The Long Baseline Neutrino Facility (LBNF):
Jan 2019 Informational Meeting

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LBNF Far Site Conventional Facilities Project Manager

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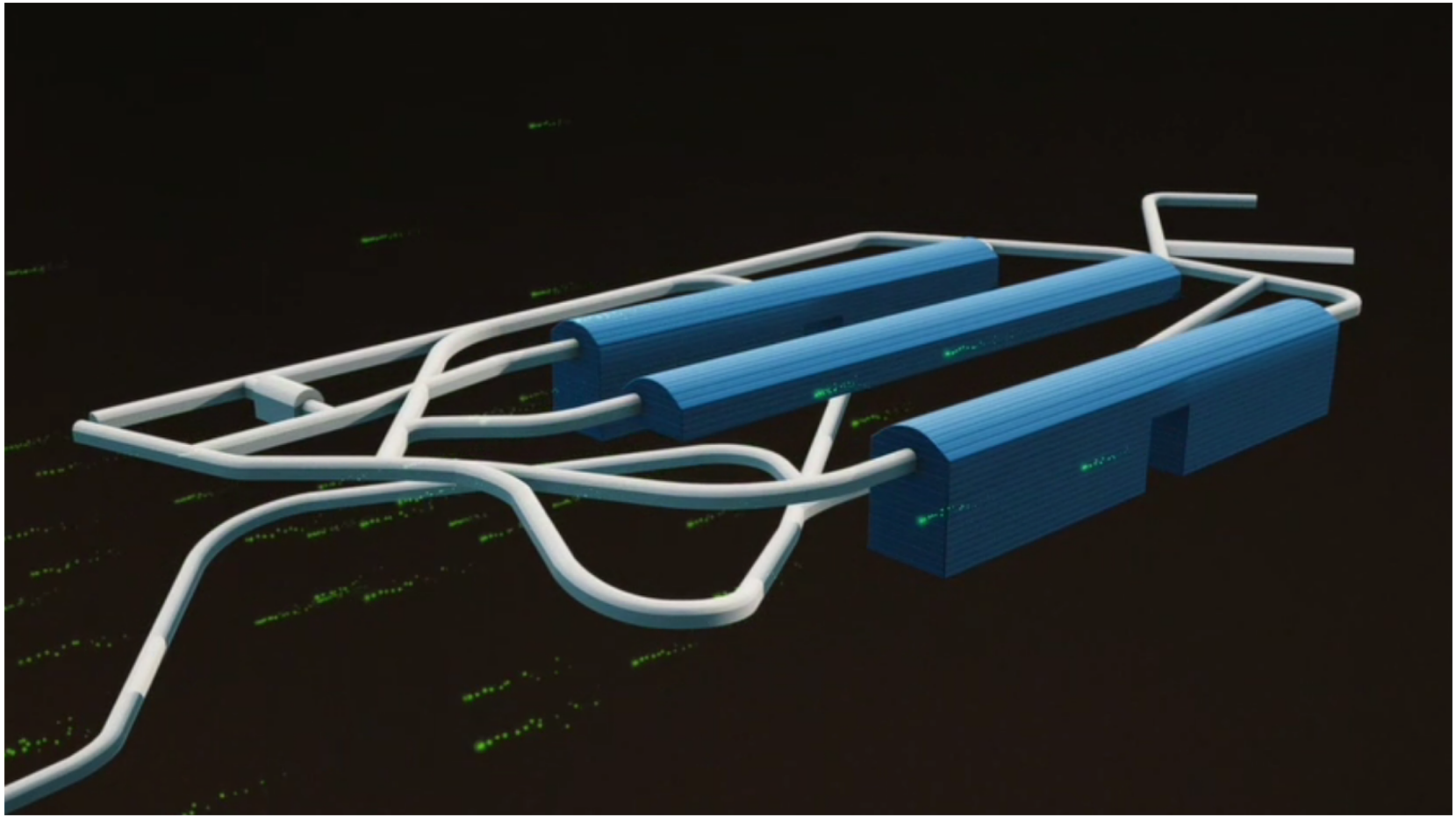
Who Am I?

- 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.
- I have been associated with DUSEL, LBNE, and LBNF as an engineer and manager since 2010.
- 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 – Scott Lundgren, KAJV

