



Accelerator and NuMI Upgrades

**FY2012 Shutdown: Installation Readiness and Plan
Risks and Mitigation**

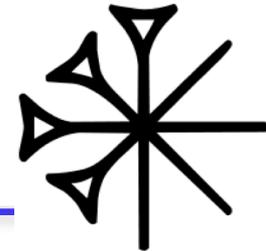
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L2 Manager

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Context of ANU

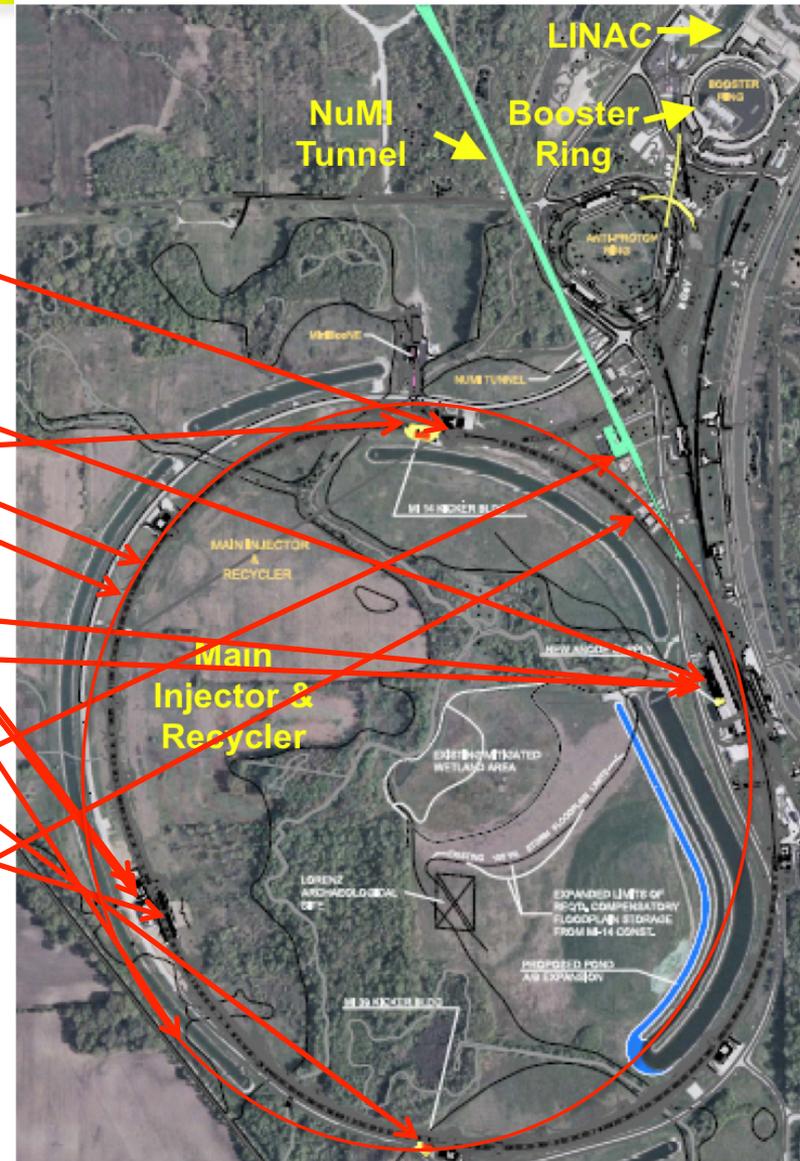


- Changes to the FNAL Accelerator complex to
 - Turn Recycler from pbar to proton ring
 - Injection and extraction lines
 - Associated kickers and instrumentation
 - 53 MHz RF
 - Decommission/remove pbar devices
 - Shorten MI cycle to 1.33 seconds
 - RF upgrades
 - Power Supply upgrades
 - Decommission/remove pbar devices
 - NuMI target station to 700 kW
 - Target & Horns to handle power
 - Configuration to maximize ν flux
 - Installation and Hardware commissioning



