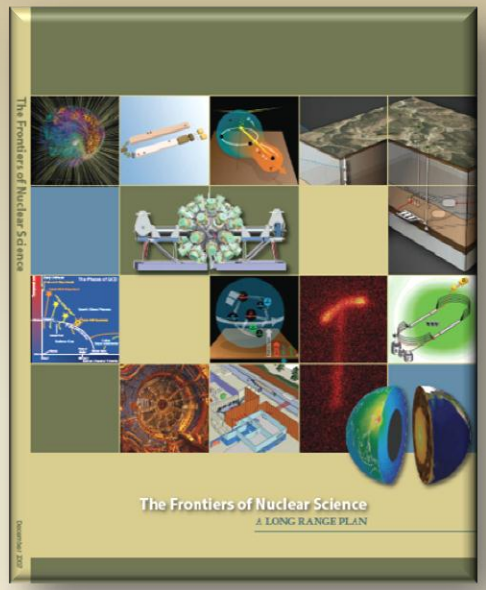
12 GeV Upgrade Project - Status

Allison Lung
UGBOD Meeting
January 23, 2014

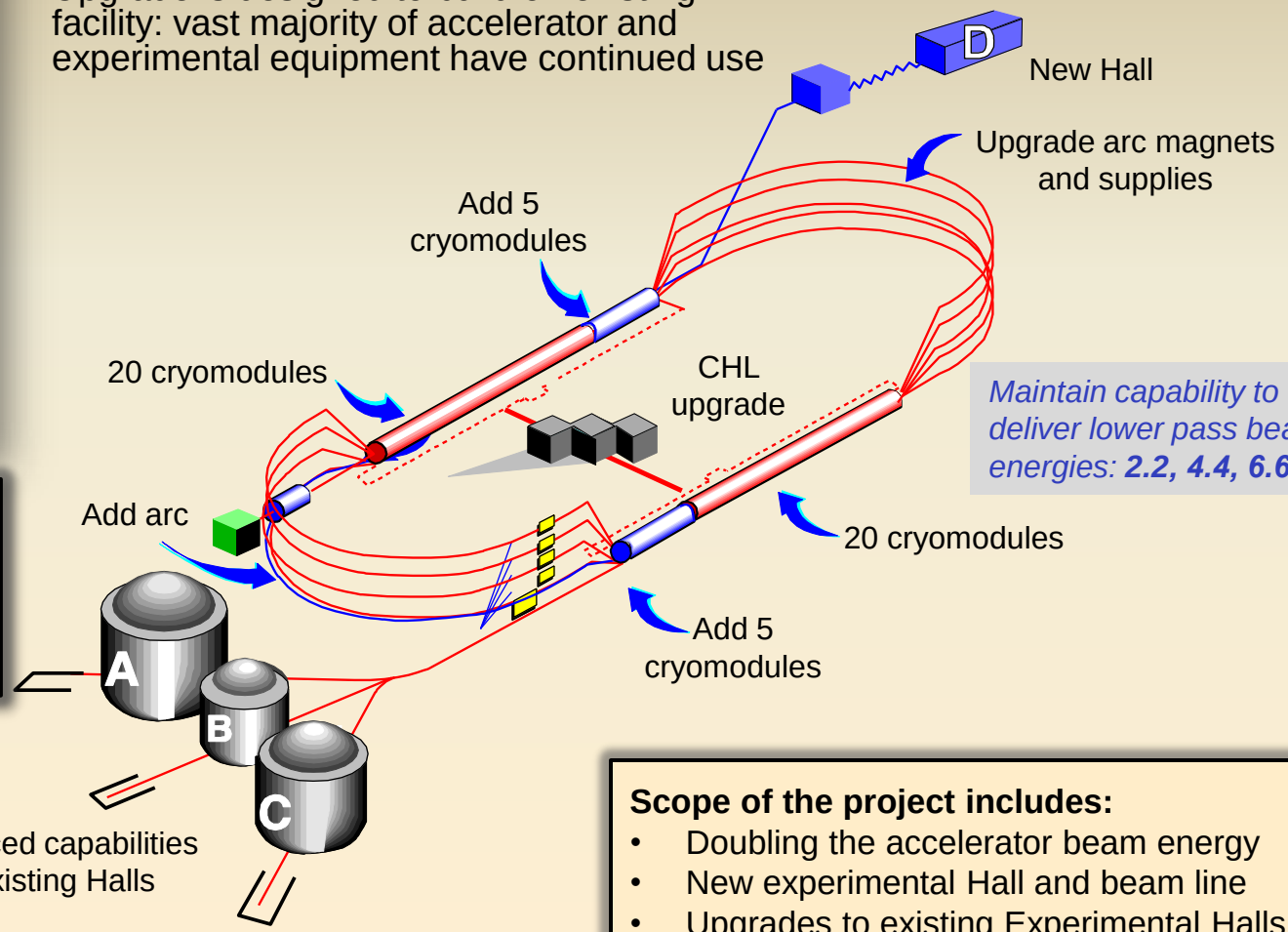
Jefferson Lab
Thomas Jefferson National Accelerator Facility

