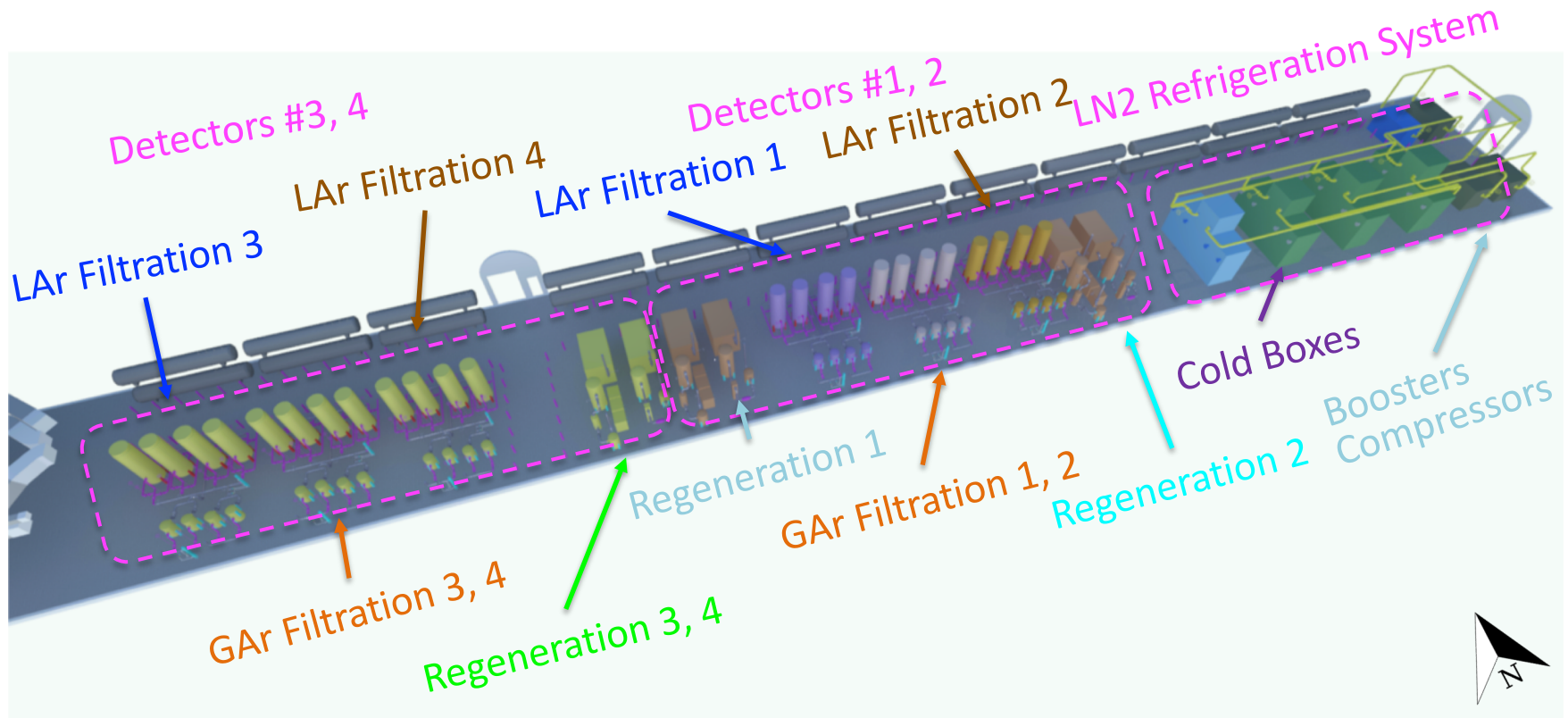
**280 ton of LAr storage**  
**3.5+ days at 75 ton/d**