LBNF / DUNE – The International mega-science project

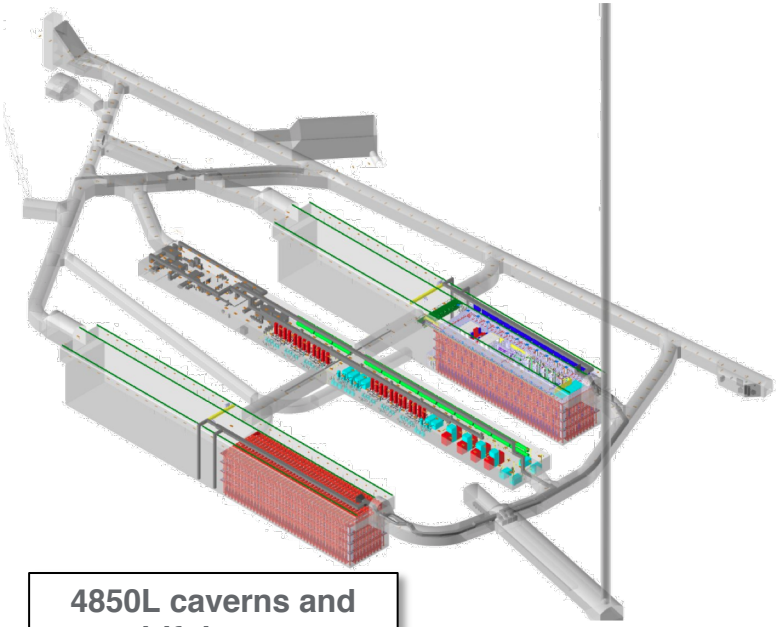


Watch the 2-minute video at: https://www.youtube.com/watch?v=AYtKcZMJ_4c

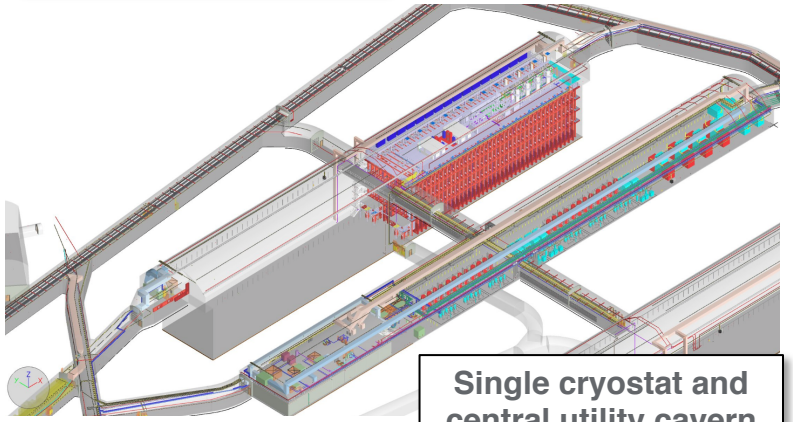
Overview – "Far Site" – LBNF / DUNE at Sanford Lab, Lead, SD

- **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 Detectors**
  - Four LAr TPC detectors