12 GeV Upgrade Project



The completion of the 12 GeV Upgrade of CEBAF was ranked the highest priority in the 2007 NSAC Long Range Plan

Upgrade is designed to build on existing facility: vast majority of accelerator and experimental equipment have continued use



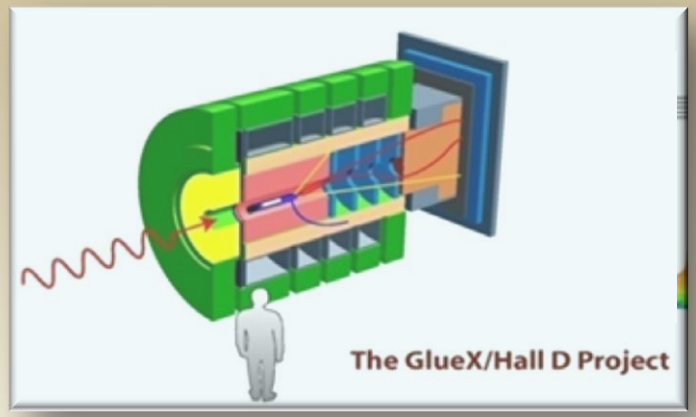
Maintain capability to deliver lower pass beam energies: ***2.2, 4.4, 6.6….***

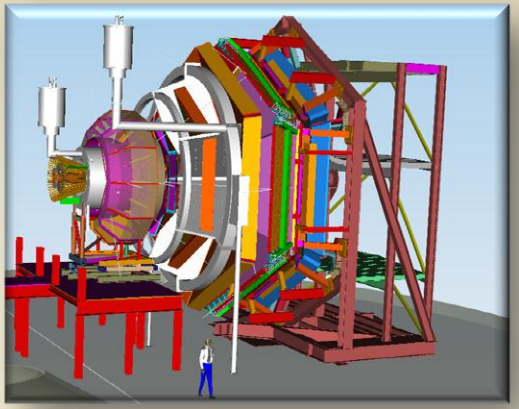
Scope of the project includes:

- Doubling the accelerator beam energy
- New experimental Hall and beam line
- Upgrades to existing Experimental Halls

12 GeV Scientific Capabilities

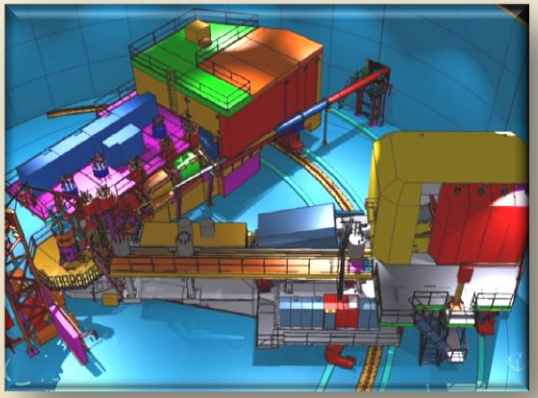
Hall D – exploring origin of confinement by studying exotic mesons

