



Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

CMTF Infrastructure

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PIP-II Machine Advisory Committee

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Outline

- CMTF Building
- PXIE Infrastructure
- PXIE Cave
- Electrical/Power Distribution
- Utilities
 - Cooling Water & Compressed Air
- Cryoplant
- Support Systems
 - Controls & Safety Systems
 - Control Room and Cleanroom
- Schedule

Cryomodule Test Facility (CMTF)



- CMTF is a new (2012) set of buildings (adjacent to NML) originally designed to house a helium cryoplant and two cryomodule test stands

SRF Accelerator Test Facility Complex (NML and CMTF)

Cryomodule Test Facility (CMTF)

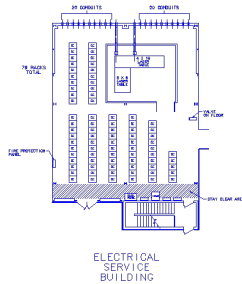
Cryomodule Test Stand (CMTS1)

Cleanroom

Cryogenic Cold Boxes

PXIE Accelerator

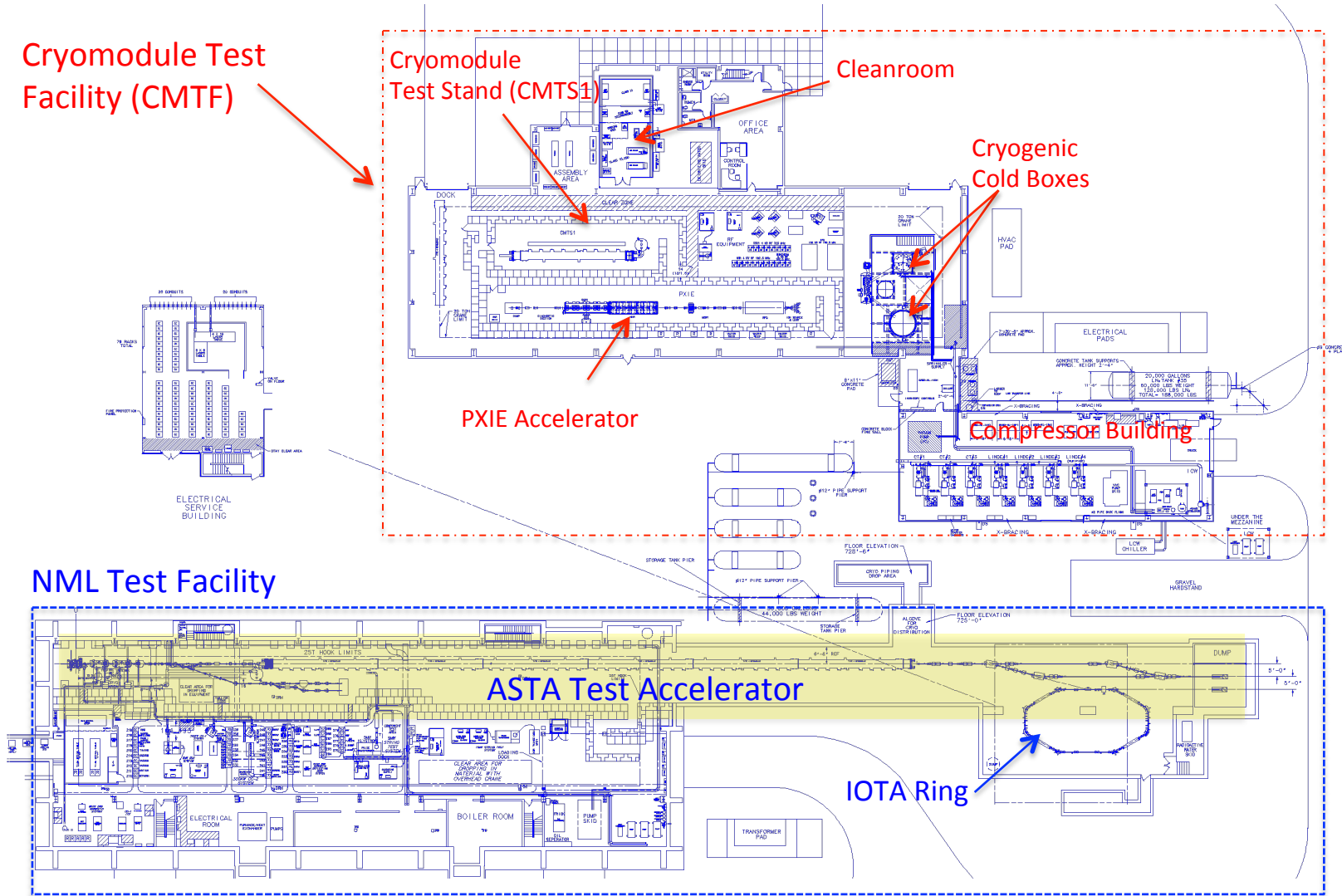
Compressor Building



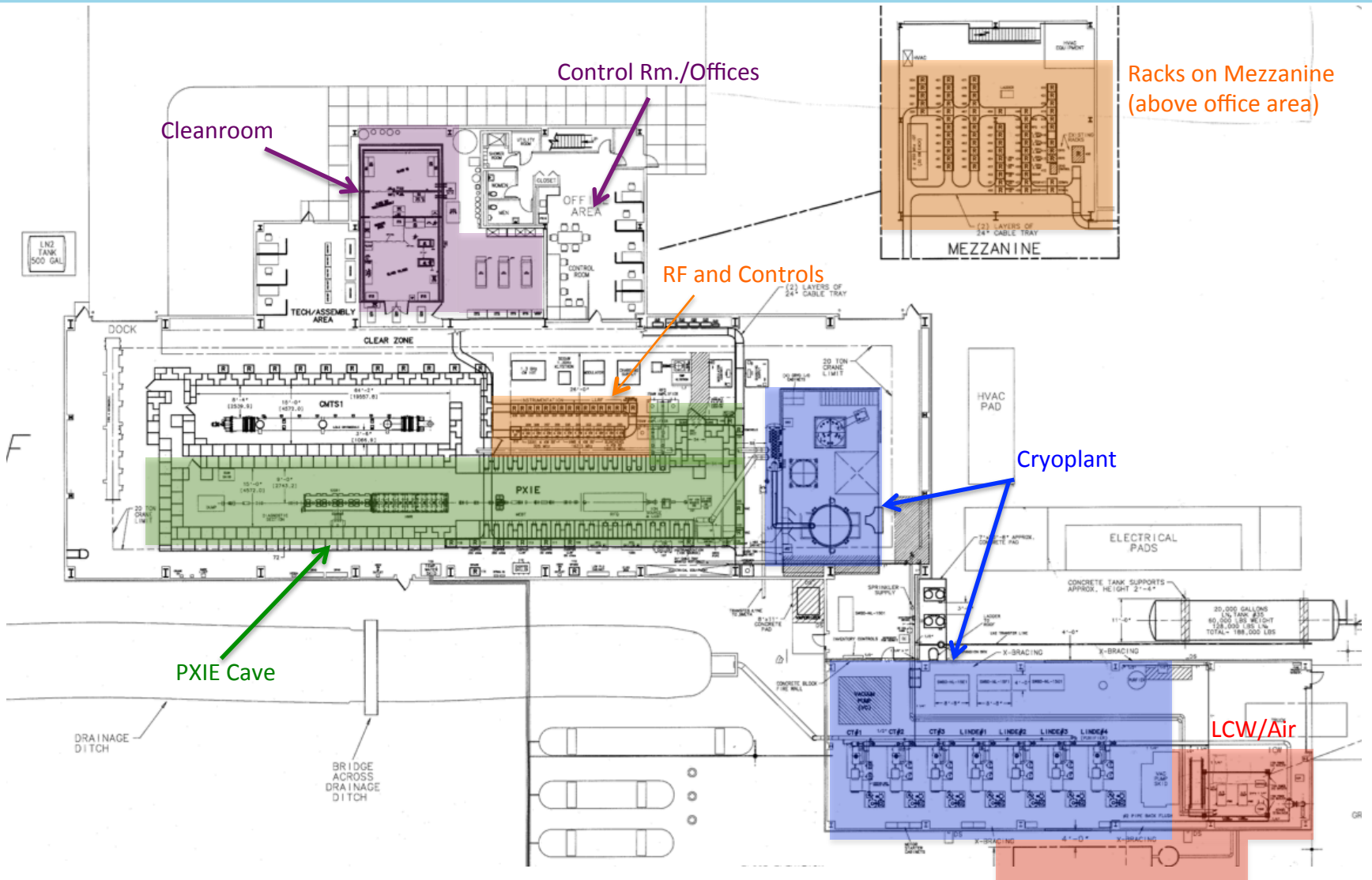
NML Test Facility

ASTA Test Accelerator

IOTA Ring

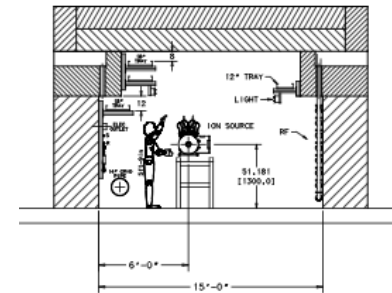
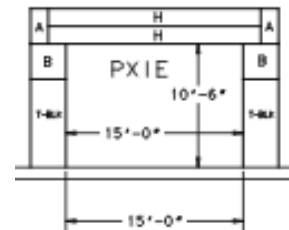
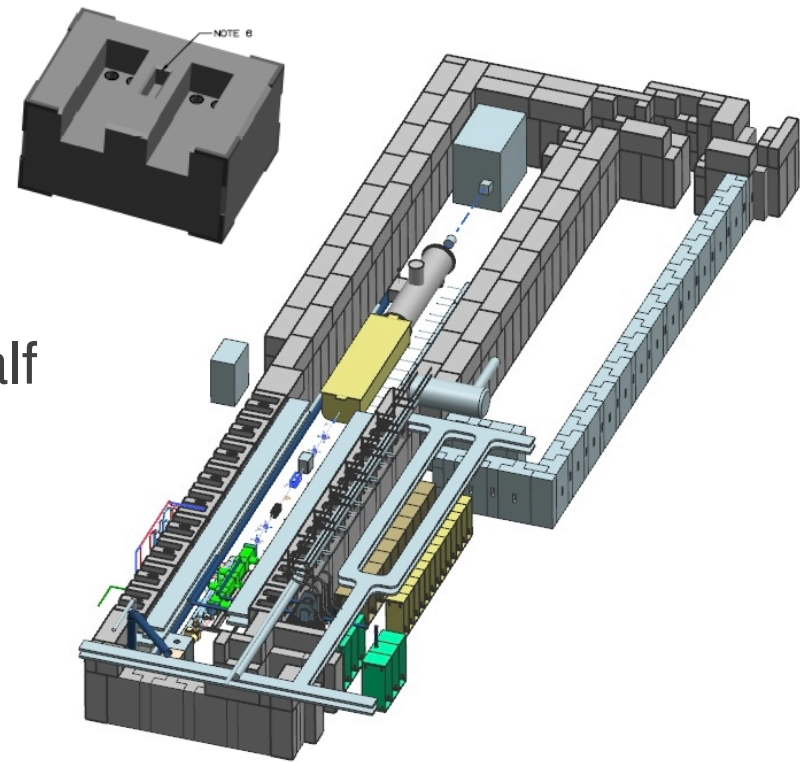