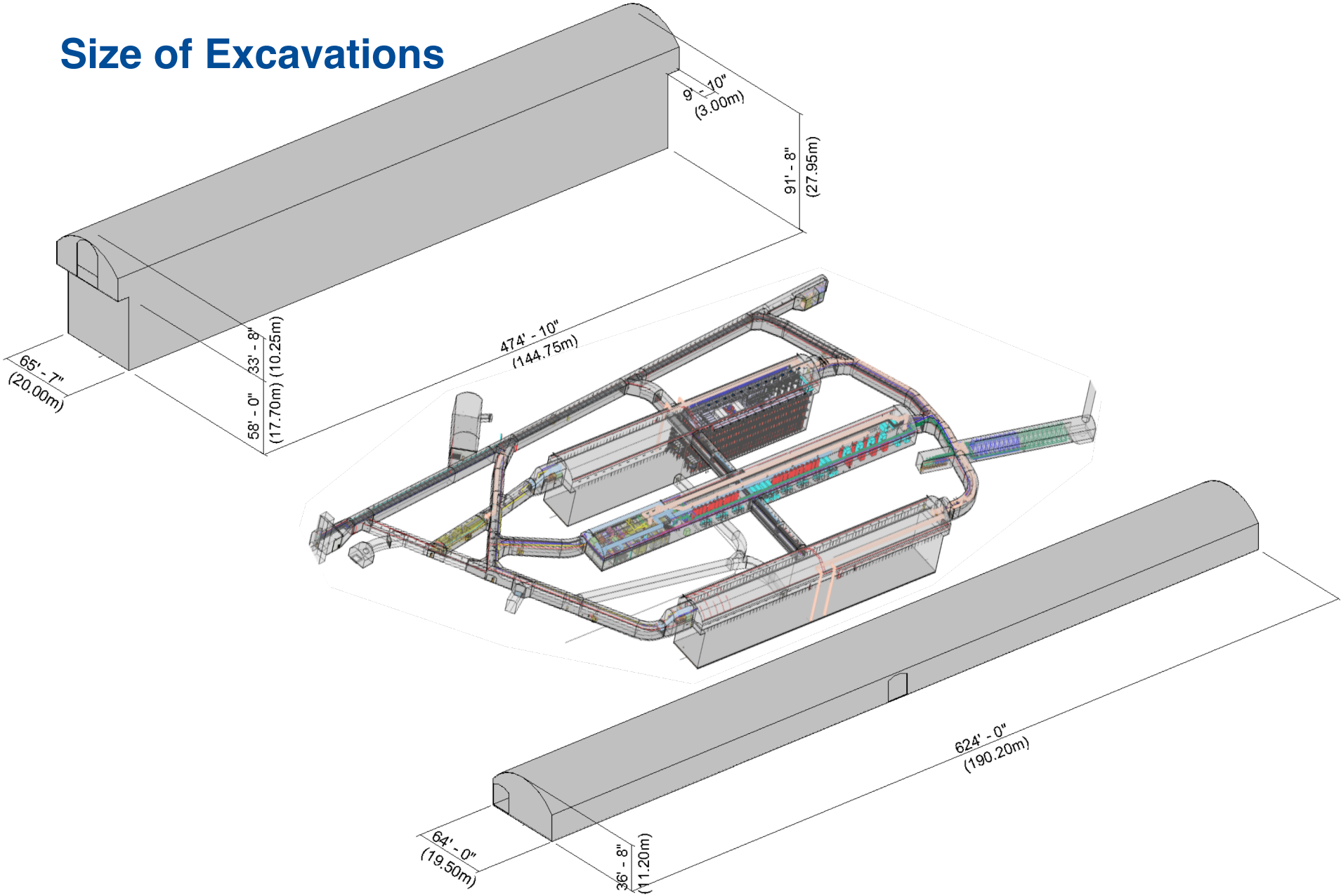


4850L caverns and drift layout

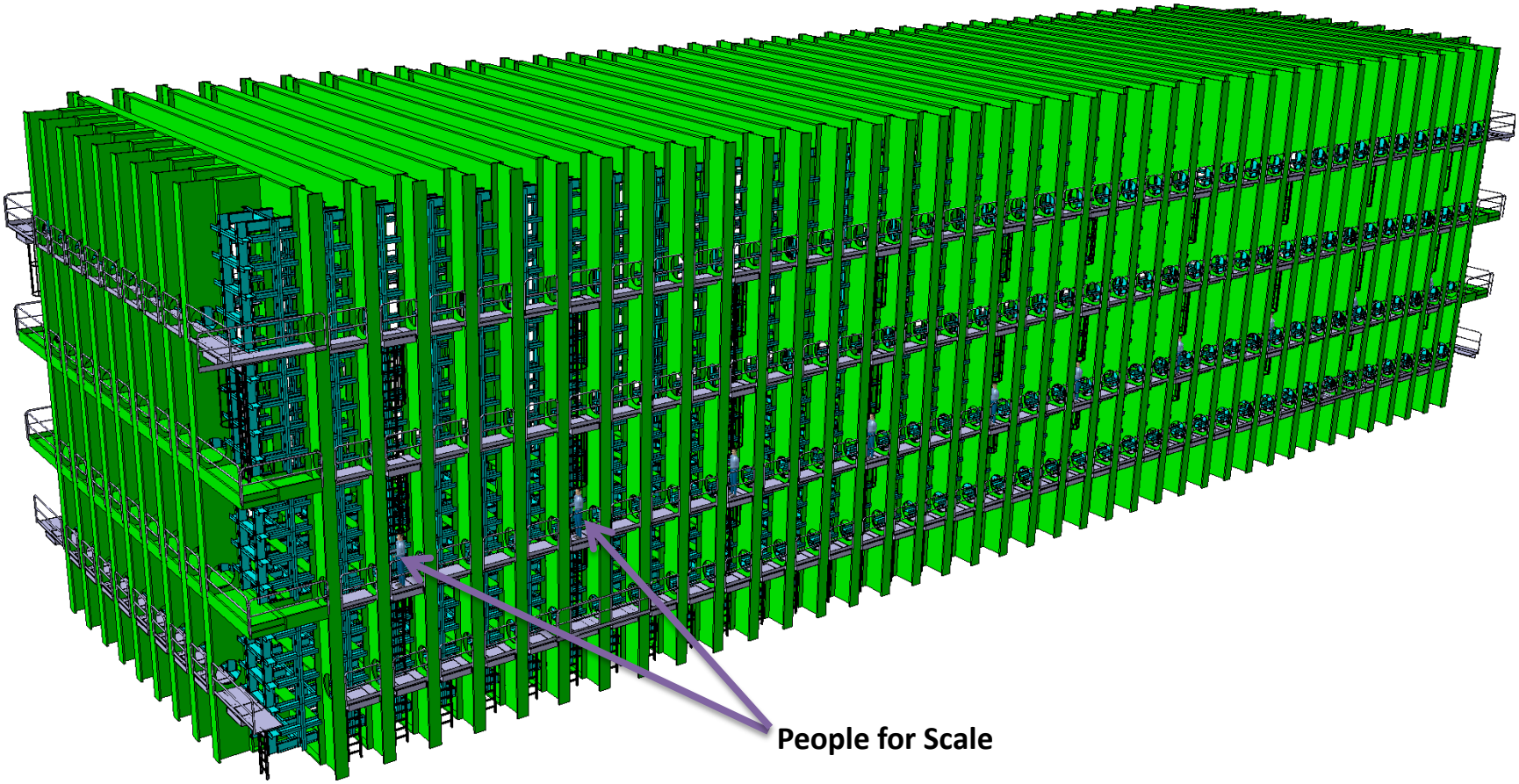


Single cryostat and central utility cavern

Size of Excavations



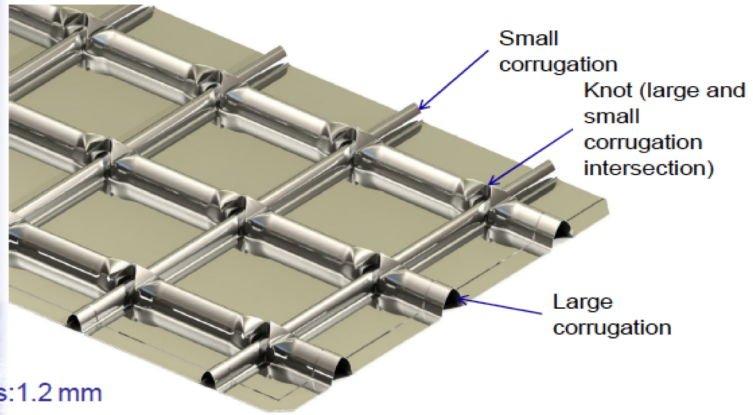
Steel Cryostat Design



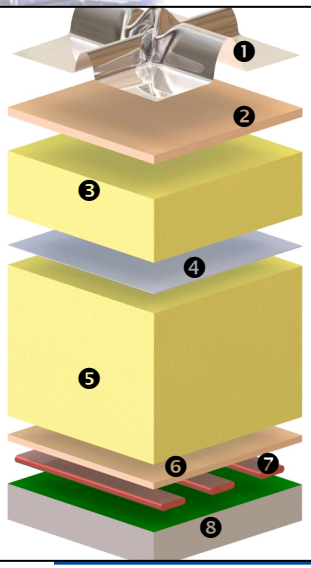
External Dimensions
62.7’ W x 59’ H x 216.5’ L (19.1m W x 18.0m H x 66.0m L)