# Proximity Cryogenics in Detector's Cavern

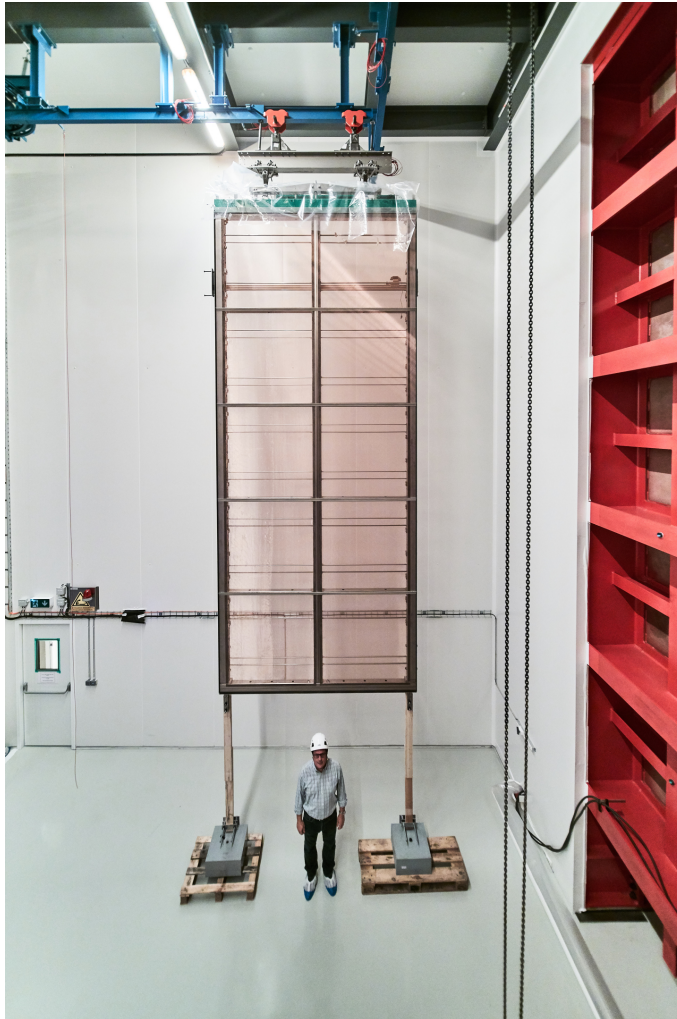




# Proximity Cryogenics in the CUC – Layout



# Detector Components



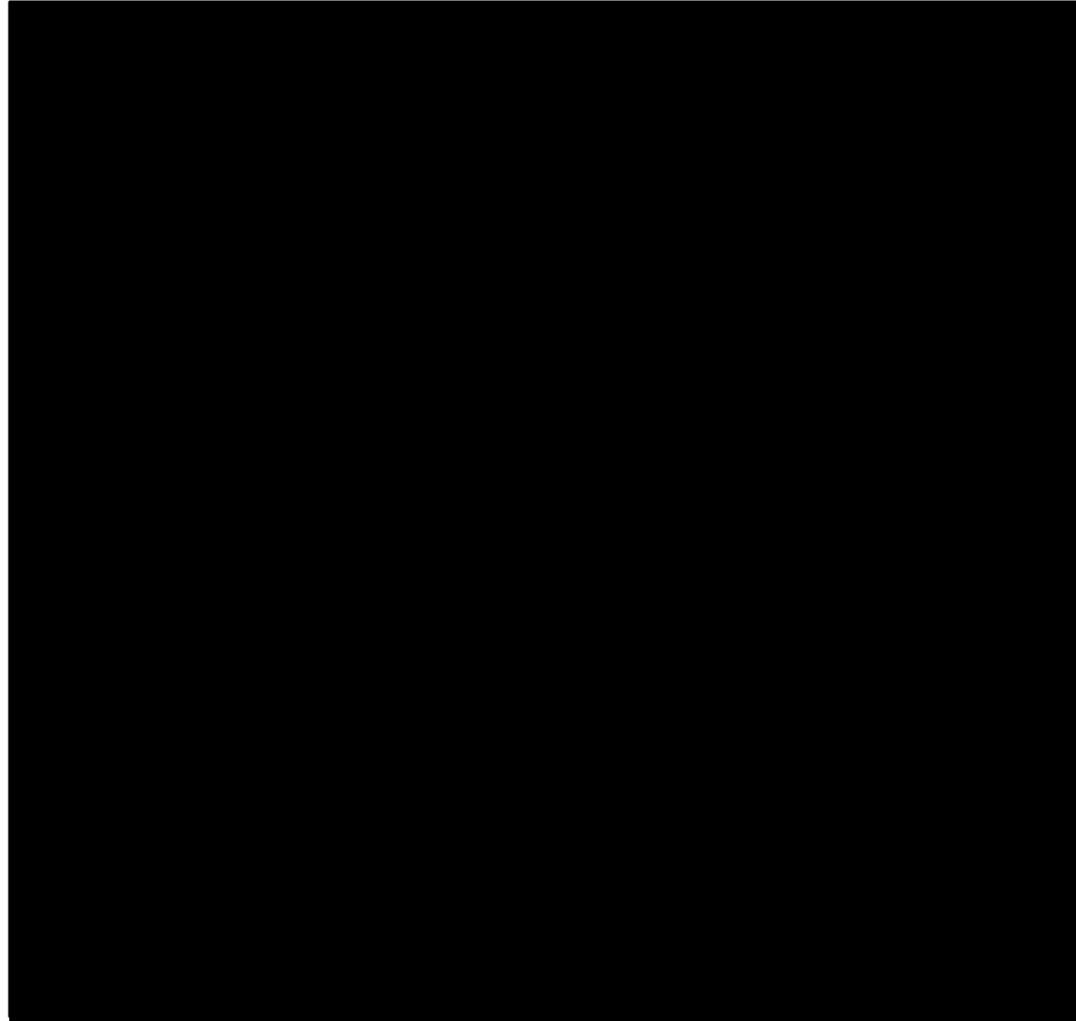


