12 GeV Upgrade Project - Status
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.

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
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 D – Detector Highlights

- **BCAL (Univ of Regina)** – 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

**Forward Drift Chamber (JLab)**

**Central Drift Chamber (Carnegie Mellon)**
All major systems under construction

HB (MSU)

HB LN2 Shield (MSU)

Dipole prototype coil (Sigma Phi, France)

SHMS Support Structure (JLab)

SHMS Magnet Power Supplies

SHMS Steel Support Structure

Hall-C Pivot

HMS

Hall C – Highlights

Shield House Wall Pour (JLab)

Dipole prototype coil (Sigma Phi, France)
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.
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
12 GeV Upgrade - Accelerator Highlights

**Commissioning started – September 2013**
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
• 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

#### Critical Decisions
- **Rebaseline complete Sept 2013**

#### Accelerator including Civil
- **16-month installation May 2012 - Sept 2013** **DONE**
- **Accelerator commissioning IN PROGRESS**

#### Hall D including Civil
- **Hall A commissioning start Feb/Mar 2014**
- **Hall D commissioning start Oct 2014**

#### Hall A
- **Halls B & C commissioning start Jan/Feb 2016**

#### Hall C

#### Hall B

#### Project Completion
- **September 2017**

### Activity Name (FY 04 - FY 17)

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### Legend
- R&D
- ACD Effort
- PED Effort
- Civil Construction
- Procurement & Assemble
- Installation & Checkout
- Beam Commissioning
12 GeV Upgrade Project - Summary

**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

**Beam commissioning in Halls A & D in CY2014**