Membrane Cryostat Design

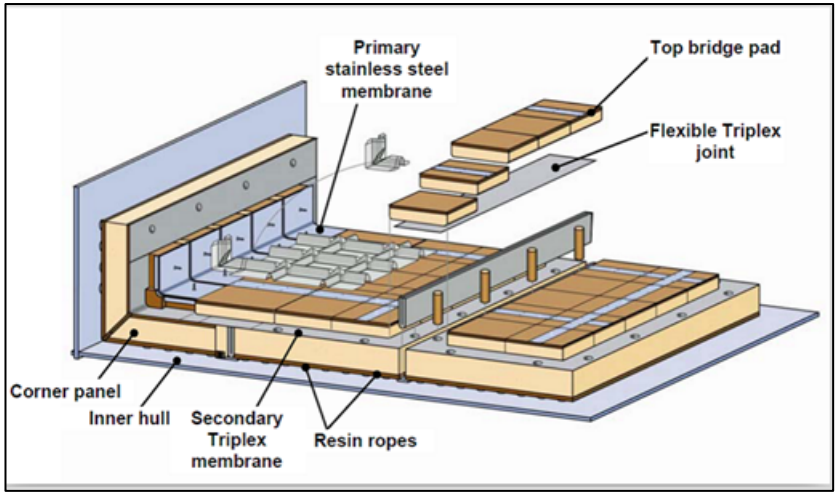
The corrugated stainless steel primary barrier:



- Thickness:1.2 mm
- Material: Stainless steel 304L



1. Stainless steel primary membrane
2. Plywood board
3. Reinforced polyurethane foam
4. Secondary barrier
5. Reinforced polyurethane foam
6. Plywood board
7. Bearing mastic
8. Steel structure with moisture barrier