PXIE - Infrastructure

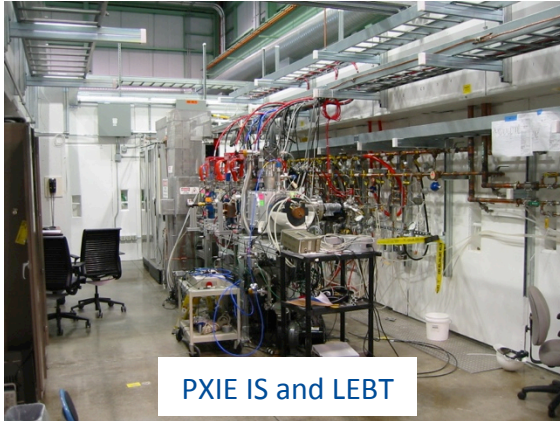


PXIE Cave

- Cave
 - Constructed of concrete shield blocks
 - Special penetration blocks for cables, water, and RF
 - Walls and penetration blocks of half of cave (IS, LEBT, RFQ, MEBT) assembled
 - Preliminary Shielding Analysis approved
- Alignment
 - Alignment network established within building and cave
 - Deep Rod Monuments to monitor movement of building will be installed in 2015



Cave Pictures



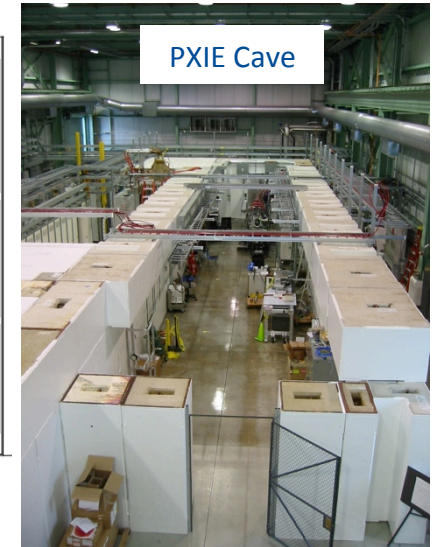
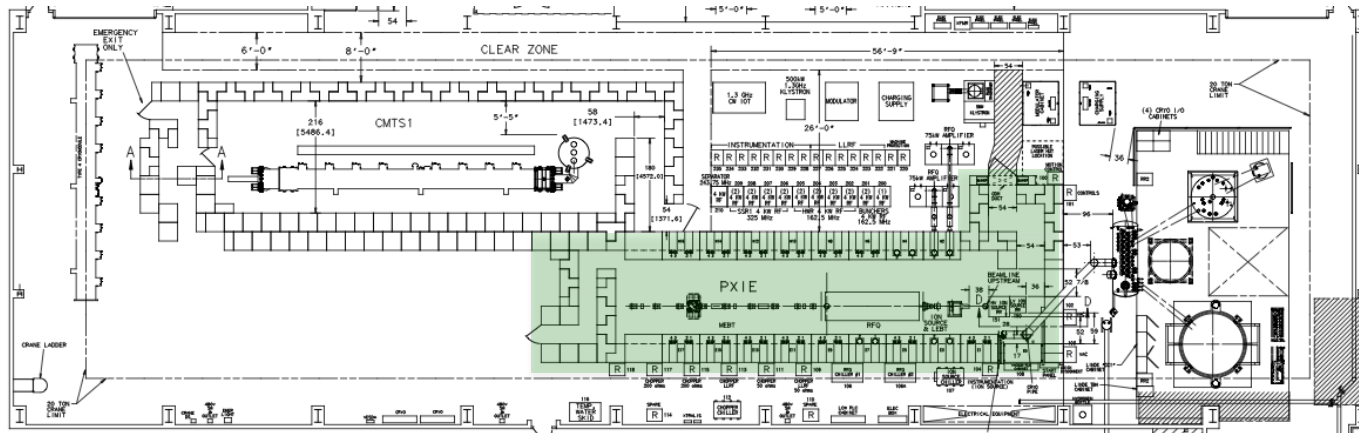
PXIE IS and LEBT



