New INL High Energy Battery Test Facility

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2011 DOE Vehicle Technologies Program
Annual Merit Review
May 9-13, 2011

www.inl.gov

Idaho National Laboratory

Poster Presentation
Project ID: esarravt074

Overview

Timeline

ARRA Project Began 02/2010
Project Complete by 04/2013
(Occupancy 09/2012)

Budget

$5M

Barriers/Risks

Vehicle Technologies Program identified need for additional test channel capability to meet critical testing demand supporting expanded battery development program.

Partners

- Idaho National Laboratory, Battelle Energy Alliance - Contracting to build the Energy Systems Laboratory complex where the New High Energy Battery Test Facility will be located.
- U.S. Department of Energy, EERE – Vehicle Technologies Program, Funding to fully equip the new battery facility.

Relevance

- American Recovery and Reinvestment Act, Facilities and Equipment Upgrade National Lab Call (FOA #09-002).

  "Energy Efficiency and Renewable Energy (EERE) desires to strengthen capabilities at the national labs by upgrading and expanding laboratory facilities and equipment"

  - **<u>Objective</u> – New and expanded Cell & Battery Test Facilities.**
    - The INL was awarded project #20855 for equipment and facility upgrades needed to operate a newly constructed 10,000 sq. ft. High Energy Battery Test Facility.
  - **<u>Impact</u> – Significant increase in test channel capability.**
    - Approximately **200+ new test channels** will be added to the current 500 in use at the INL. A significant increase in EERE high energy cell and full vehicle system test capability.

Approach

- The INL New High Energy Battery Test Facility
  - **A newly constructed 10,000 sq. ft. battery testing laboratory** building located within the new INL Energy Systems Laboratory (ESL) complex.
    - ESL complex will provide additional office and conference room support for the battery test facility.
    - ESL complex will provide additional laboratory space for electronics and instrumentation set-up, and facility control.
  - **New battery building being constructed at no cost to EERE.**
    - ARRA project funds used for test equipment, electrical modifications and climate systems needed to use and support the battery testing operations.
    - Current INL battery testing and applied research laboratories will continue to be used and maintained.
    - This is a significant expansion of capability to perform performance, life and diagnostic testing on new technology.