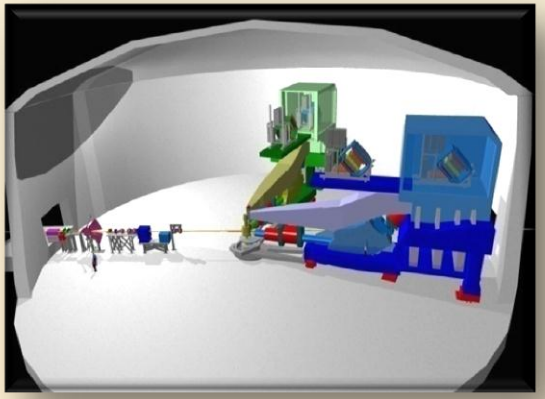




Hall B – understanding nucleon structure via generalized parton distributions

Hall C – precision determination of valence quark properties in nucleons and nuclei





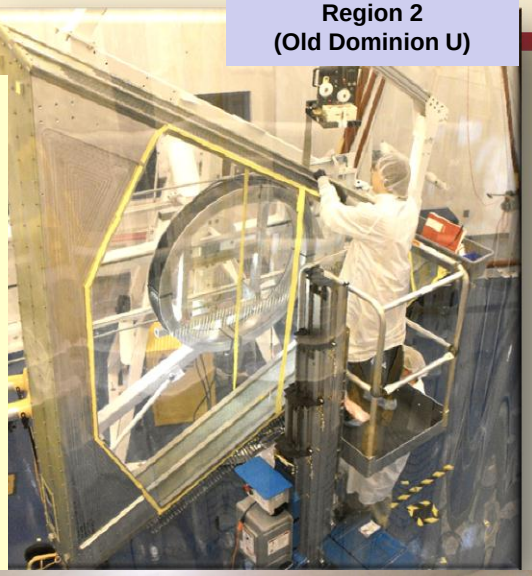
Hall A – form factors, future new experiments (e.g., SoLID and MOLLER)

12 GeV Project (slide from Mont's talk)

- Successful Rebaseline September 1, 2013
  - TPC $338, CD4B 4QFY17
- Mini Lehman December 9, 2013
- Accelerator
  - Beam Transport, out of tunnel. Power Systems, staying ahead of the waves, I&C mainly in Hall D line
- Detectors
  - Magnets, moderately good progress
  - Detectors
    - Hall D installation, good progress FDC prep, CDC in wings, overall is slower than hoped
    - Hall C detectors in good shape, SHMS carriage
    - Hall B detectors,
      - HTCC, LTCC, to be done
      - SVT (flex cable issue)
- Director's Review March, 2014
- OPA Review April 8-10, 2014

Hall B – Detector Highlights

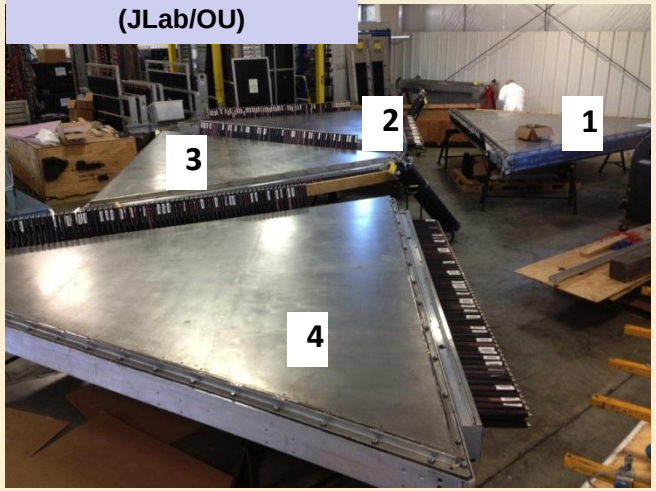
Hall B Drift Chamber Region 2 (Old Dominion U)