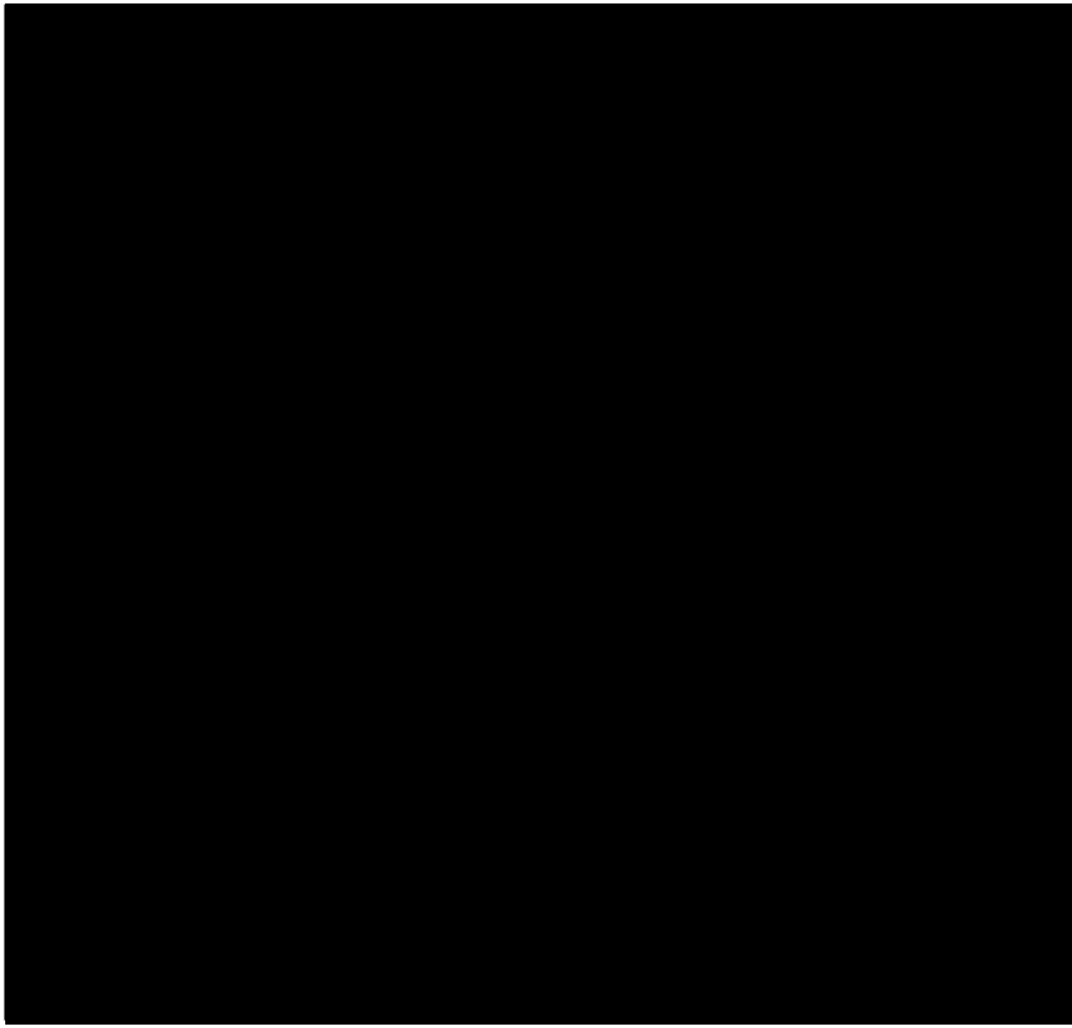


Detectors in the Cryostats

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

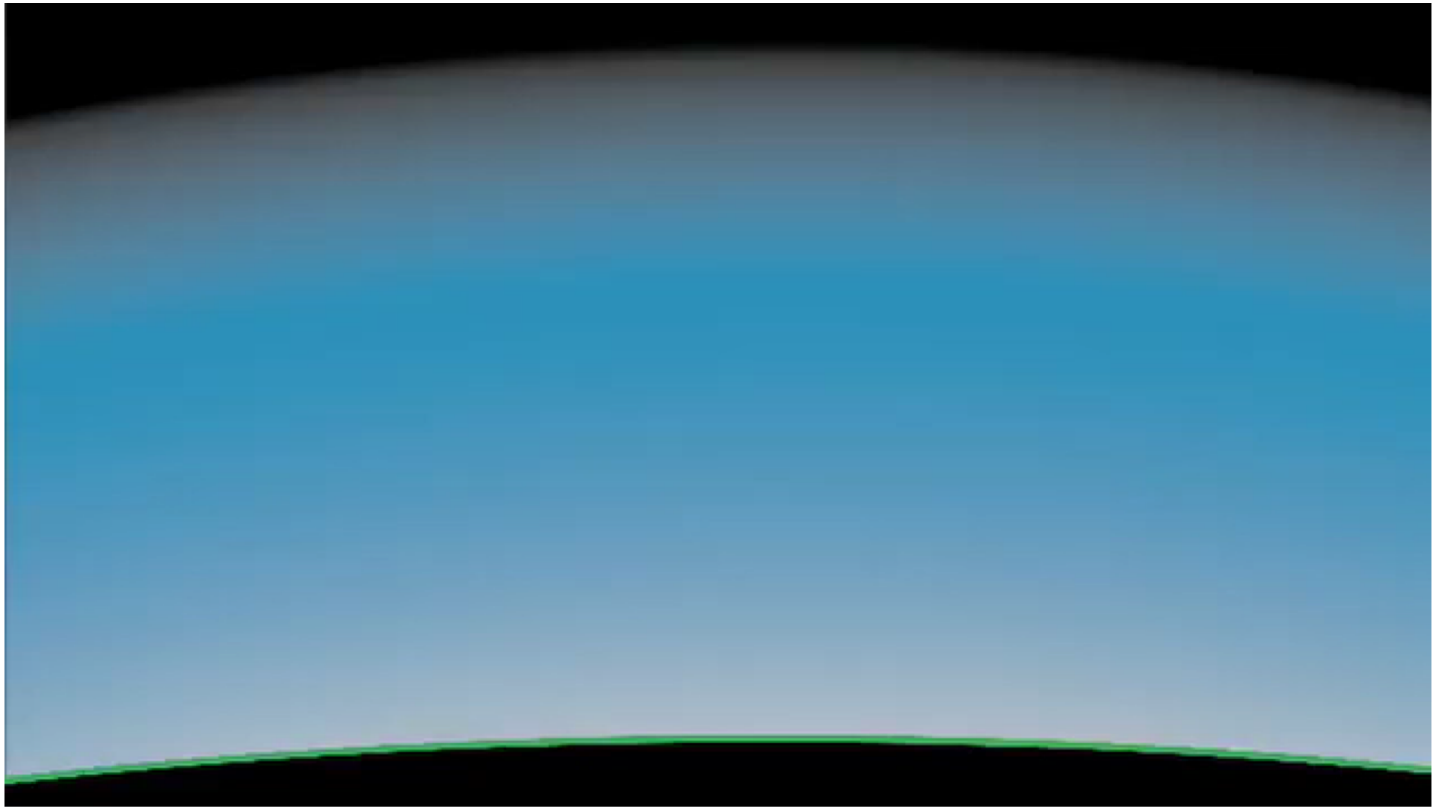
How Detectors work:

- 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 ~1.4) material makes for enough collisions to study. Going deep avoids detecting other particles.