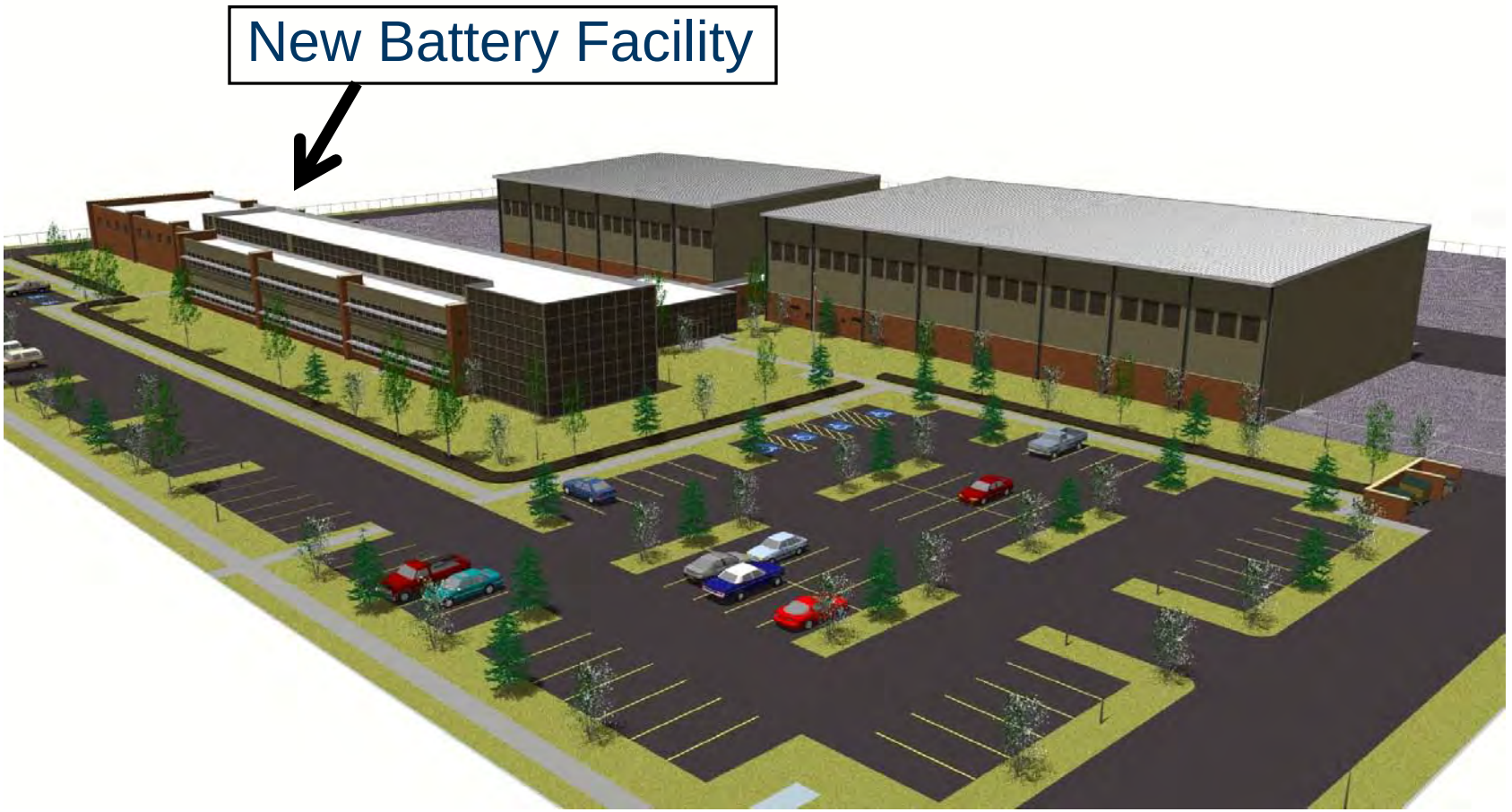
Approach

- **Test channels planned to meet testing needs – Transition to high energy cells up to 100Ah, requires broader test capabilities.**
  - USABC development contract deliverables.
    - 14 existing programs, each with multiple cell deliverables.
    - Additional high energy EV battery projects planned.
    - Cells, Modules, and some full systems.
  - EERE Battery Manufacturing Initiative Awards.
    - Up to 10 projects, each with multiple deliverables.
    - Cells, Modules, full systems expected.
  - DOE/EERE Benchmarking, R&D project support.
    - Diagnostic testing of new materials, screening tests.
    - Testing of prototype cells from non-funded projects.
  - Typical USABC cell deliverables can require 20 test channels each.
    - 16 channels for calendar life testing (5V / 60 Amp).
    - 4 channels for cycle life testing (5V / 250 Amp).

Approach

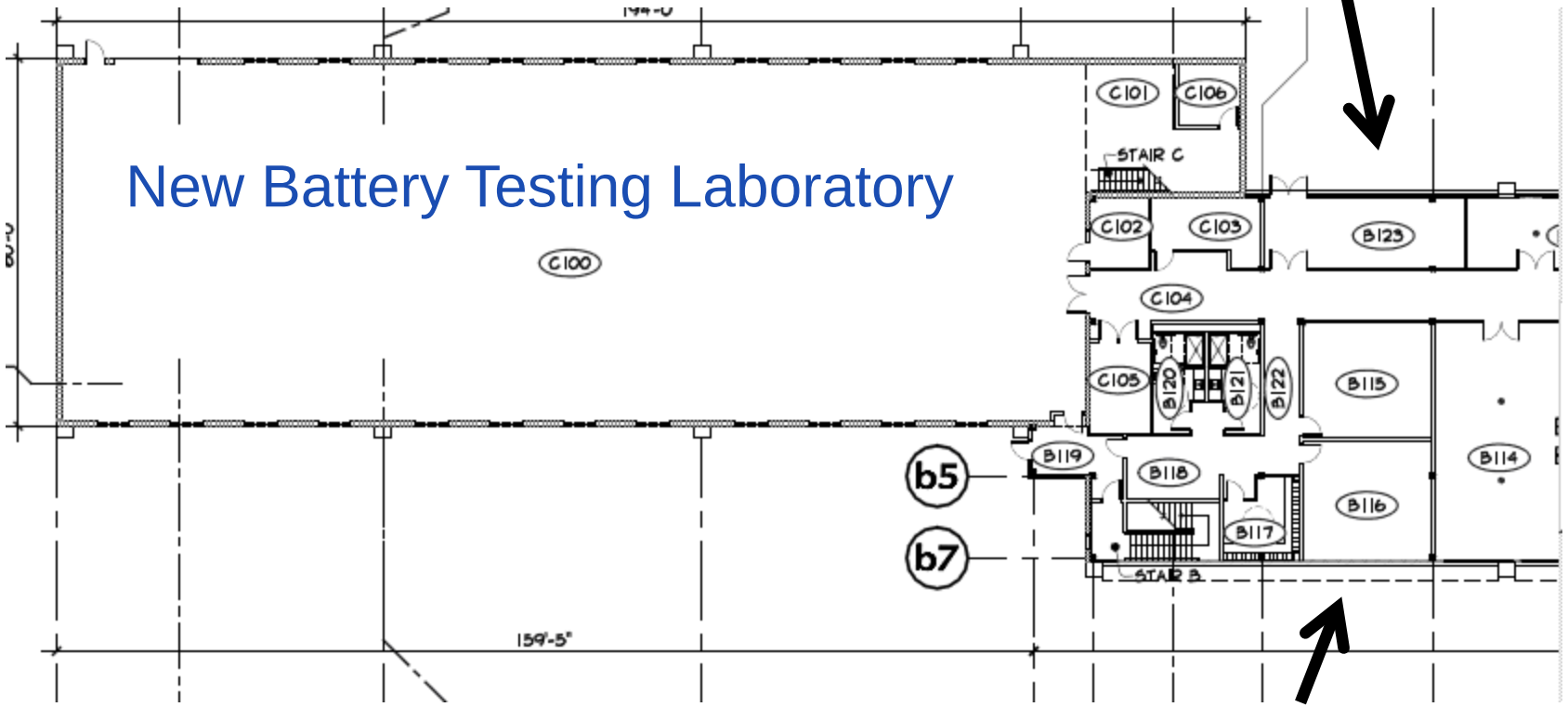
- **The AARA funding is focused on adding test capability.**
- $3.7M directly for test channels and supporting equipment.
  - 4 new full system test channels.
  - 200 new high energy cell performance & life channels.
  - New full system sized environmental chambers.
  - New cell, Module sized environmental chambers.
  - New calibration equipment.
- $1.3M for facility modifications required for battery testing operations and to add vibration testing capability.
  - Complex power distribution to multiple panels and transformers throughout the facility.
  - Large air conditioning and ducting systems required to mitigate large heat loads generated from test operations.
  - Large scale vibration test system capable of testing full size battery systems.