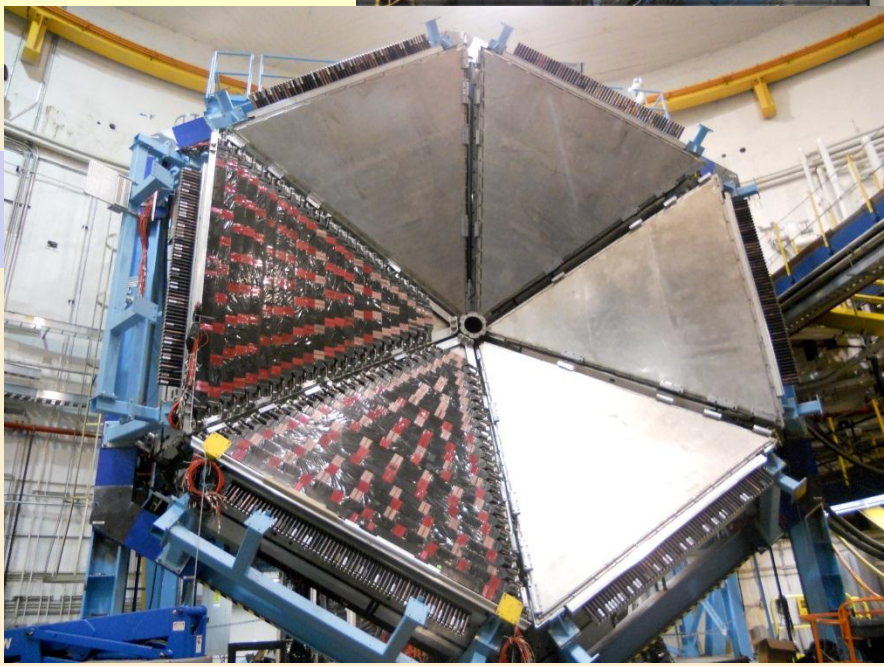
All major detector systems under construction:

- ***SVT two modules complete; production delay at FNAL due to vendor cable issue***
- ***HTCC & LTCC in progress***
- ***CTOF in progress***
- ***DC RI and RIII on schedule (Idaho State / JLab)***
- ***DC RII complete (Old Dominion U.)***
- ***FTOF-1a installing (U. South Carolina)***
- ***PCAL installed (Ohio U.)***

Hall B PCAL (JLab/OU)



Hall B PCAL & FTOF-1a installation

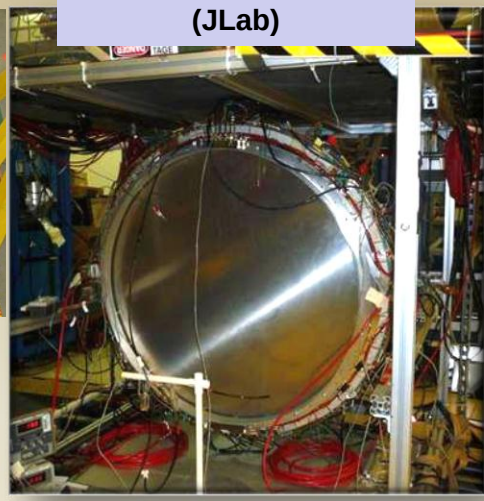


Hall D – Detector Highlights

BCAL
(Univ of Regina)

FCAL
(Indiana Univ)

Forward Drift Chamber
(JLab)



BCAL (URegina) – Installed, cabled

FCAL (IU) – Installed, cabled

FDC (JLab) – Installing

CDC (CMU) – Testing at JLab

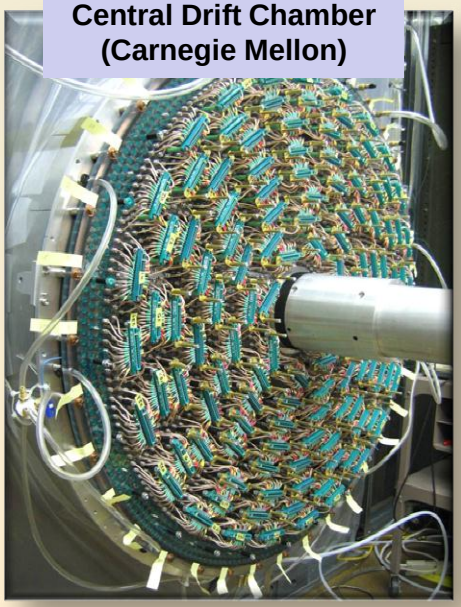
TOF (FSU) - nearly complete

Tagger hodoscope (CUA) – In progress

Tagger microscope (UConn) – In progress

F1TDC testing (UMass) – In progress

Central Drift Chamber
(Carnegie Mellon)