Accelerator and NuMI Upgrades

- Recycler Ring, RR (WBS x.0.1)
 - New injection line into RR
 - New extraction line from RR
 - New 53 MHz RF system
 - Instrumentation Upgrades
 - New abort kickers
 - Decommissioning of pbar components
- Main Injector (WBS x.0.2)
 - Two 53 MHz cavities
 - Quad Power Supply Upgrade
 - Low Level RF System
- NuMI (WBS x.0.3)
 - Change to medium energy ν beam configuration (new target, horn, configuration)
 - Cooling & power supply upgrades
- Beam Physics (WBS 1.0.4)
 - Beam Simulations & Evaluation of Proton Plan





2010 IPR Recommendations



U.S. DEPARTMENT OF
ENERGY

2.1.3 Recommendations

- Formulate an alternative plan (by 12/31/10) to mitigate the potential impact of further delays to the kicker ceramic vessel procurement and target production.

- 12/31/10 Plan:
 - Decide by April on full turn kicker approach
 - Pursue Accord with 2nd target production vendor
- April: mix of long and short for full turn kickers, tubes at vendor for brazing
- Accord (PO) with STFC/RAL for target fabrication executed in March 2011 with expected delivery in Fall 2011



Installation Readiness: Magnets

- Building/Refurbishing/Recycling magnets
 - Building 9 types
 - Refurbishing 2 types
 - Recycling 6 types

 - Stands for all the types in 3 different lines

 - Even installed 1!



Installation Readiness: Magnets

- PDD magnet installed in injection line:
 - Test of new stand design and installation procedure