PXIE Cave



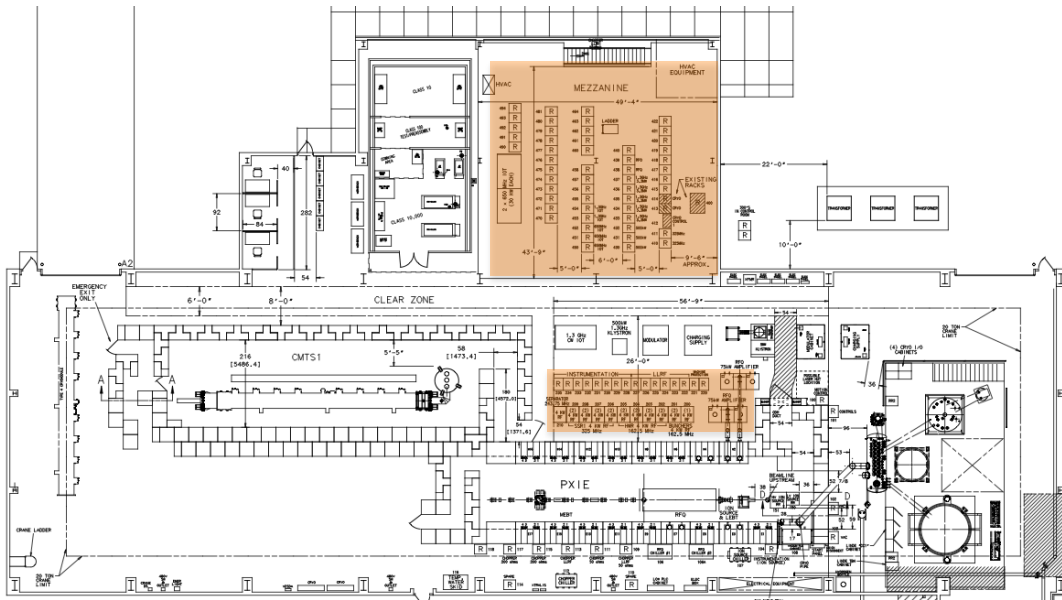
PXIE and CMTS Caves



PXIE Cave

Electrical/Power Distribution

- Electrical Power
 - (4) 1800 kVA transformers feed the CMTF building
 - PXIE racks, tray, and power distribution in place



Cooling Water & Compressed Air Systems

- PXIE Water Cooling
 - Ion Source chiller and manifolds installed and operating
 - Temporary LCW skid and piping to RFQ RF system installed
 - LEBT manifolds installed and piped to temporary LCW skid
 - RFQ sub-chillers being procured
- Low Conductivity Water (LCW) System
 - 1000 GPM, 100 PSIG, 83F +/- 1F, 1200 kW cooling capacity
 - Currently being installed to support all of CMTF
 - Plan is to have system complete and operational in Spring 2015 (to coincide with RFQ delivery)
- Compressed Air System
 - 95 CFM (160 CFM Max.), 100 PSIG, 40°F dew point
 - Compressed air system installed and operational throughout CMTF

Water/Air Status

- 315 Ton LCW Chiller(s) on-site
- Awaiting thaw to pour concrete support pad
- Pump and piping installation is approximately 50% complete