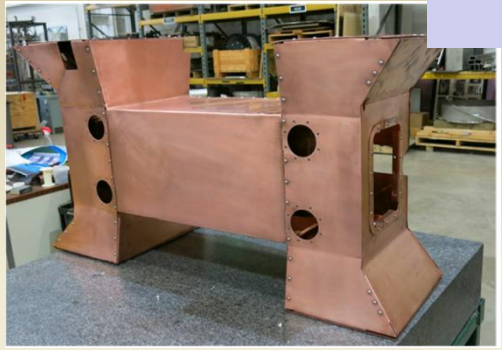


Hall C – Highlights

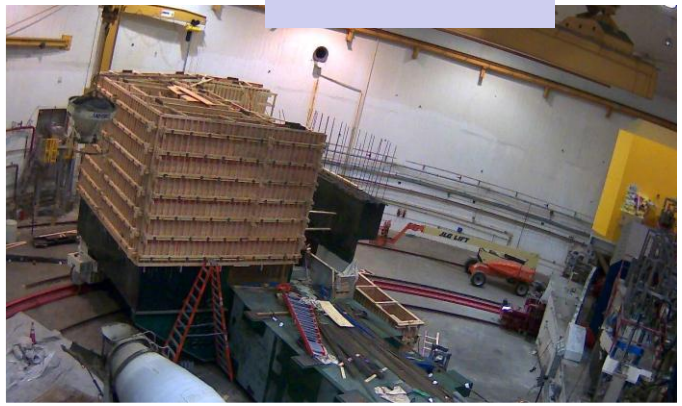
All major systems under construction

HB (MSU)

HB LN2 Shield (MSU)

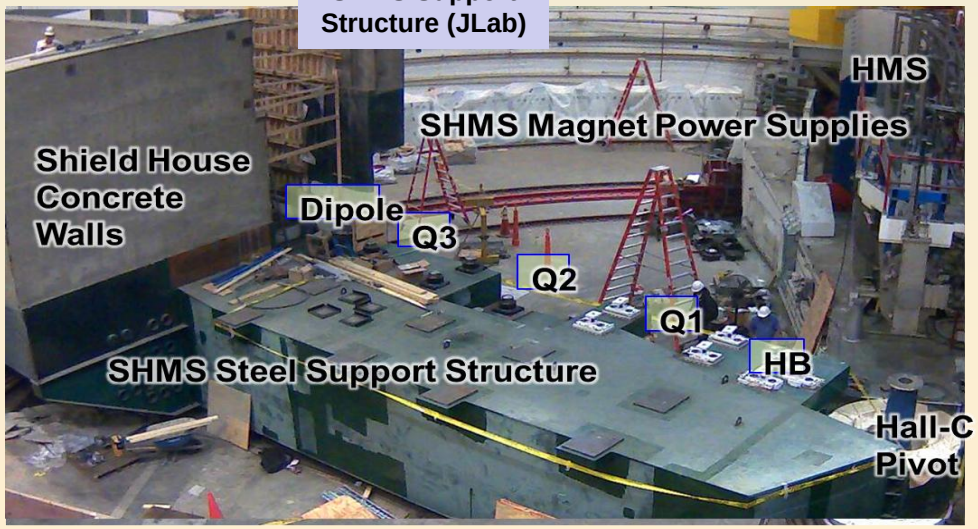


Shield House Wall Pour (JLab)



Dipole prototype coil (Sigma Phi, France)

SHMS Support Structure (JLab)



Hall C – Highlights

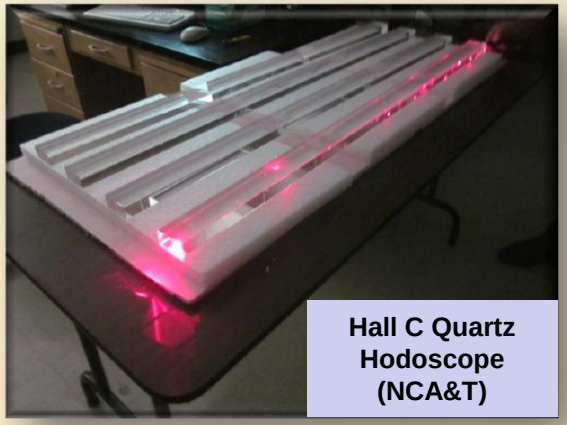
DETECTORS (NSF-MRI funded):

Hampton University – wire chamber assembly completed, testing underway.