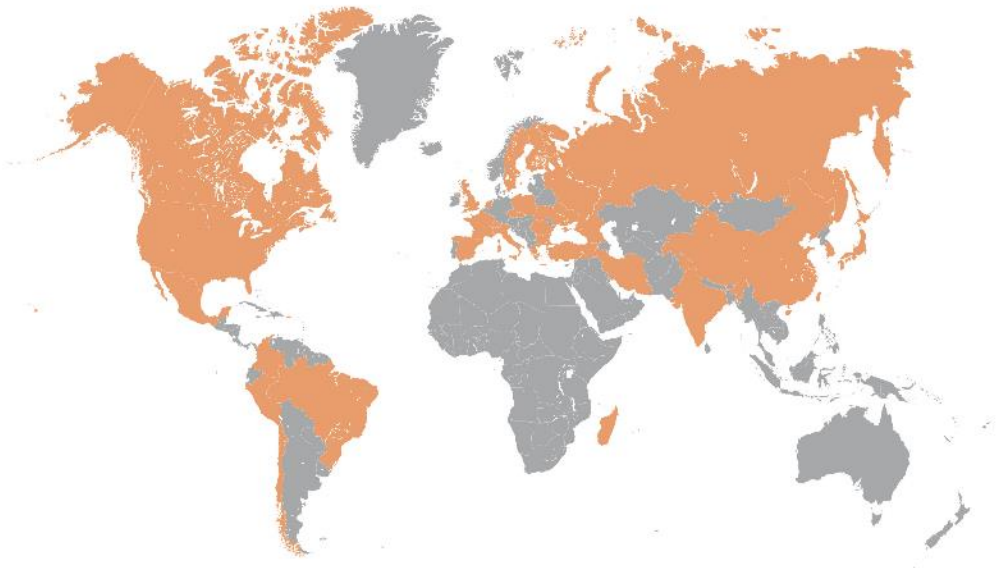
Recent Accomplishments

DUNE experiment is managed by the DUNE Collaboration

60 % non-US

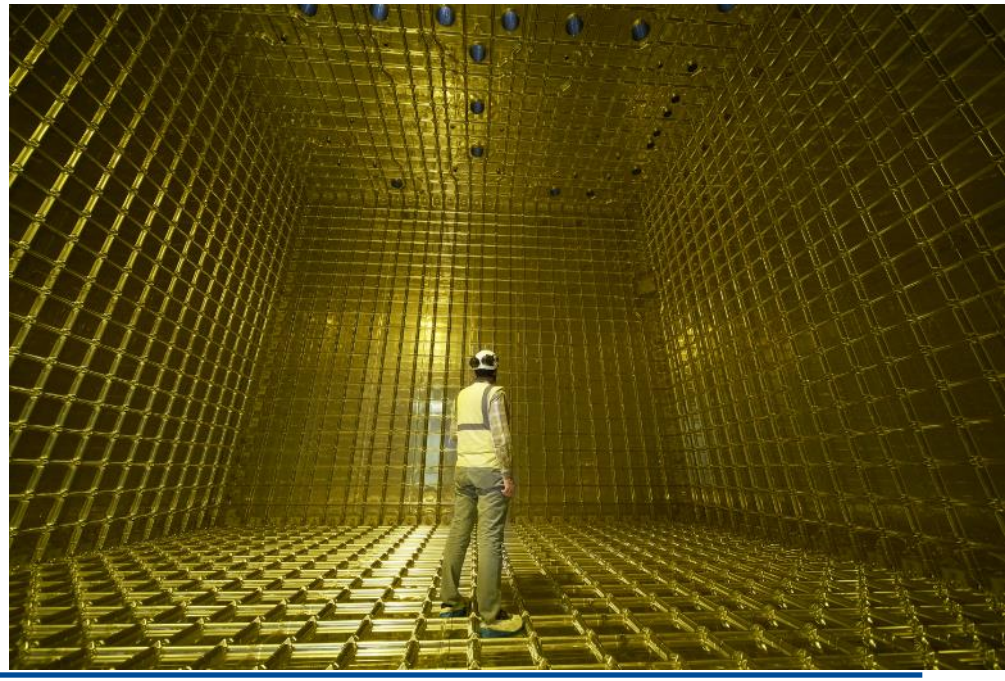
1180 collaborators from 178 institutions in 32 nations

