DOE-OE FY14 Energy Storage Demonstration and Analysis Projects

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Sandia National Laboratories

DOE –OE
Peer Review
Sept, 2014
Energy Storage (ES) Demonstration & Analysis

Presentation Outline

- Team
- Project Overview
  - Mission Statement
  - Approach
- Current Status
  - Geographical Location of Projects
  - Summary Chart of Projects
- FY14 Accomplishments
- Path Forward - Next Steps
  - Demonstration and Analysis
  - Commissioning
  - Safety & Reliability
ES Demonstration and Analysis Team

- Jaci Hernandez
- Ben Schenkman
- Summer Ferreira
- David Rosewater
- Victor Chavez
- David Schoenwald
- Todd Olinsky-Paul
- Georgianne Huff
- Garth Corey
- Abbas Akhil
Mission Statement:

Encourage investment in Energy Storage by insuring systems are:

- Safe
- Reliable
- Cost effective
- Functional
- Understood by the public
ES Demonstration & Analysis
Project Overview

Approach

- Work with National and International entities including DOD, State Energy offices, Utilities, ES Industry, Universities and Consumers to:
  - Provide **third party independent analysis and evaluation** for cells and systems
  - Support **grid-tied field demonstration** projects to monitor and analyze new and existing ES technologies in differing applications
  - Support State renewable/resiliency/ES initiatives
  - Develop public information programs
Approach (continued)

- **Third party independent analysis and evaluation**

  1. Analyze and evaluate cells and systems for performance, safety and reliability
    - Innovative technologies – Aquion, Enervault, Primus, UET, Transpower, EPC, Altairnano, Ceramatec
      - Testing protocol and specification development
      - Technical readiness level evaluation
      - System operational performance and **optimization**
      - **Safety** analysis and evaluation
Approach (continued)

- **Grid Tied Field Demonstrations**
  1. Analyze and evaluate systems
     - Technical **consulting**, design support, **cost** and **optimization modeling**
     - Hawaiian Electric Company (HECO)
     - CEC ES 1.3 GW Initiative
     - University of California San Diego ES projects
     - Support the development of testing **protocols** and procedures
     - Measuring and evaluating the Performance of Energy Storage Systems
     - Develop **Commissioning** procedures and provide commissioning **support**
     - Primus Power, UniEnergy Technology, GS Battery
     - **Monitor operational data, analyze, evaluate** and **disseminate** significant findings
     - DOD Base Camp Integration Lab
State initiatives and Public education

1. Through our Clean Energy States Alliance (CESA) partnership:
   - Provide Technical consulting to Various State Agencies
     - Connecticut DEEP; Innovate Massachusetts, New York, New Jersey, Burlington Vt. Airport
     - Develop projects, provide technical consulting and provide limited cost share to innovative technologies
     - Vermont and Oregon Department of Energy
     - Innovative technologies – Helix, Enervault, SustainX, Aquion

2. Partner with the ES industry, Academia, Consumers and others to provide education and act as ES information clearinghouse:
   - Energy Storage Guide
   - Various Sand Reports
   - Conduct ES related webinars
Map of DOE-OE EES Projects 2014

Legend:
- State - 6 (4)
- DOD - 1 (2)
- Academia - 1 (2)
- Commercial End User - 4 (2)
- Industry - 8 (7)
- New or Proposed - 2 (2)

FY14 – 22 Projects
FY13 – 19 Projects
4 New; 1 Done

## Summary of EES Projects

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Technology</th>
<th>Environment/Application</th>
<th>Principal Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts</td>
<td>Fort Devens Base Camp Integration Lab (BCIL)</td>
<td>30-75kW 0.5-1hr Lead Acid</td>
<td>Military Nanogrid – Forward Operating Base</td>
<td>Ben Schenkman</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>David Rose</td>
</tr>
<tr>
<td>California</td>
<td>SunPower ES Installation</td>
<td>125kW 4hr Zinc Bromide</td>
<td>Commercial PV energy shifting Microgrid support</td>
<td>Matt Galland</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ben Schenkman</td>
</tr>
<tr>
<td>California</td>
<td>University of California San Diego (UCSD) Energy Storage Initiative</td>
<td>2.5 MW 2hr</td>
<td>University campus microgrid with renewables</td>
<td>Ben Schenkman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bill Torre</td>
</tr>
<tr>
<td>Hawaii</td>
<td>NELHA</td>
<td>Aqueous sodium</td>
<td>PV support</td>
<td>Dan Borneo</td>
</tr>
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</thead>
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<tr>
<td>Vermont</td>
<td>Green Mountain Power</td>
<td>4MW with 1MWh Li-ion, and 2.4MWh LA</td>
<td>Utility/renewables</td>
<td>Jaci Hernandez</td>
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<tr>
<td>Alaska</td>
<td>Kodiak</td>
<td>Energy Storage</td>
<td>Utility/Grid</td>
<td>Ben Schenkman</td>
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<tr>
<td>Connecticut</td>
<td>Connecticut Deep</td>
<td>Multiple</td>
<td>Microgrid resiliency</td>
<td>Dan Borneo</td>
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<tr>
<td>Massachusetts</td>
<td>Clean Energy Center. Division of Energy Resources</td>
<td>various</td>
<td>DOER $40M Grid Resiliency</td>
<td>TBD</td>
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<tr>
<td>New Jersey</td>
<td>Board of Public Utilities</td>
<td>TBD</td>
<td>$10M ES for critical infrastructure $200M NG Energy Resilient Bank</td>
<td>Dan Borneo</td>
</tr>
<tr>
<td>Oregon</td>
<td>Oregon Dept. of Energy</td>
<td>TBD</td>
<td>Utility resiliency and upgrade deferral</td>
<td>Dan Borneo</td>
</tr>
<tr>
<td>Washington</td>
<td>Puget Sound Energy</td>
<td>1 MW 2 hr Zinc Bromine Flow battery</td>
<td>Utility grid Support</td>
<td>Ben Schenkman</td>
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<tr>
<td>California</td>
<td>CEC/CPUC</td>
<td></td>
<td>1.3 GW initiative</td>
<td>Ray Byrne</td>
</tr>
<tr>
<td>New York</td>
<td>NYSERDA</td>
<td>TBD</td>
<td>$40M New York Prize - Grid Resiliency</td>
<td>TBD</td>
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<tr>
<td>New Mexico</td>
<td>NM Department of Energy,</td>
<td>TBD</td>
<td>Renewable integration</td>
<td>Dan Borneo</td>
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## Summary of EES Projects

