Sandia National Laboratories

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Sandia National Laboratories Energy Hawaii Initiative

Daniel Borneo, P.E.

Sandia National Laboratories

NELHA ES Conference

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U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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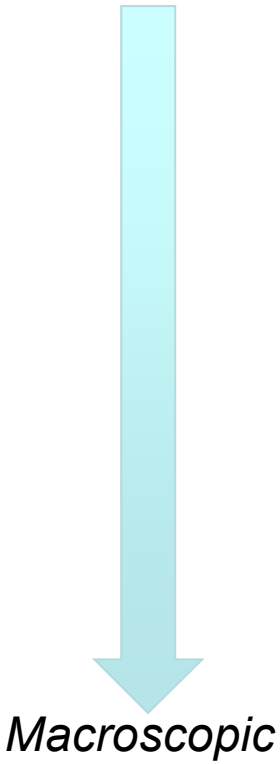
SAND Document SAND2016

Outline

- Overview of Sandia's ES demonstration Project
- Hawaii Specific Active Projects
  - HECO
  - NELHA

Six Sandia Thrust Areas to Meet Grid Challenges

- **Materials and Systems Development**
  - Leading the **development** of next-generation technologies
  - Improving current **technology** (flow batteries, flywheels, etc.)
- **Power Electronics**
  - **Developing** and testing new wide-bandgap power-electronic devices
- Component and systems analysis and safety
  - Analysis from battery cells through MW size ES systems
  - ES system testing protocols
  - ES system safety R&D
- ***Industry Acceptance (IA)***
  - ***ES System Field deployments and commissioning***
  - ***State-Initiated Demonstrations***
  - ***Technical support***
- **Grid Analytics and Policy**
  - Providing **assessments** of the impact of storage placement
- **Outreach -** Leading publications and meetings to **help** educate the Grid Energy community



SNL Industry Acceptance – ES Projects Team

MISSION STATEMENT: Encourage investment in Energy Storage by insuring systems are safe, reliable, cost effective, functional, understood and valued by the public though field deployments.

APPROACH: Work with national and international entities that include the DOD, State Energy offices, Other National Labs, Utilities, Energy developers, installers, integrators, Universities and Consumers to:

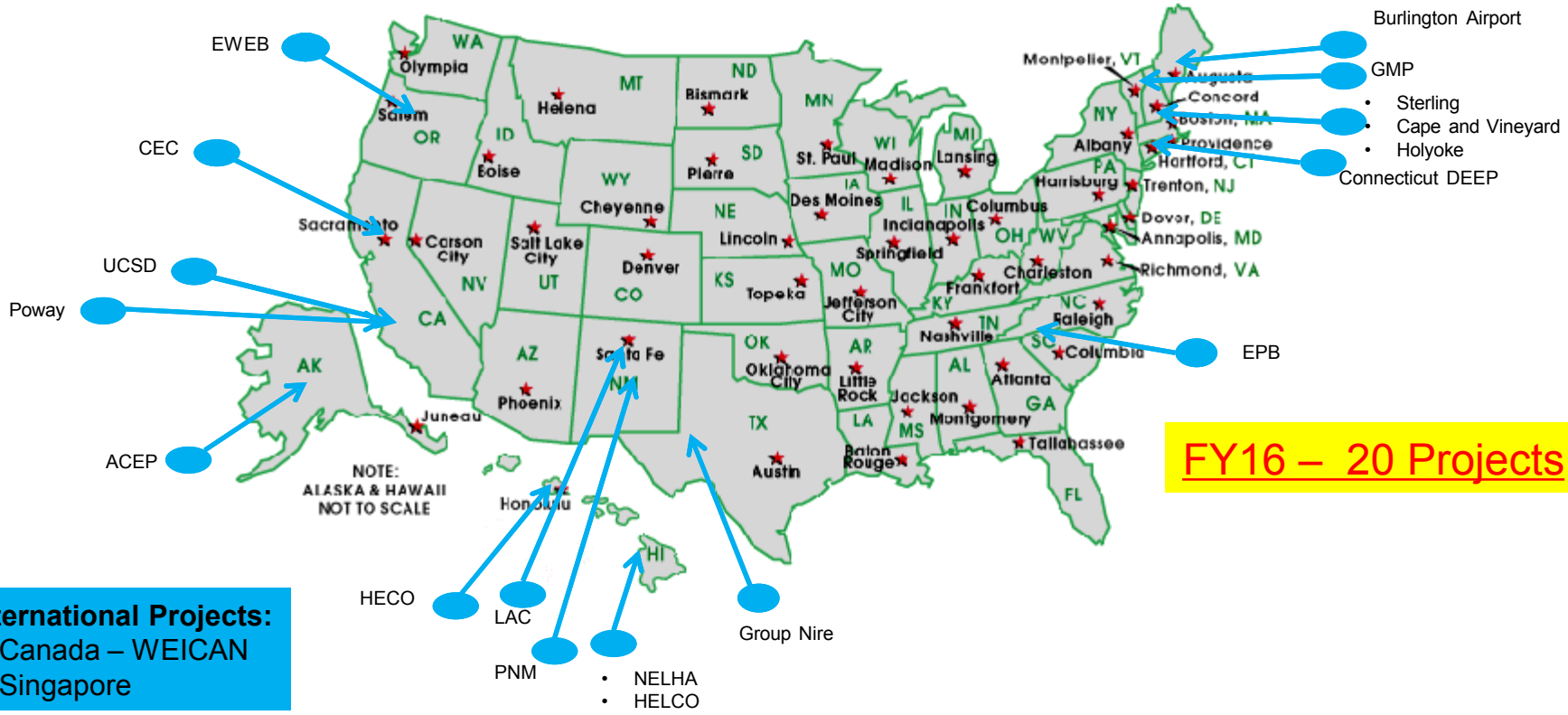
- Provide Independent technology reviews, design analysis, installation/specification guidance, commissioning support, and operational evaluations
- Support State and International renewable/resiliency/Energy Storage initiatives
- Develop public information programs concerning energy storage