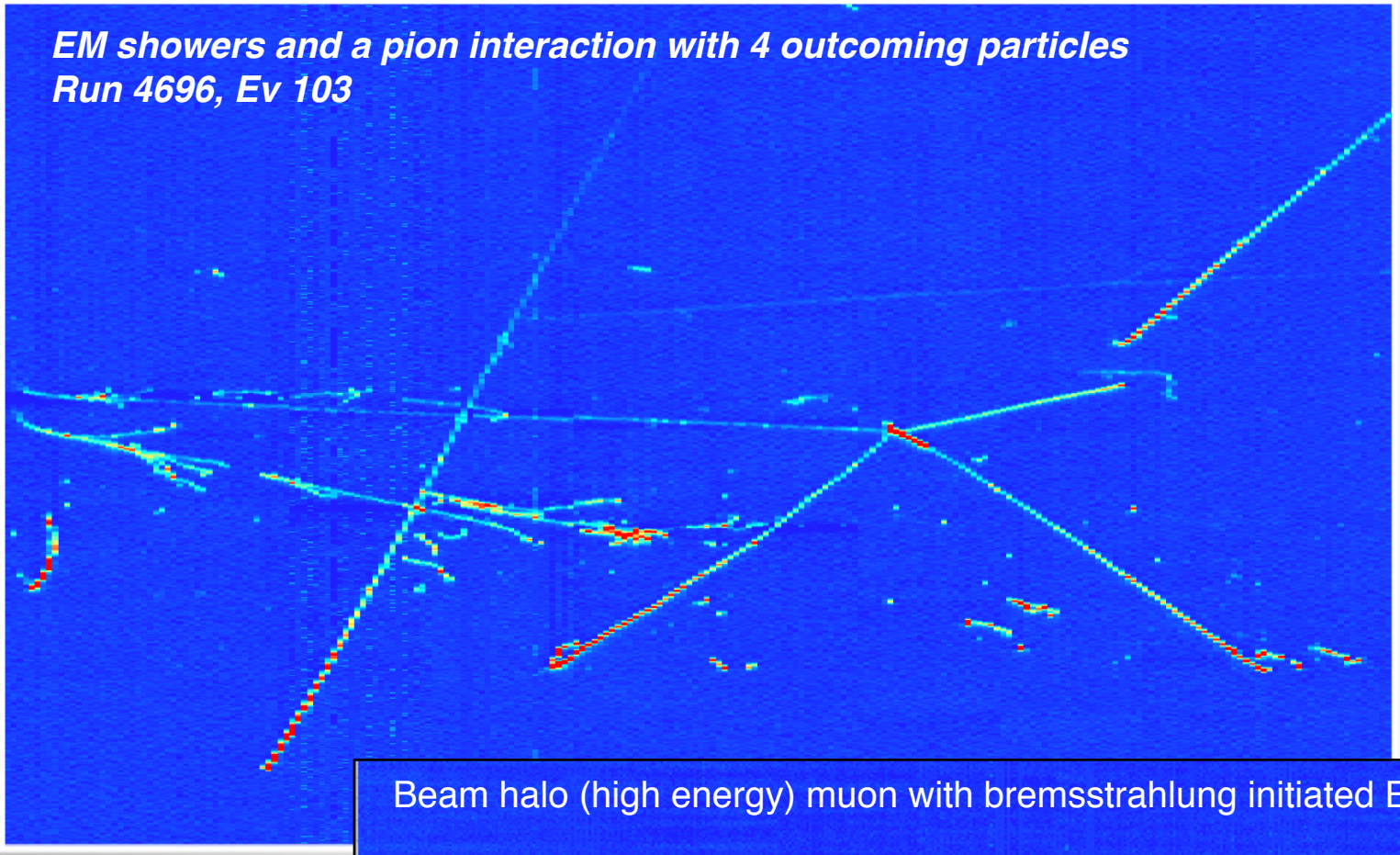
Armenia, Brazil, Bulgaria, Canada, CERN, Chile, China, Colombia, Czech Republic, Finland, France, Greece, India, Iran, Italy, Japan, Madagascar, Mexico, Netherlands, Paraguay, Peru, Poland, Portugal, Romania, Russia, South Korea, Spain, Sweden, Switzerland, Turkey, UK, Ukraine, USA