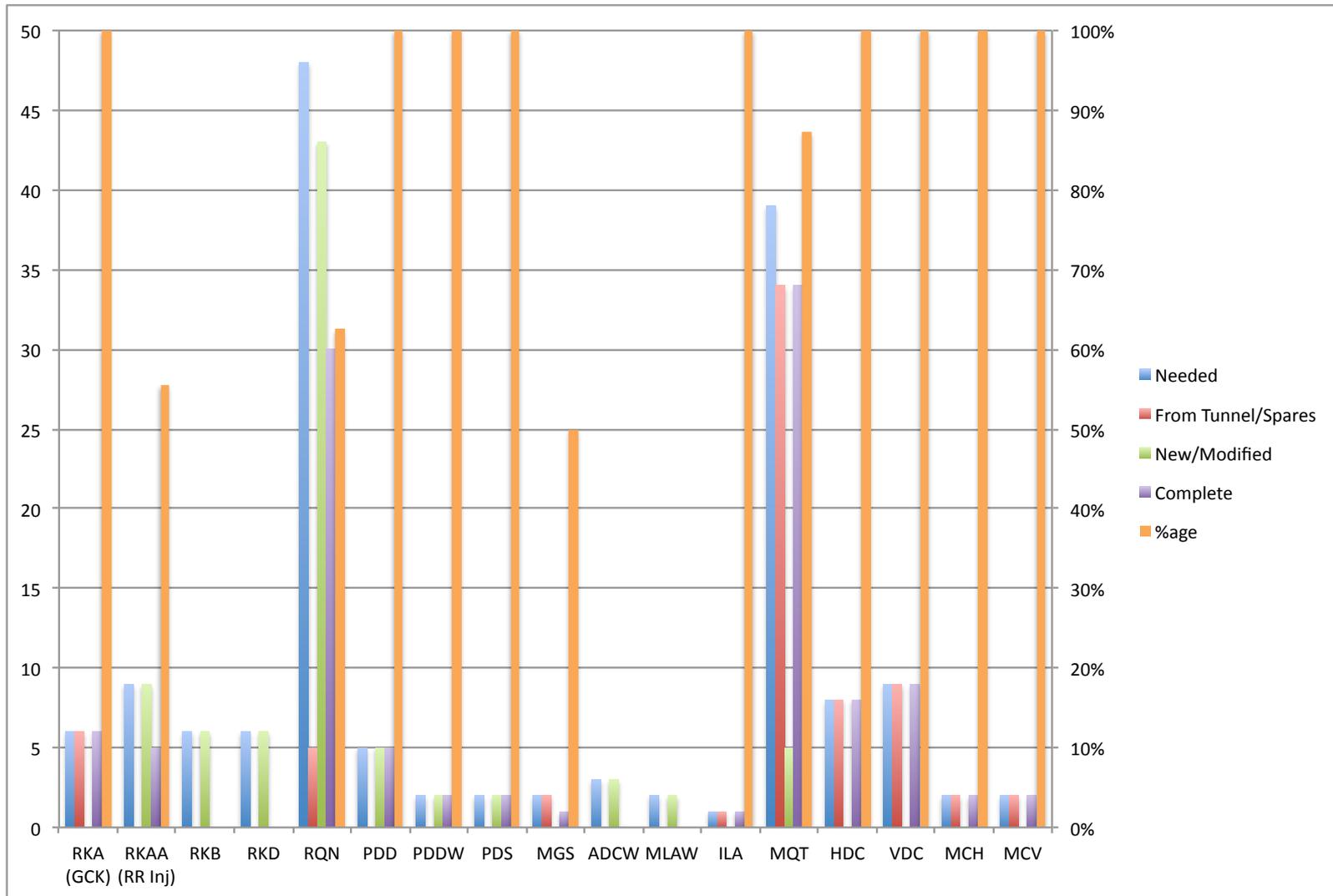


Installation Readiness: Magnets





Installation Readiness: Magnets



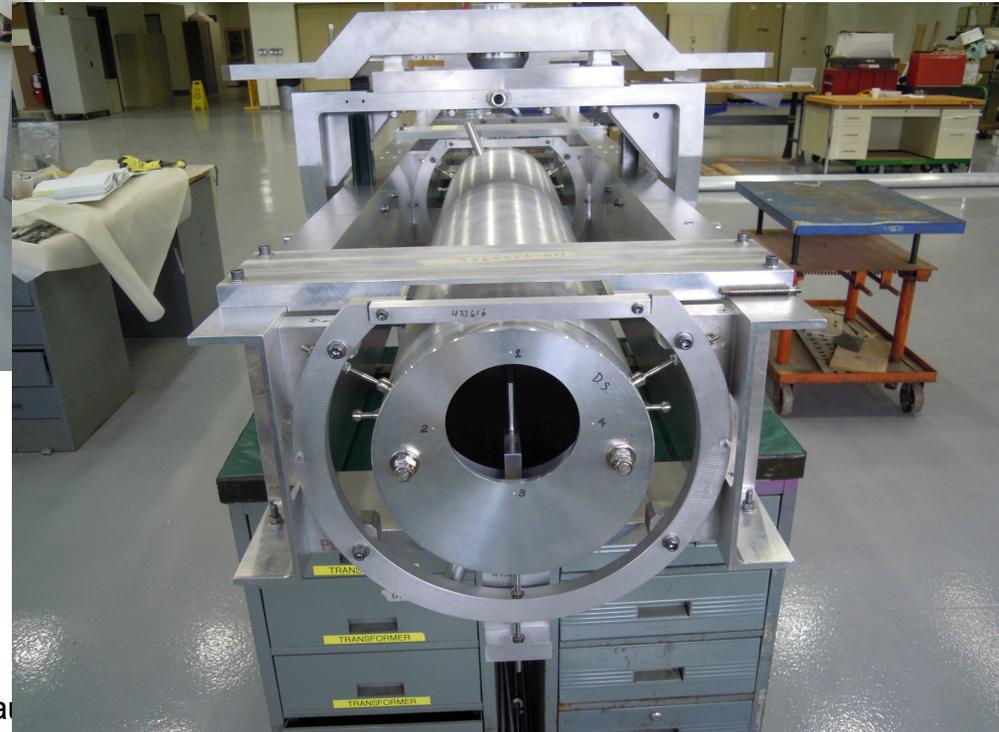


Installation Readiness: Target Hall

- Prototype Target Carrier complete: used for 1st target



Upstream: baffle



Downstream: target canister





Installation Readiness: Target Hall



Fabrication of the individual components is complete at MAB

4.75" Thick Steel

12" Thick Steel

Void Floor Shielding (1 each)