SNL Industry Acceptance – ES Projects Team Capabilities

Energy Storage System Project Technical Support:

- Preliminary grid analysis & modeling to determine applications, ES sizing, and technologies using commercial and Sandia developed analysis tools (PYOMO, PLEXOS,PSLF)
- Assist states in developing request for Information and Proposals (RFI & RFP).
- Assist in the project design, specifications, and construction of ESS'.
- Assist in the design of Data Acquisition Systems (DAS).
- Assist in developing and implementing the ESS commissioning plan. Support start-up and commissioning.
- Analyze operational test data and develop system optimization algorithms.
- Develop and deliver educational programs and information through webinars, papers, etc.

DOE-OE Demonstration Projects 2016



International Projects:
- Canada – WEICAN
- Singapore

FY16 – 20 Projects

Stock Image source: http://www.devarticles.com/c/a/Web-Services/Cooking-With-Web-Services-PHP-and-GD/3/

Ongoing Hawaii Projects

NELHA Collaboration:

Sandia National Laboratories is collaborating with National Energy Lab of Hawaii Authority (NELHA) in its effort to incorporate Electrical Energy Storage in its renewable energy, microgrid and innovative energy projects. SNL has and is providing technical consulting, system evaluation, and analysis services.

Agreed upon technical support includes but is not be limited to:

- Providing technical expertise in the development of RFPs for distributed energy and energy storage projects
- Evaluate proposed energy storage systems for Technical Readiness Level (TRL), functionality, and applicability to project deliverables
- Perform technical reviews of project design documentation including complete system design, installation design, and data acquisition design
- Witness and/or verify installation and operation of systems including control algorithms and software, data acquisition system operation and remote access
- Verify start-up and commissioning of complete systems
- Remotely access, monitor and analyze system operation and performance data for up to one year post commissioning
- Participate in education, outreach and technology transfer as requested by NELHA and agreed upon by SNL

Completed or in-process tasks:

- Provided support to NELHA during the installation and commissioning of the 10KW Aquion system. Presently evaluating system operation.
- Developing remote access to NELHA Data Acquisition System (DAS). This will allow SNL access to system(s) operation
- Part of team to develop a UET (Vanadium Flow battery) project. DOE/Sandia will contribute cost share to project
- Identification of additional ES Project for FY17/18.

Ongoing Hawaii Projects

HECO project

In May, 2014, HECO issued an RFP for one or more large-scale energy storage systems able to store 60 to 200 megawatts for up to 30 minutes. HECO approached DOE OE / SNL to assist in the selection, commissioning and long term analysis of energy storage systems. SNL has and is providing technical consulting, system evaluation, and analysis services.

Agreed upon technical support includes but is not be limited to:

1 Assist HECO in developing RFP selection criteria and reviewing proposals

2 Assist HECO in determining optimum deployment sites and technology types

3 Work with HECO and the selected companies in developing commissioning documents for systems > 20MW, including system acceptance best practices, safety and commissioning

4 Perform long term monitoring and data analysis of deployed systems

5 Publish analysis results

Completed or in-process tasks:

- NDA with HECO in place.
- Provided guidance on the selection criteria.
- Participated in the final review of those proposals and provide HECO with an opinion of the feasibility and value of the top ten.
- Conducted production cost modeling of the Oahu grid to evaluate the benefits of energy storage for arbitrage and contingency reserves
- Modeled behind the meter PV generation variability using Sandia's Wavelet Variability Model (WVM)

Potential Hawaii Projects

Honolulu Authority for Rapid Transportation (HART)

- The train will have the capacity for regenerative braking. 70% will be used by accelerating trains with 30% being lost to heat. Project will capture this 30% using energy storage. HART is looking at a wayside energy storage system that was pioneered in Pennsylvania by Viridity with grant from Pennsylvania energy authority. LA Metro is also using it as are a few other cities and internationally. HART, who will be the largest utility user in the state, is installing 2,000kVa transformers in each of 16 substations = about a 30 MW system. Peaks will be in morning and evening commute (6-8:30 a.m., 4-6 p.m.) which dovetails with residential electricity peaks. In order to move forward, they would like to do a feasibility study to understand if ES would work on their system and to understand the benefits

Ikehu Molokai Energy Storage Project

- Two phase project: Phase 1 will add 6 MW PV and 6 mW/6 mWh energy storage resources to achieve 40% renewables penetration on the Molokai island grid, allowing retirement of a portion of the island's diesel generation; Phase 2 aims to achieve 100% renewable generation on Molokai. Partners include Princeton Energy Group in collaboration with HECO/MECO and the Hawaii Energy Agency, with support from DOE/OE.

Thanks

Dan Borneo - drborne@sandia.gov

IA Team:

Ana Beare

Ben Schenkman

Ray Byrne

Cesar Silva-Monroy

David Rosewater

Frank Maldonado

Don Bender

Todd Olinsky-Paul (CESA)