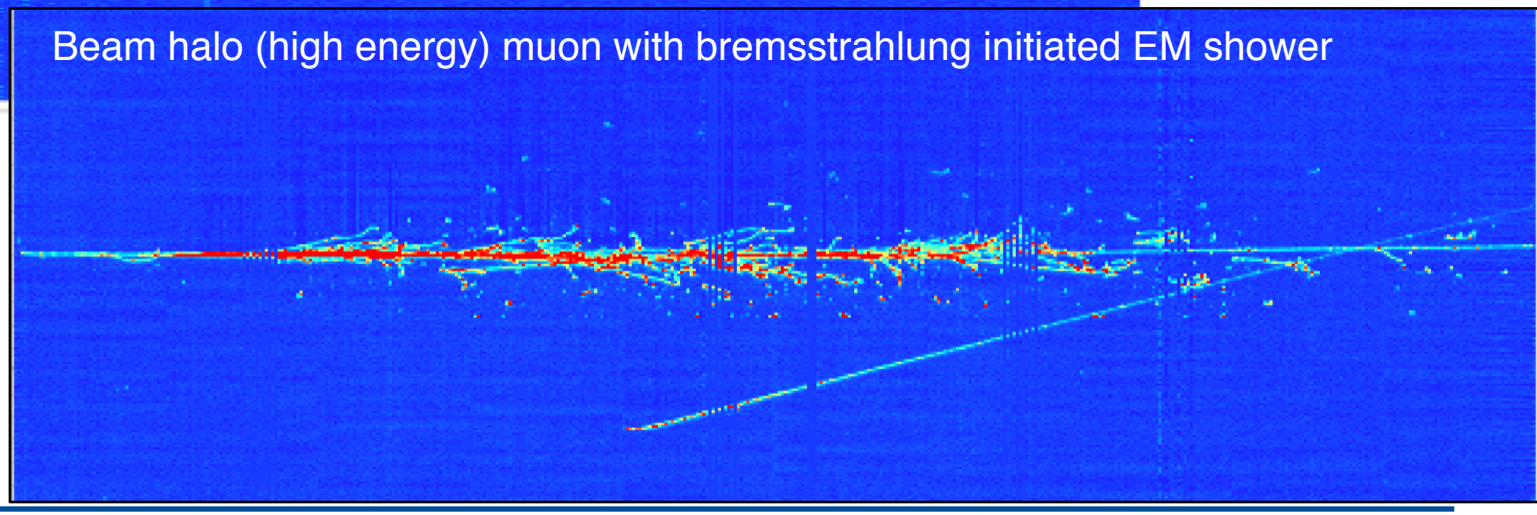


DUNE is still growing: dN/dt > 100 collaborators/year!

ProtoDUNE progress at CERN




EM showers and a pion interaction with 4 outcoming particles
Run 4696, Ev 103


Beam halo (high energy) muon with bremsstrahlung initiated EM shower

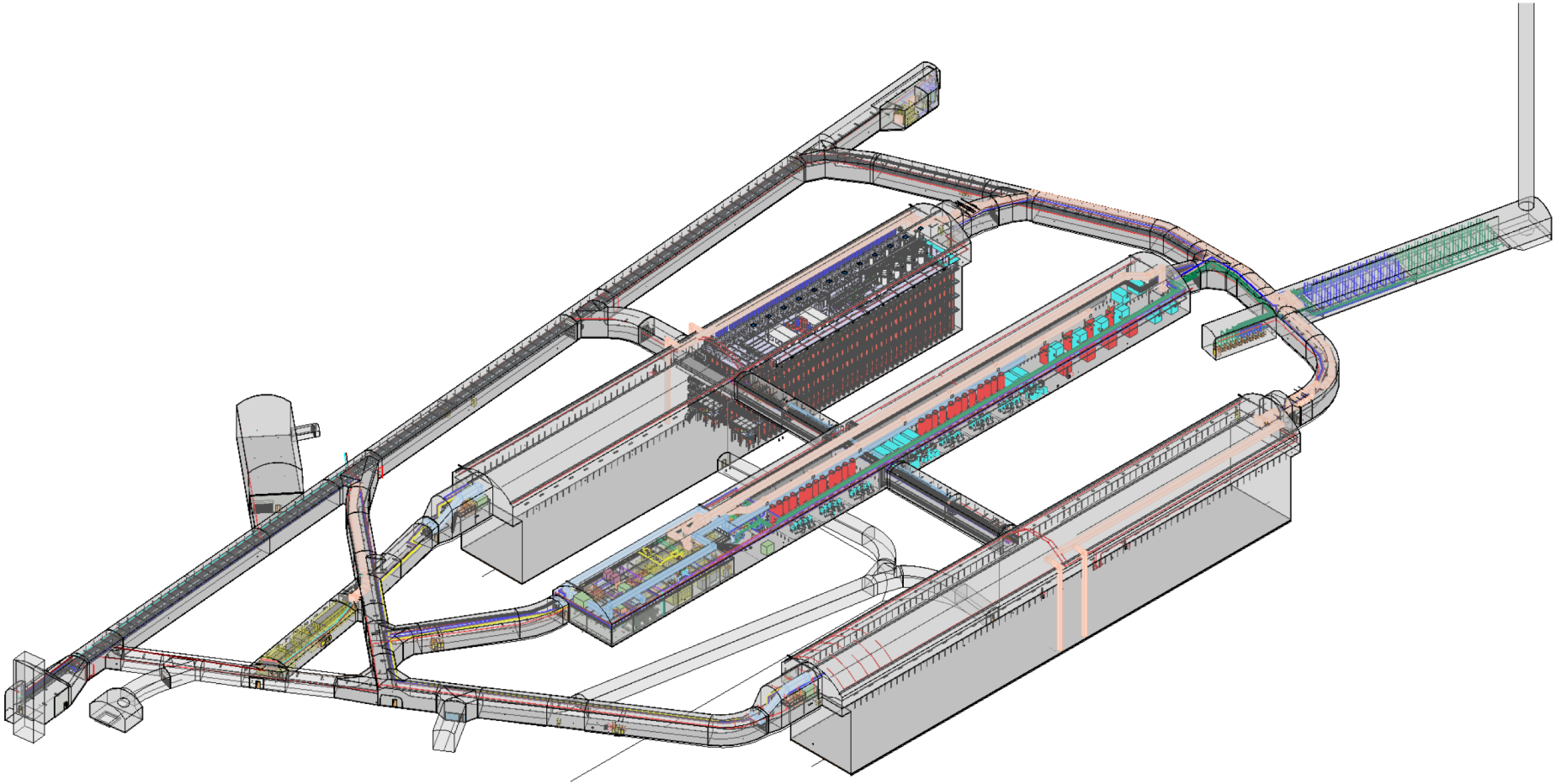
Getting to work

- Construction contract issued to Kiewit/Alberici Joint Venture (KAJV) November 30, 2018
- KAJV is in their office on Main Street!

Upcoming Activities

Scott Lundgren

Questions?



Fermilab CERN Sanford Underground Research Facility U.S. DEPARTMENT OF ENERGY Office of Science