### OPTIMIZATION, TESTING AND INDUSTRY SUPPORT

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<tr>
<th>Location</th>
<th>Name</th>
<th>Technology/Set-up</th>
<th>Environment/Application</th>
<th>Principal Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Carolina</td>
<td>Duke Rankin site</td>
<td>FIAMM Sodium Nickel Chloride</td>
<td>Utility</td>
<td>David Schoenwald</td>
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<tr>
<td>California</td>
<td>Enervault</td>
<td>Iron Chrome Flow</td>
<td>Renewable support</td>
<td>Dan Borneo</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>SustainX</td>
<td>ICAES</td>
<td>Industrial manufacturing facility grid</td>
<td>Summer Ferreira</td>
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<tr>
<td>Pennsylvania</td>
<td>Aquion Energy</td>
<td>Aqueous Sodium</td>
<td>Industrial manufacturing facility microgrid</td>
<td>Summer Ferreira</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Helix</td>
<td>Flywheel</td>
<td>Frequency Response</td>
<td>Jaci Hernandez</td>
</tr>
<tr>
<td>Georgia</td>
<td>GS Yuasa</td>
<td>LA/Ruggedized ES mobile unit LI-ion Testing</td>
<td>Microgrid/Commercial Safety Testing</td>
<td>Ben Schenkman, David Rose</td>
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<tr>
<td>Texas</td>
<td>Texas Tech</td>
<td>1 MW 1hr Li-ion</td>
<td>Grid/Stabilization and arbitrage</td>
<td>Ben Schenkman</td>
</tr>
<tr>
<td>Hawaii</td>
<td>Hawaiian Electric Company</td>
<td>60-200 MW ES</td>
<td>Utility Renewable Support</td>
<td>Dan Borneo, Ray Byrne</td>
</tr>
</tbody>
</table>
An old farmer takes up fishing
FY14 Accomplishments

• Joined Puget Sound Energy team (PNNL and Primus) to develop Factory Acceptance test. Provided input to factory testing plan that was based on our learnings from other ES projects.
• Completed evaluation of Flow battery installation at UCSD
• Completed testing of ESS in a forward operating base application for DOD Base Camp Integration Lab (BCIL)
• Joined HECO team and provided technical review of 22 ES proposals to install 200MW of ES.
• Joined CEC team to assist in roadmap and ES system protocol development.
• Initiated an ES project with Oregon Energy
• Executed contracts with GMP for an ES Project
• Completed analysis of three ES systems at ESTP
• Completed testing of cells for four battery vendors
• Conducted 8 webinars with a total of 795 attendees.
Energy Storage Demonstration & Analysis

Path Forward

- Provide support to Nation in the development, design, installation, commissioning, and operation of ES systems:
  - Increase optimization modeling capabilities and support
  - Continue cell and system level analysis
  - Increase project operational analysis and evaluation support
  - Develop Commissioning documentation and Increase field Commissioning endeavours
  - Support the development of codes, standards, regulations, and safety roadmap
  - Initiate another ES project with a State energy department.
  - Increase exposure to the international community
  - Continue support of ongoing projects – CEC, HECO, VT, OR, etc.
  - Continue partnership efforts with the industry - Innovative technologies, DNV-GL, etc.
  - Continue ES education efforts and webinar series
The 2015 Winter Call for proposals Will open end of September. 
Notifications will be sent out February 2015.

The 4th Proposal Call is for testing: 

The database is always open for FAST-Track Proposals.

Contact: Summer Ferreira srferre@sandia.gov or David Rosewater dmrose@sandia.gov

For more information, visit the website at: www.sandia.gov/batterytesting
Acknowledgements

DOE’s **Office of Electricity** and **Dr. Imre Gyuk** for the confidence in me and my team, and continuing funding Sandia and the Energy Storage Demonstration Project.
“We won’t go commercial until we are sure the battery will do what we say its going to do, for as long as we say its going to do it.”

Quote from Sally when asked when the Ultrabattery was going to go commercial
Thank You

Questions?

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