Univ of Virginia - manufacturing design detailing for the noble gas Cerenkov continues, PMTs delivered, and mirrors in fabrication.

Univ of Regina - heavy gas Cerenkov counter assembled, mirrors aligned, awaiting installation.

Q1 Magnet Yoke/Coil Assembly with Field-Plotting Equipment Inserted



Hall C Quartz Hodoscope (NCA&T)

12 GeV Spectrometer SC Magnets

Hall C SHMS:

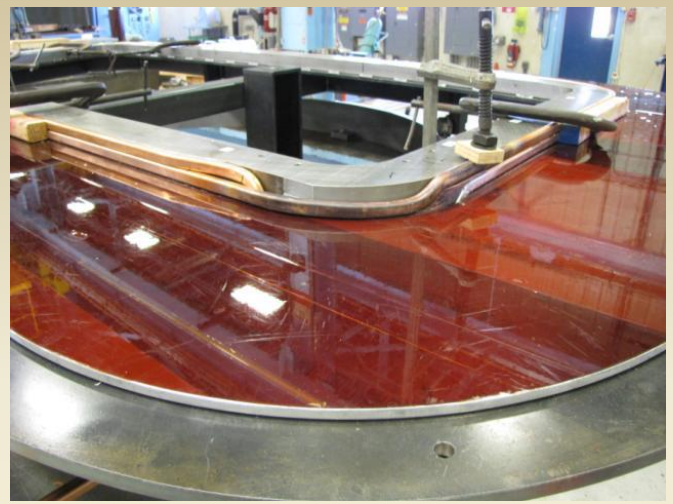
- HB – Michigan State Univ making slow progress
- Q1 – Scientific Magnetics, UK all 4 coils built, assembly underway
- D/Q2/Q3 – Sigma Phi, France prototype coil winding done but epoxy VPI failed

Hall B CLAS12:

- Torus – FNAL practice coil winding complete; JLab design effort & cryogenics & cryostat factory making solid progress
- Solenoid – Everson Tesla, PA, behind schedule; Final Design Review ~late Feb 2014.

Hall D:

- Solenoid – successfully operated and mapped at ~1300A in August 2013, refrigerator repair has started