INL
Energy Systems Laboratory
Occupancy September 2012



New High Energy Battery Test Facility

Second floor office and conference areas.



Ground floor support laboratories.

Milestones

<u>Project Schedule Risk</u> – Long lead items, construction delays, Installation issues.

- Acquisition Plan Complete 03/1/10, Complete
- All test equipment ordered by 6/1/11, 60% Complete by 02/2011
- All test equipment delivered 2/28/12, 20% Complete by 04/2011
- Test equipment installations complete by 4/30/13, On Schedule
- Vibration Test Equipment received by 4/1/11, Material delays TBD
- Central Control Room Complete 4/30/13, On Schedule
- Power Distribution Upgrade Complete 4/30/13, PO issued 02/2011
- HVAC Upgrade Complete 4/30/13, On Schedule
- Construction Start 8/1/11, Groundbreaking 02/01/2011, construction may start by 03/2011 ahead of schedule.
- Construction Complete 8/30/12, Occupancy date, On Schedule
- Final Report 4/30/13, On Schedule

Schedule status may change by Review Date 04-2011

Technical Accomplishments/Progress

- The project objective was to significantly expand cell and battery testing capability supporting the DOE Vehicle Technologies Program.
  - 80% of awarded funding goes directly towards test equipment.
    - 60% of new test equipment has been ordered by 02/2011.
    - 20% of new test equipment has been received by 04/2011.
  - 20% of awarded funding goes to building upgrades needed to support the actual battery testing operations.
    - Purchase Order issued 02/2011 to construct specific high power electrical panel and transformer distribution throughout the new laboratory to operate test channels.
    - High capacity air conditioning system and ducting design is complete 02/2011. Purchase Order pending.
  - New project started FY2010, ARRA call to build EERE facilities.
    - There is no prior year or previous evaluations to status against.

Collaborations/Partnerships

- The INL continues to enjoy a close testing partnership with Argonne National Laboratory in support of this expanded test capability.
  - Test channel capability, approach.
  - Procedures, analysis, defined parameters.
    - Affects facility and equipment design.
  - Reduces unnecessary duplication and creates valuable overlap of capability where its useful.
- Expanded test capability will create additional opportunities for collaboration with other national labs (ANL, LBNL, SNL, NREL), industry and academic institutions.
  - Life prediction models, analysis, mechanisms, diagnostics.
- Will expand our ability for direct technology transfer to EERE battery R&D suppliers, and with the United States Advanced Battery Consortium (USABC).

Future Work

- INL New High Energy Battery Test Facility.
  - Cell and Battery Test Equipment.
    - Place orders for the remainder of the actual test channels and supporting equipment planned in FY 2011 on schedule.
    - Store and stage equipment in parallel to the building construction schedule to meet occupancy date.
  - New building construction and upgrade schedule.
    - Work directly with construction project manager to track construction requirements and upgrades needed to support battery and cell testing operations.
    - Begin installation of new equipment as soon as the construction schedule allows.
- Complete ARRA project on-time and within budget.
  - National Environmental Policy Act requirements met.
  - Comply with all reporting requirements.

Summary

- American Recovery and Reinvestment Act, EERE Facilities and Equipment Upgrade National Lab Call (FOA #09-002). Project #20855
  - **Objective – New and expanded Cell & Battery Test Facilities.**
    - The INL was awarded $5M for equipment and facility upgrades for a newly constructed 10,000 sq. ft. High Energy Battery Test Facility. Start 2/2010, End 4/2013.
    - 200+ new test channels for high energy cells and batteries.
    - 60% of new equipment is on order, 20% received ($ spent).
    - Equipment cost variance due to varying long lead times.
    - No significant equipment schedule variance to date.
    - Building electrical upgrade design complete, PO issued.
    - Building air conditioning/duct design complete, PO pending.
    - Funding obligated for all building upgrades.
    - Project and construction is on schedule.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Vehicle Technologies Program