12" Thick Steel

- Use standard T-block lifting fixture
- Fabrication at MAB starting this month





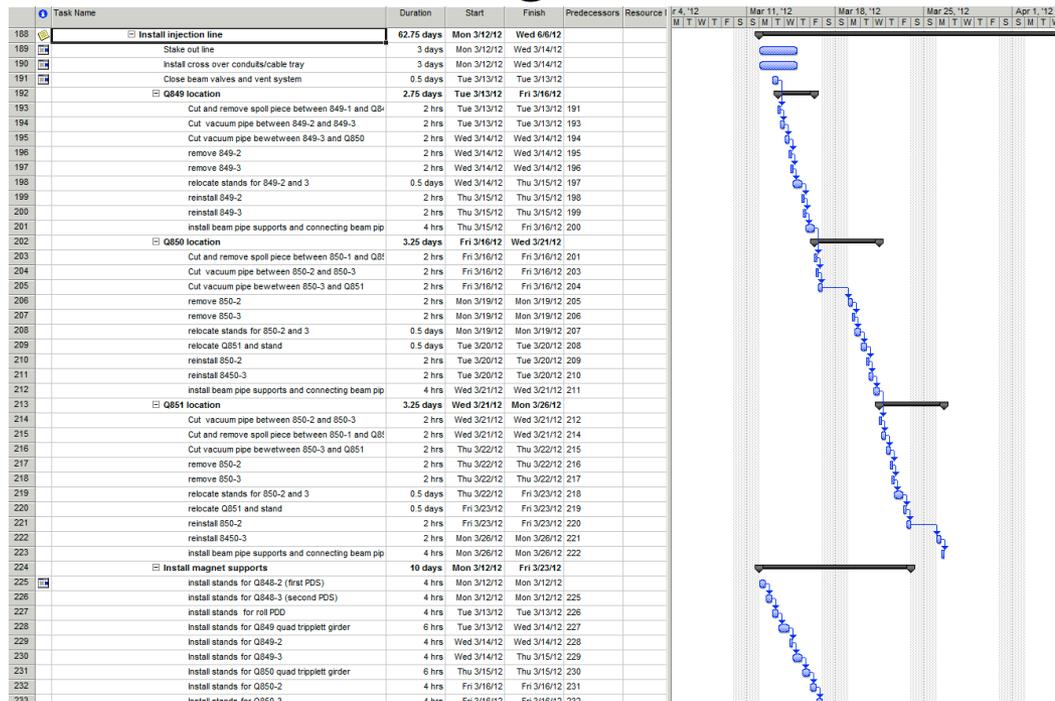
Installation Readiness: ALARA

- Doing work in high radiation areas
 - Make use of temporary shielding
 - MI 30 area (Ecool removal, RR -> MI Transfer line)
 - NuMI Target Hall (Target Installation, Horn 2 move)
 - Build as much upstairs
 - For injection and extraction lines, fabricate girders with magnets/ beampipe/instrumentation upstairs, install in one piece
 - Dry runs of critical tasks
 - cutting sheetmetal air seal, remotely lifting and placing blue-blocks in coffin, welding T-block support tubes
 - Scheduled in next few weeks
 - Working with Rad safety for some time