# Detectors in the Cryostats

Neutrinos are everywhere, and trillions pass through us per second. DUNE creates specific neutrinos from a specific direction, but will detect others

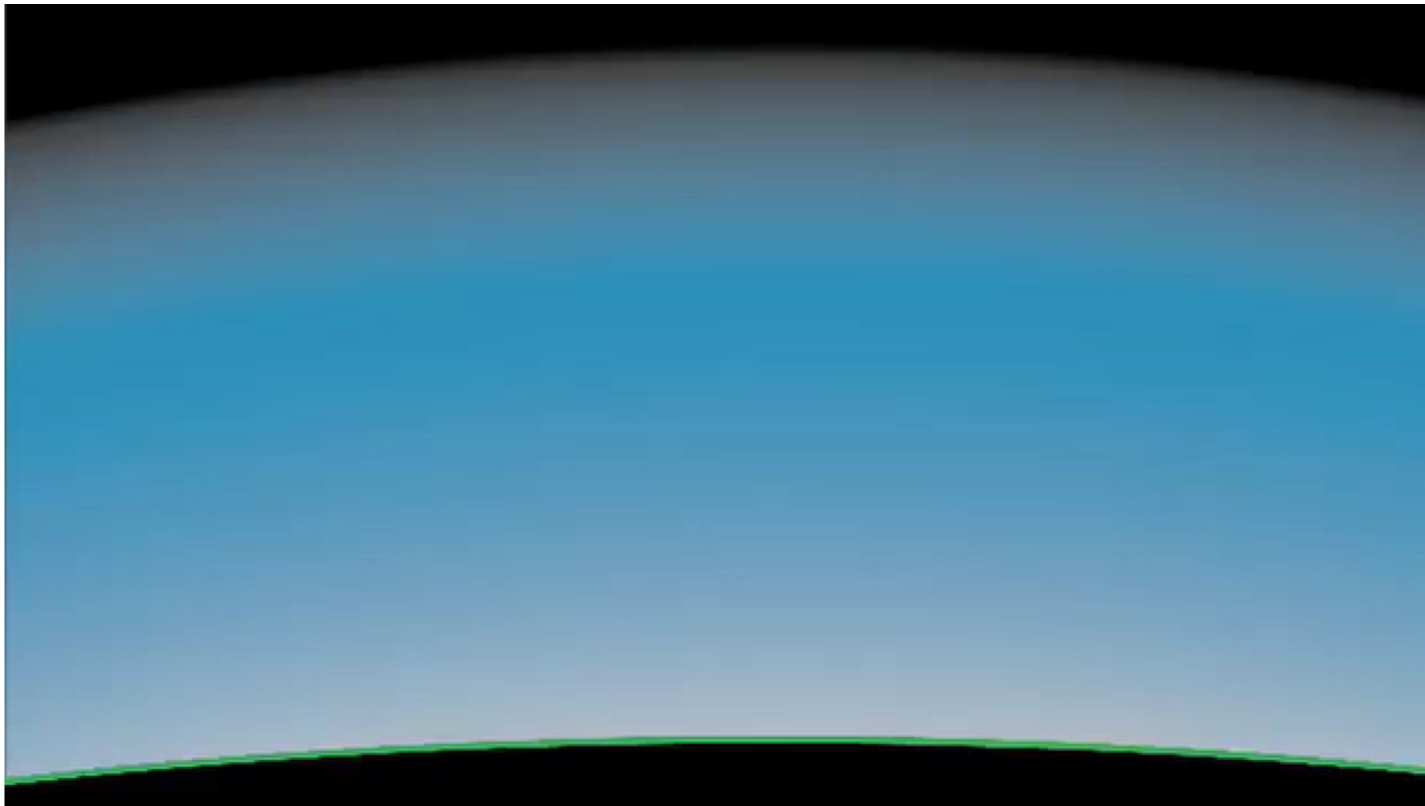
How Detectors work:

- Neutrinos (occasionally) collide with Argon atom.
- Resulting particles cause electrons to be knocked loose from liquid argon atoms, which is what the detectors “see”



# Why so deep? Why so big? Why liquid argon?

Neutrinos are about a millionth of the size of an electron, with trillions passing through you every second.. Over half would pass through a light-year of lead. Using 70,000 tons of really dense (SG  $\sim 1.4$ ) material makes for enough collisions to study. Going deep avoid detecting other particles.



# Recent Accomplishments

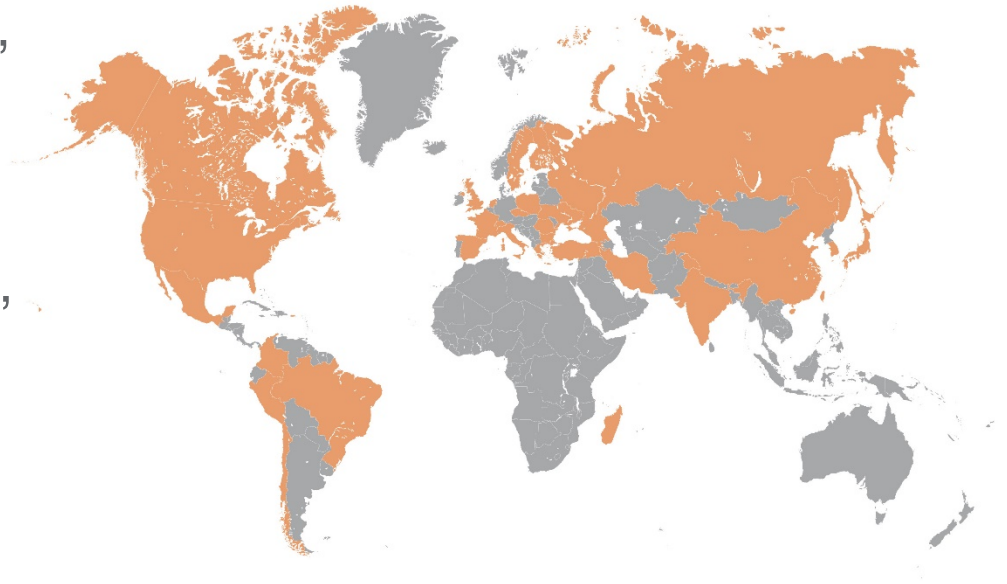
# The DUNE Collaboration

As of today:

>60 % non-US

**1061 collaborators from 175 institutions in 32 nations**

Armenia, Brazil, Bulgaria, Canada, CERN, Chile, China, Colombia, Czech Republic, Finland, France, Greece, India, Iran, Italy, Japan, Madagascar, Mexico, Netherlands, Peru, Poland, Portugal, Romania, Russia, South Korea, Spain, Sweden, Switzerland, Turkey, **UK**, Ukraine, **USA**



**DUNE has crossed the 1,000 collaborator threshold!**

# Groundbreaking (July 21, 2017)



- Strong support - Hosted by Governor Dugaard and SDSTA; participants included:
  - Congressional delegations (Thune, Noem, Rounds, Hultgren(IL))
  - Executive Office of the President (Kratsios)
  - International agencies: CERN, INFN, and STFC
  - DOE



## Strong support of project continues...

**Deputy Assistant to the President and Deputy U.S. Chief Technology Officer Michael Kratsios, Office of Science and Technology Policy:**

*“Today’s groundbreaking for the Long-Baseline Neutrino Facility... serves as a model for what the future of mega-science research looks like: an intensely collaborative effort between state, local and federal governments, international partners, and enterprising corporate and philanthropic pioneers whose combined efforts will significantly increase our understanding of the universe.”*

- FY 2019 Administration Research and Development Budget Priorities memorandum of 17 August 2017: “Innovative partnership models involving other agencies, state and local governments, the private sector, academia, and international partners can help maximize utilization of underused facilities and lead to sharing the costs of new R&D facilities.”