Temp. LCW Skid & IS Chiller



LEBT Manifolds & LCW Chiller



LCW and Air System



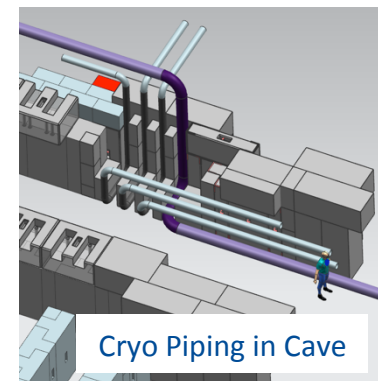
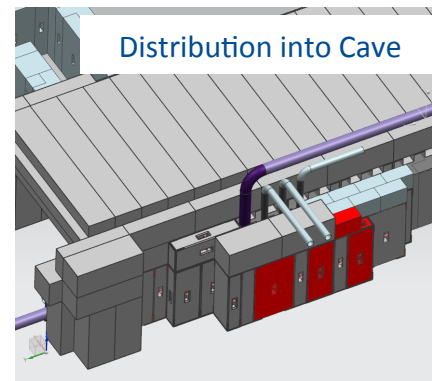
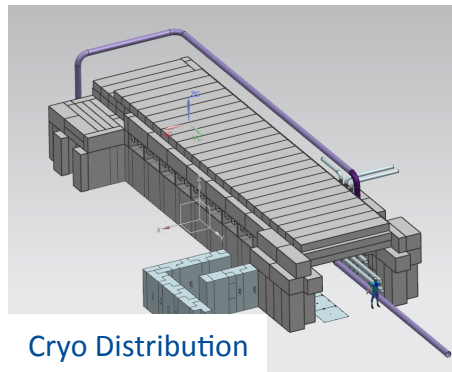
CMTF Cryoplant

- Helium Cryoplants in CMTF (nominal capacities)
 - New Superfluid Refrigerator (40K, 4.5K, 2K, using cold compressors)
 - ~ 250W @ 1.8K or 500W @ 2K
 - Repurposed SLAC CTI-4000 Refrigerator – (liquefier using turbine expanders)
 - ~ 1500W @ 4.5K
- Cryoplant provides independent operation of PXIE and CMTS



Cryoplant Status

- Status
 - Cryoplant was fully commissioned (2014)
 - Distribution piping from Cryoplant to Distribution Box due in March
 - Conceptual design for piping from Distribution Box to PXIE exists (cave to be modified Spring 2015)
 - Final design and procurement of cryo distribution piping in FY16
 - Installation and commissioning of PXIE system in FY17 (HWR)



Controls & Safety Systems

- Cryogenic Control System
 - Siemens S7-400 with ET200 remote IO's
 - Feeds into CMTF facility control system
- CMTF Master Control System
 - ACNET, real time data acquisition
 - Database, data logging, sequencer, alarms, save/restore, synoptic display
 - Linux, VxWorks, Java, Labview, EPICS support
- Interlocks and Controlled Access – FY16
 - Same as NML and CMTS (standard at Fermilab)
- Oxygen Deficiency (ODH) – FY17
 - Monitors, alarms, ODH ventilation, etc. needs to be designed for cave
 - Will be modeled after NML & CMTS (standard at Fermilab)

Control Room

- Control Room/Office Area
 - Control room is fully operational
 - Mobile control consoles in high-bay
 - 5 offices, meeting area, kitchen, bathrooms, shower



Cleanroom

- Cleanroom
 - Class 10, 100, and 10,000 areas
 - External preparation area (ultrasonic tanks, rinse sinks, parts washer, ultra-pure DI water system, clean Nitrogen system)
 - Certification and ODH approval received (January, 2014)



Preparation Area



Nitrogen Dewar



Cleanroom



Inside Cleanroom



Infrastructure Schedule/Scope

- FY15
 - Install infrastructure to test RFQ RF stations
 - Install and commission LCW system
 - Prepare for RFQ installation and commissioning
- FY16
 - Design and procure cryo distribution piping
- FY17
 - Install cryo piping
 - Extend cave
 - Install and commission HWR & SSR1
- FY18
 - Install HEFT, beam dump, and RAW cooling system
 - Test HWR and SSR1 with beam

Thank You!