Installation Readiness: Planning

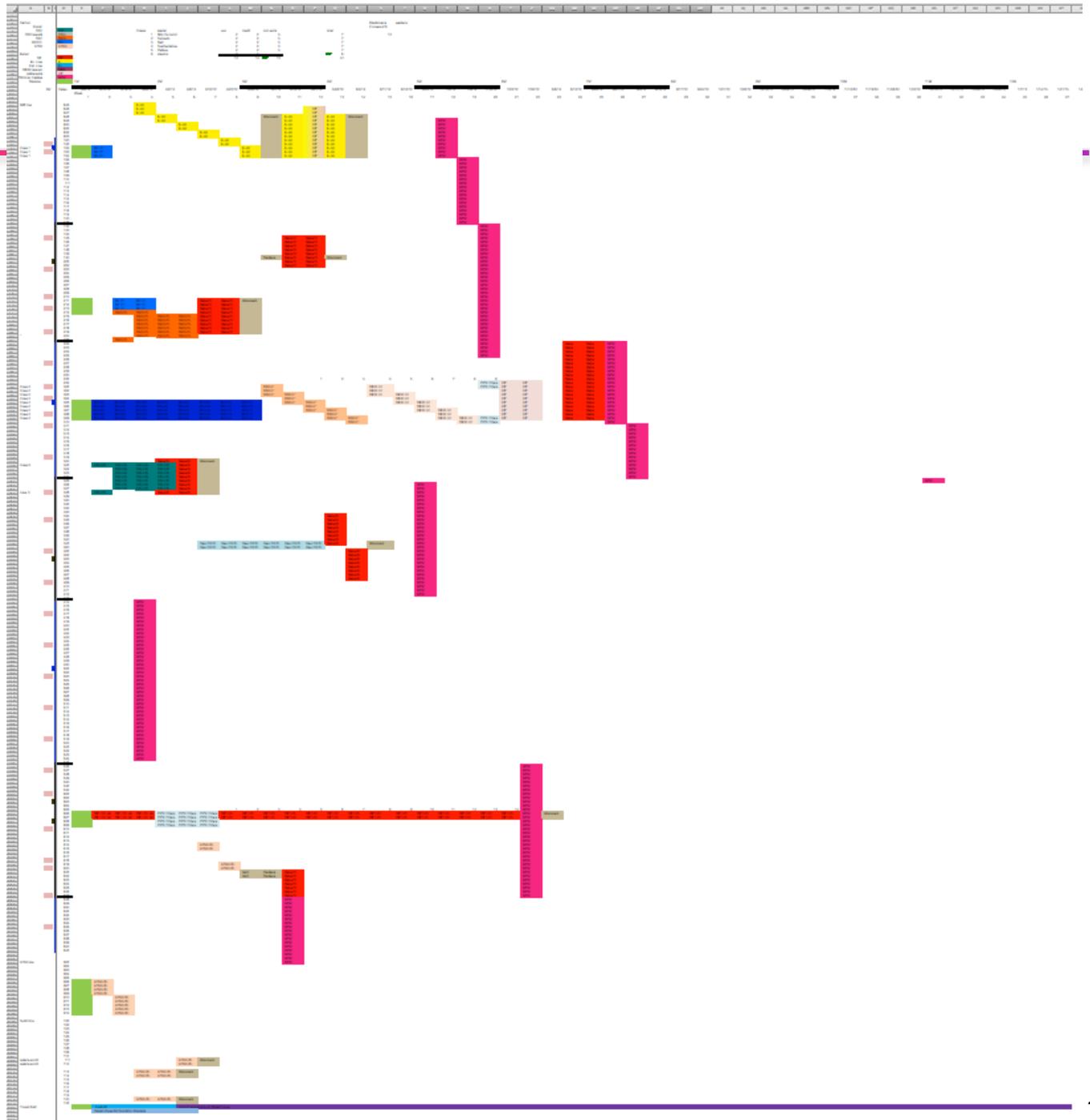
- Have a detailed 700+ line MPP schedule
 - For time and labor estimates
 - Pictorial view to handle space conflicts around the tunnel, with crew assignments





Readiness: Planning

- Time: x axis (weeks)
- Location: y axis (vacuum sector)
- Color: crew
 - AD Installation
 - Electricians
 - Riggers
 - Pipefitters