**Not just words – appropriations fully met request for FY18**

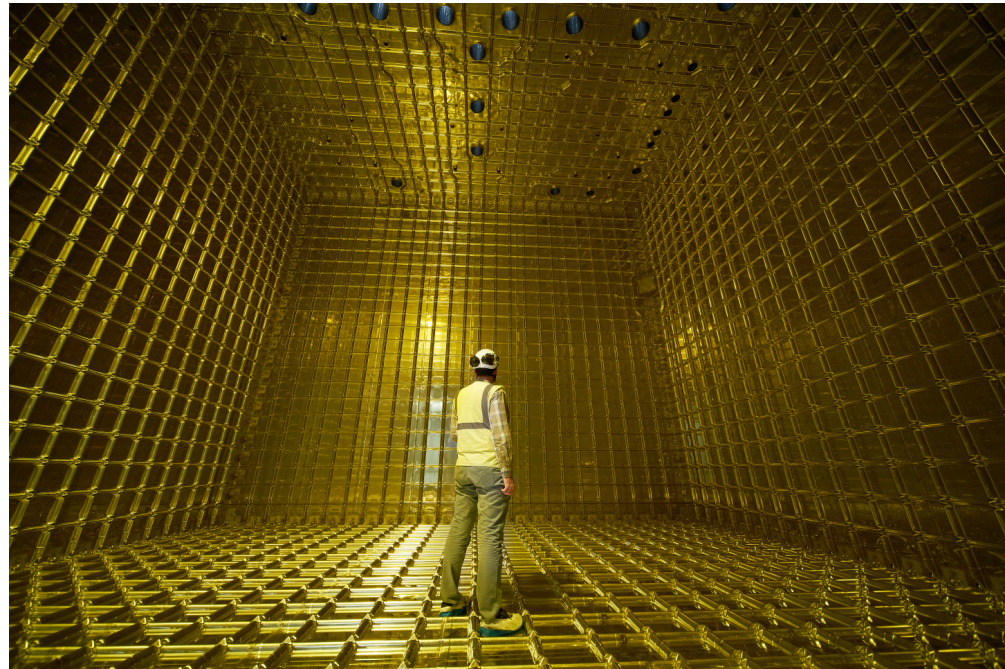
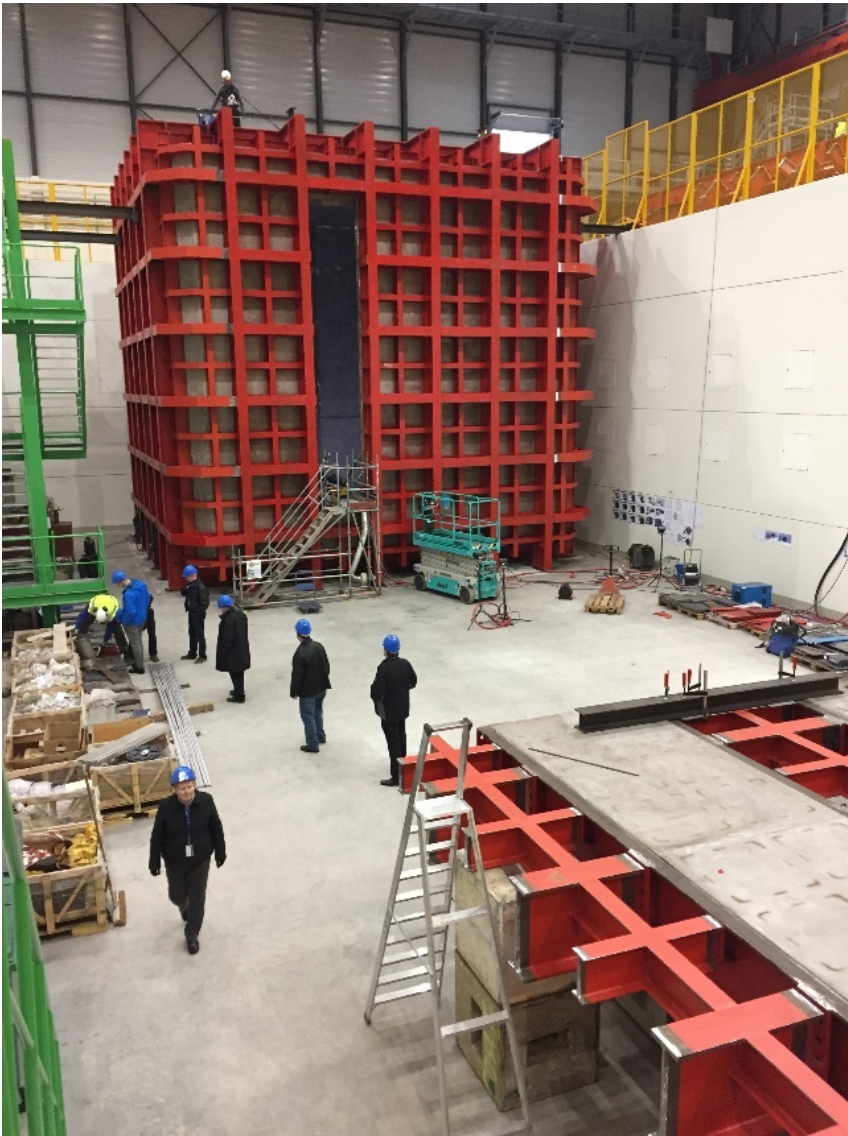
## And so we get to work