CLAS12 Torus coil winding table at FNAL

12 GeV Upgrade - Accelerator Highlights

Commissioning started – September 2013


12 GeV Cryomodules & RF Zones


CHL Upper Coldbox


East Recombiner

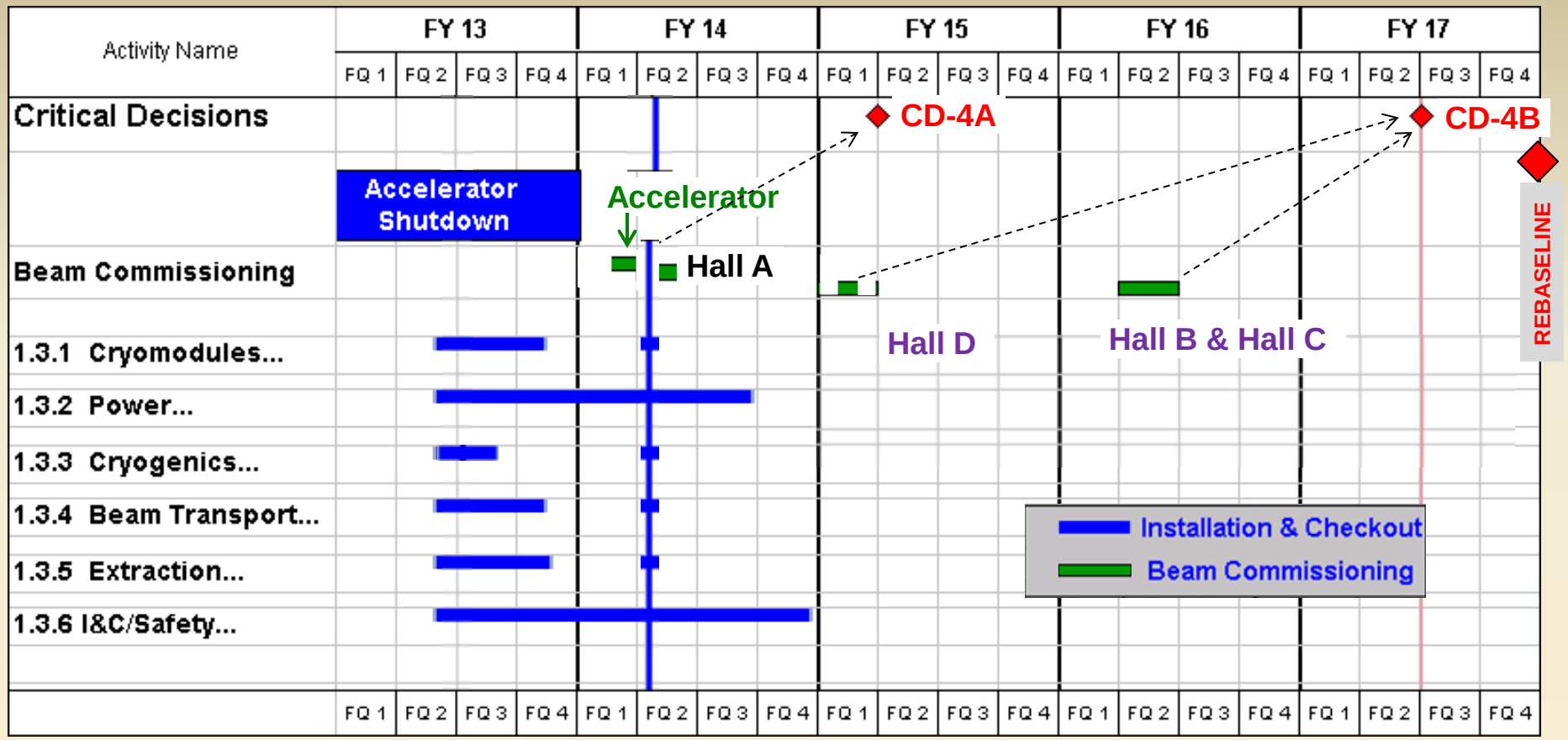

East Arc


CHL Lower Coldbox

Accelerator Status

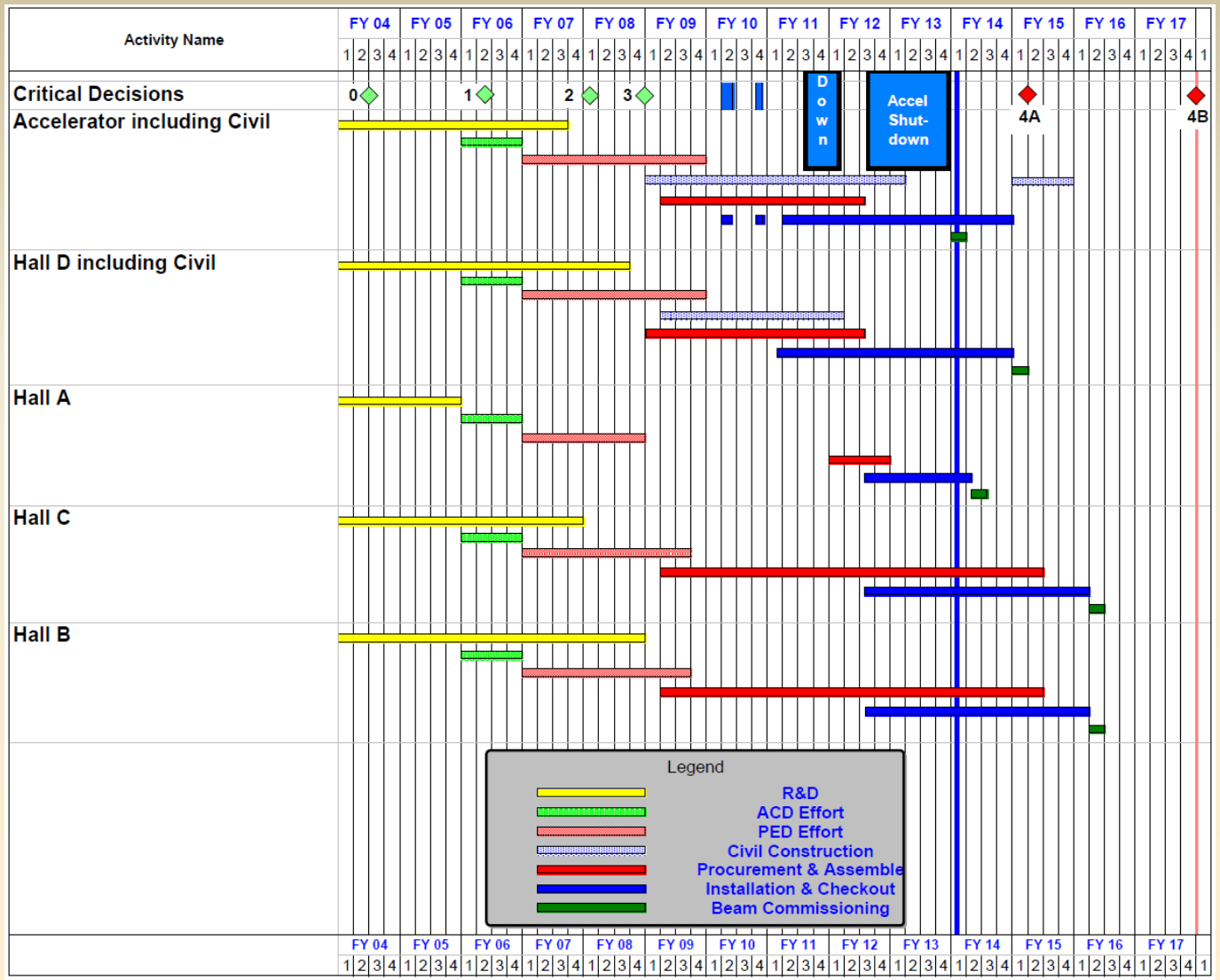
- Cryomodules: ten C100s built, installed, and commissioned
- RF Power: zones #1 - #10 complete and commissioned
- Magnet Power: all hardware required for Accelerator Run I is complete
- Cryogenics: CHL2 met the commissioning performance goals
- Beam Transport:
  - Accelerator Ring: Installation complete
  - Hall A/Hall B/Hall C: Hall A line reinstalled; B & C underway
  - Hall D: dipoles in, LCW and air headers installed on ramp
- Extraction: Complete
- I&C: Controls software complete; Safety systems ready for beam

12 GeV Project - Accelerator Schedule



- Cryomodules, Cryogenics, and Extraction complete
- Beam Transport to Hall beamlines will be done Feb 2014
- Power and I&C deliveries extend into CY14 but will not affect commissioning schedule

12 GeV Upgrade Project Schedule



Rebaseline complete Sept 2013

16-month installation
May 2012 - Sept 2013 DONE

Accelerator commissioning
IN PROGRESS

Hall A commissioning start
Feb/Mar 2014

Hall D commissioning start
Oct 2014

Halls B & C commissioning start
Jan/Feb 2016

Project Completion
September 2017

12 GeV Upgrade Project - Summary

Hall D & Counting House

12 GeV Cryomodules & RF Zones

Project 85% Complete, 96% Obligated

- Civil (92%) ; Accelerator (98%) ; Physics Equip (~65/90%)

Challenges with spectrometer superconducting magnets

- All 7 new magnets under contract
- Detector installation underway in Halls B/C/D

Rebaseline complete and implemented

- TPC = $338M ; CD-4B September 2017

Hall D Interior

Beam commissioning in Halls A & D in CY2014