Installation Readiness: Planning

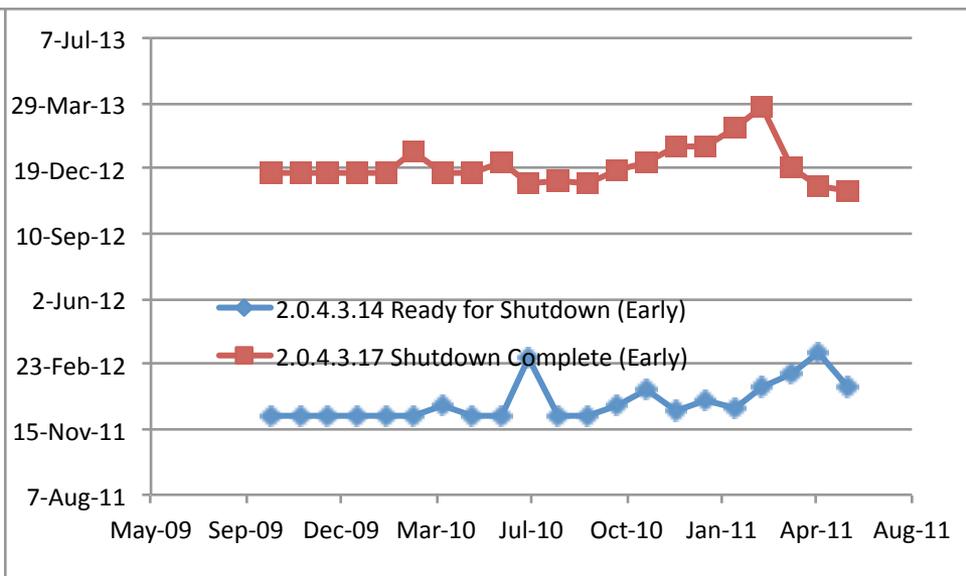
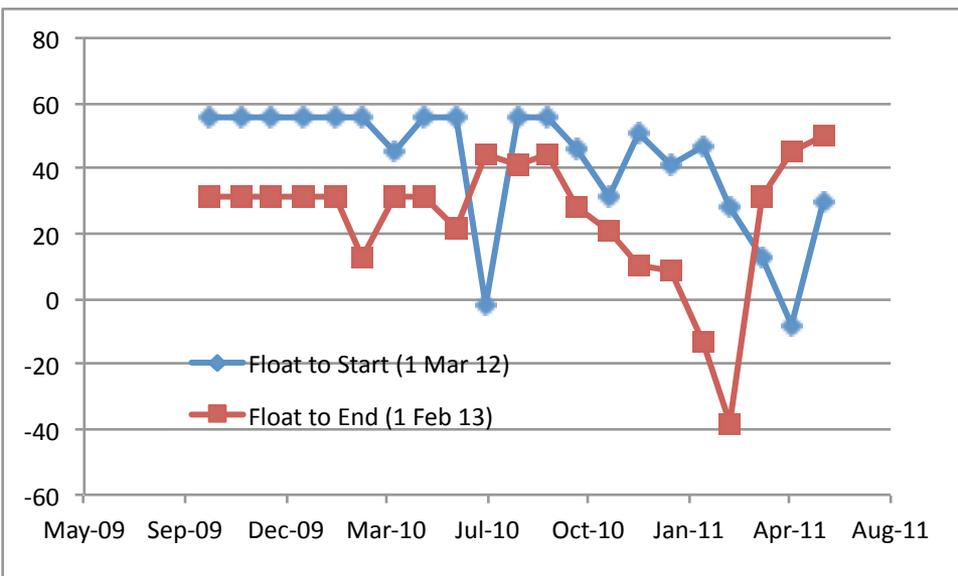
- Series of reviews of Target Hall procedures
 - Remove radiation shielding (radioactive)
 - Install temporary shielding
 - Perform installation work
 - Remove temporary shielding
 - Install permanent shielding

- NOvA Docs 2621, 3539, 4978



Shutdown Start

- Track ready for start of shutdown: 30 days float to 1 Mar 2012
 - Critical Path: Radioactive Water Design tasks
 - Target and Absorber Hall RAW handling
- Track shutdown complete: 50 days float to 1 Feb 2013
 - Critical Path: Full turn kicker systems
 - Long Beam Tubes for RKB, Ferrites/Capacitors for RKD