- Kiewit/Alberici Joint Venture (KAJV) and LBNF project team at 29/30 August kick-off meeting at Sanford Lab
- KAJV's initial scope is bidding pre-excavation work and supporting final design.



# ProtoDUNE progress at CERN





# Upcoming Activities

# Far Site Scope – Timeline

## 1. Sanford Lab Reliability Projects

*2016 – 2020*

- Ross shaft rehab
- Hoist work
- Oro Hondo Fan
- New cage and skips
- Refuge Chamber

## 2. Pre-Excavation

*2018 - 2020*

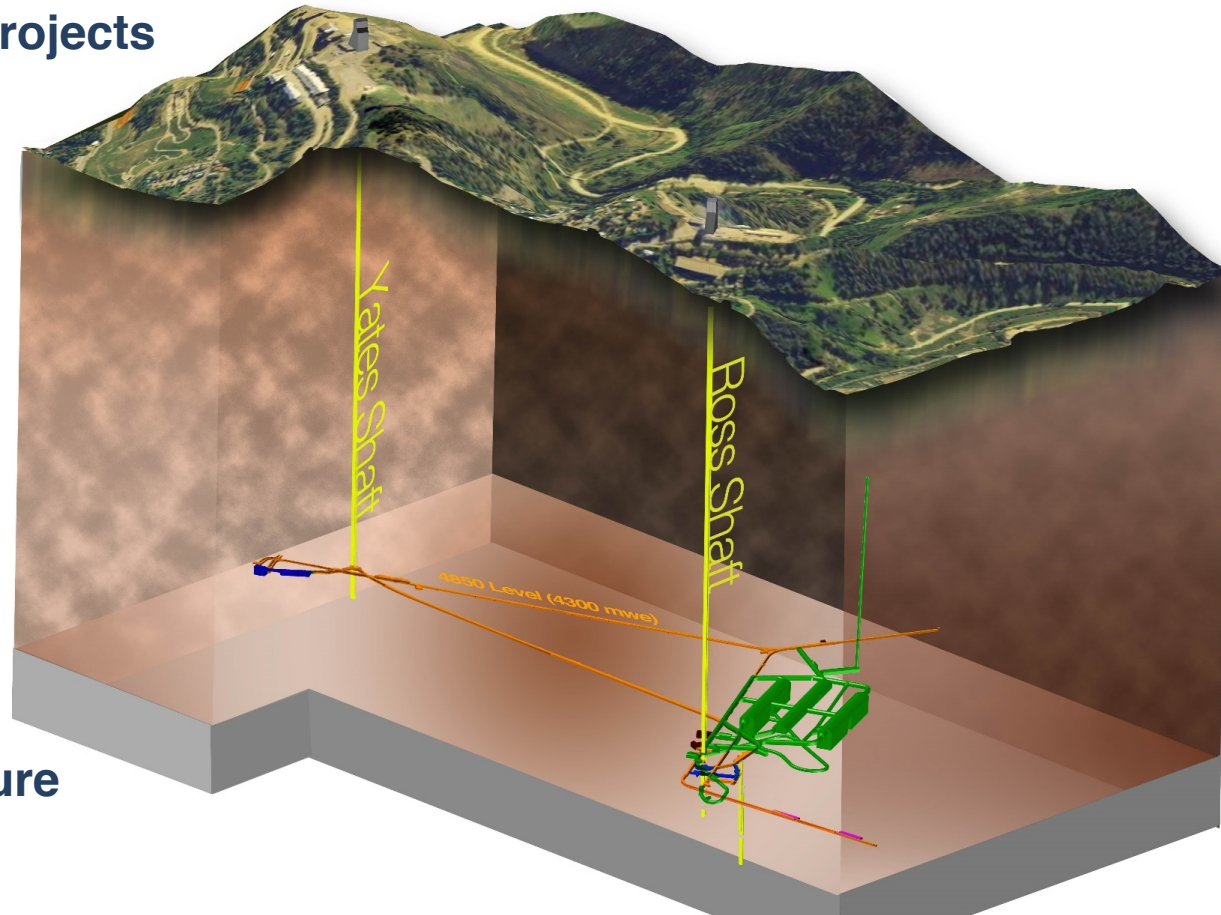
- Rock handling systems
- Headframe Reinforcement

## 3. Excavation & Infrastructure

*2020 – 2023*

## 4. Cryostats/Cryogenic Systems and Detectors *2022 – 2030*

## 5. *Detector Operation 2026+*

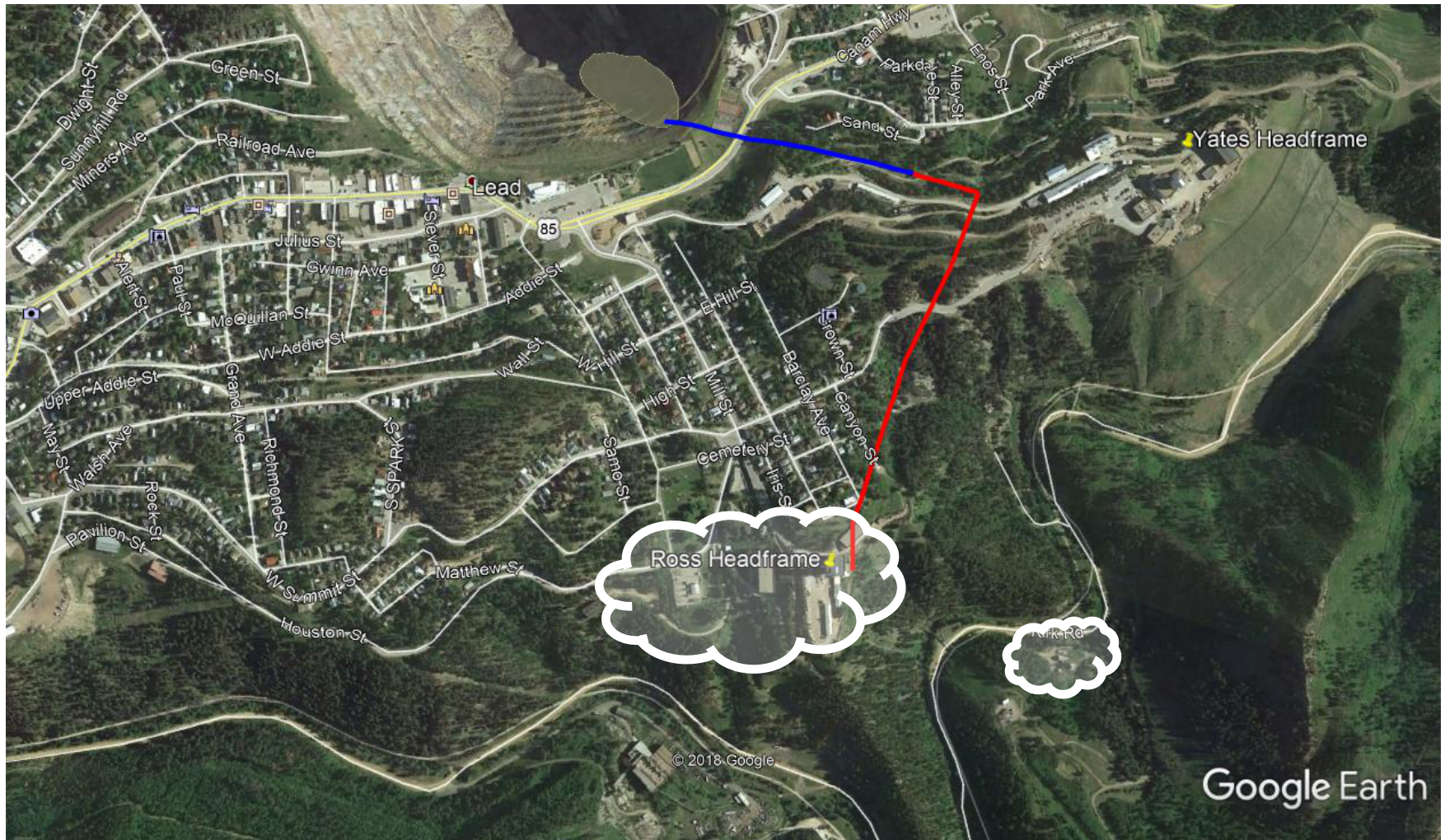


# Upcoming Work

- Ross Shaft rehab is ongoing
- A new electrical drive for the Oro Hondo Fan near Kirk Road is being ordered with plans to install this fall
- New electrical drives, brakes, and clutches are being ordered for both Ross Hoists
- The motors for the Ross Hoists are planned to be rebuilt
- Pre-bid site visits were held by KAJV May 21-25, with focus on:
  - Headframe reinforcement
  - Electrical substation and distribution
  - Crusher rehabilitation
  - Miscellaneous site preparation
  - Various support services (trash, sanitary, surveying, etc.)
- KAJV is also developing proposals for self-performing:
  - Tramway rehabilitation
  - Underground rock handling



# Where work will happen

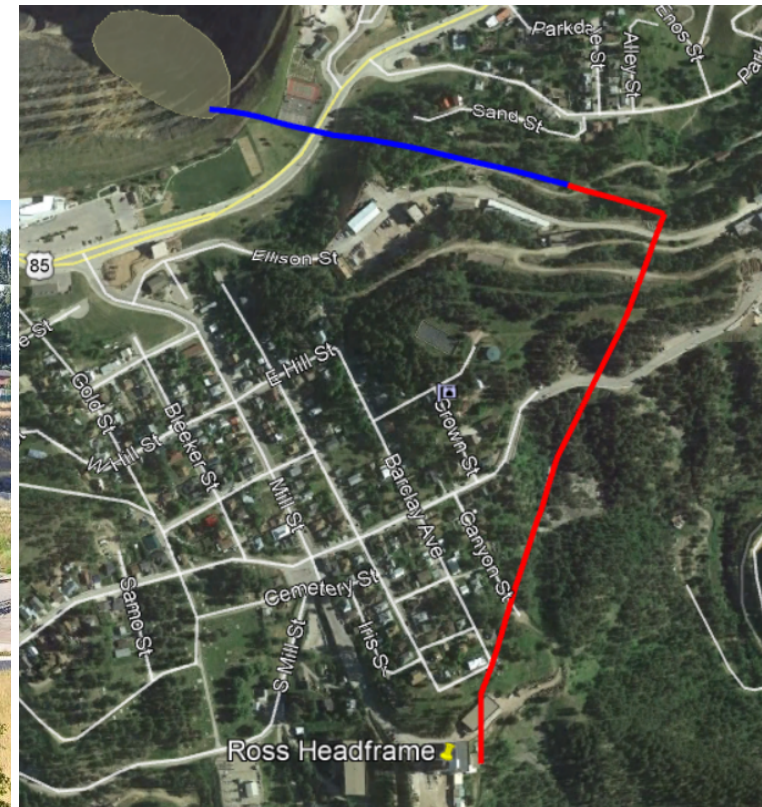


Other than the conveyor (next slide), most work will be around Ross or underground, with a bit at the Oro Hondo Fan near Kirk Rd.



# Conveyor Update

- Working with KAJV to evaluate technical improvements.
- Public visibility not significantly different
  - Still following old route, short tunnel excavation, trestle over highway, cut through berm into open cut



## Other updates

- Designing additional office space for Fermilab team at Ross Dry
  - Fermi Research Alliance is considering leasing a small corporate office in the City of Lead.
- KAJV will also be looking to lease office space in Lead
- Hiring additional positions (construction coordinators, logistics coordinator, procurement administrator, administrative assistant)
  - 10 full time Fermilab people dedicated for LBNF construction in Lead by year end.
- A new Fermilab division called the “South Dakota Services Division” has been established to integrate all Fermilab Activities at the Sanford Lab. The new Division Head, Patrick Weber, will begin the week after next. He will become a central contact for many items as Elaine will describe.

# Questions?