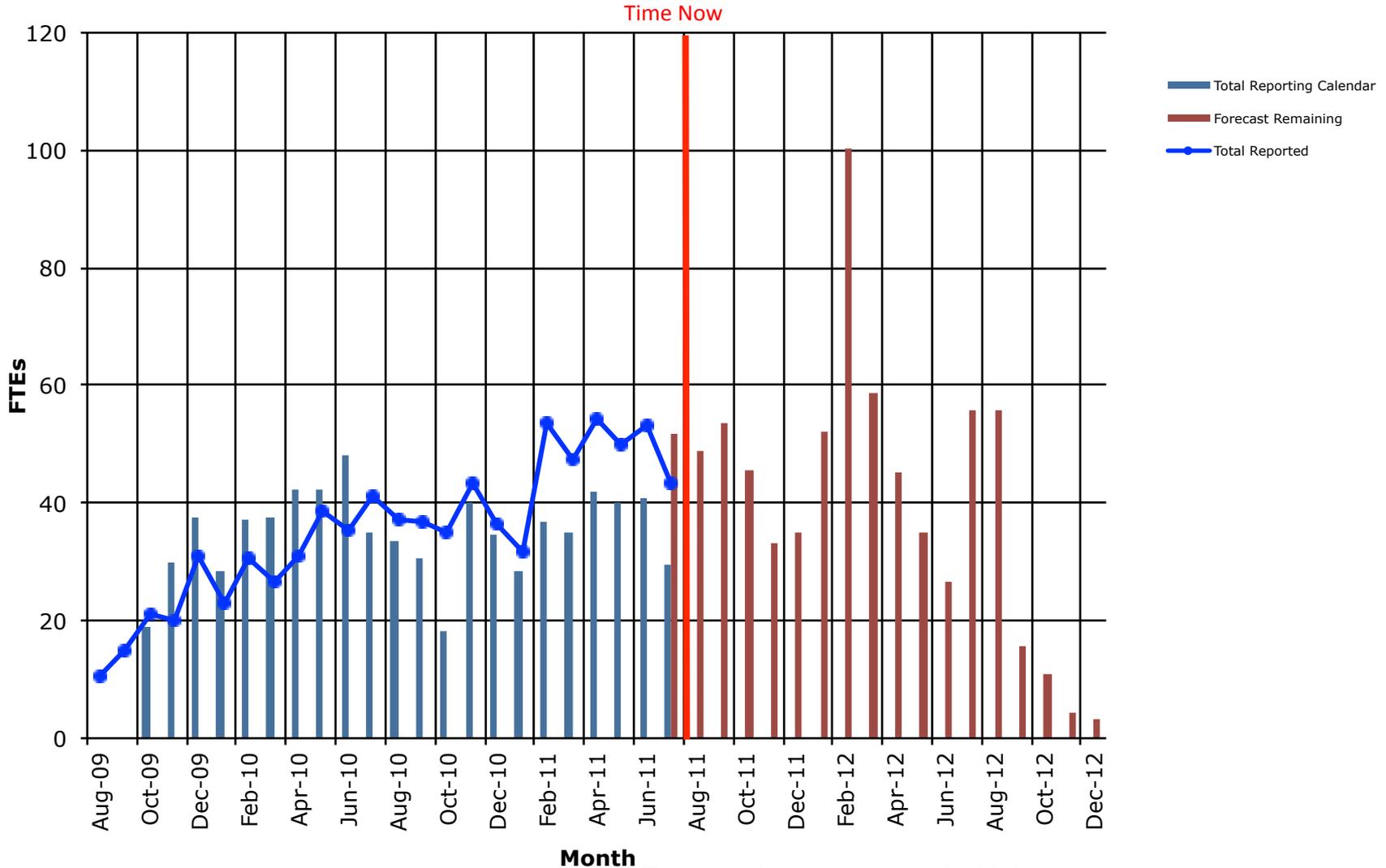
Risk: Resources

- People Resource Availability
 - Have priority within AD and TD and getting what we need at this time
 - Recent changes in lab staffing will impact divisions ability to support operations and projects
- Impact:
 - Slow down work, shutdown start/end may move
 - Substantial float to CD-4
- Mitigation:
 - Regular discussions with division and lab management to understand impacts



Resource Needs

ANU Resource Requirements





Risk: Radiation

- MI 30 area and Target Hall are high radiation areas
 - Shielding plans in place, reduce to level of <10 mr/hr
 - MI 30 area: wall shine at few mr/hr, long half life (330 d)
 - Rad exposure limits may cut into trained technician pool, slowing down work
- Impacts:
 - Slow down work, shutdown start/end may move
 - Substantial float to CD-4
- Mitigation:
 - Shielding, practice runs, girder assembly upstairs
 - Work in cooler areas first



Risk: Ceramic Beam Tubes

- Need 6 60” coated flanged ceramic beam tubes
 - Have 0 (2 coated but not flanged)
 - Order from CoorsTek
 - Infrastructure problems, expected in February
- Impacts:
 - Shutdown end
- Mitigations:
 - Fallback to short tubes and magnets: Schedule & Cost
 - Lattice redesign, additional parts
 - Fallback to existing 62” tubes: Schedule & Cost
 - Mechanical design and parts
 - Fragile and radioactive



Accelerator and NuMI Upgrades

- Made significant technical progress on many fronts in the past year
- Addressed the resource problems
 - Track and monitor on regular basis
 - Have necessary resources assigned to the project
 - Recent staffing changes may impact project
- On track for Accelerator Shutdown March 1st 2012
 - OpenPlan: 30 working days in advance of scheduled start date of March 1st 2012
- On track for Shutdown completion February 1st 2013
 - 50 working days of float
- Installation plan well developed, integrate into OpenPlan by October 1st