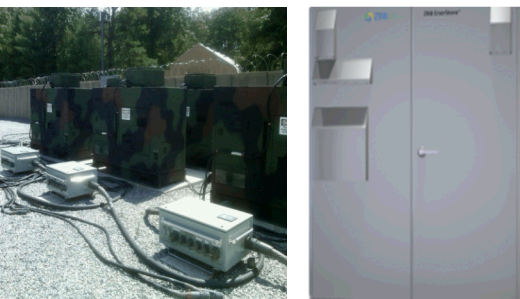


# Sandia National Laboratories Energy Storage Projects



**Daniel Borneo, P.E.**  
Sandia National Laboratories

**SW PUC Energy Storage Workshop**  
**May 3, 2016**



*Exceptional  
service  
in the  
national  
interest*



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SAND Document

# Five Sandia Thrust Areas to Meet Grid Challenges



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- **Materials and Systems Development**

- Leading the **development** of next-generation technologies
- Improving current **technology** (flow batteries, flywheels, etc.)

- **Power Electronics**

- **Develop**ing and testing new wide-bandgap power-electronic devices

- *ES Systems Demonstrations and Testing*

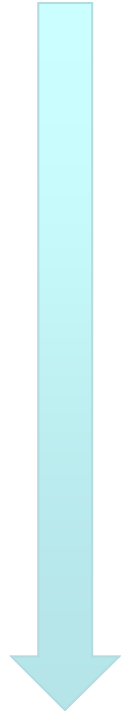
- *Laboratory testing and analysis from individual cells to 1MW systems*
- *Field deployments*
- *State-Initiated Demonstration Project Development*

- **Grid Analytics and Policy**

- Providing **assessments** of the impact of storage placement

- **Outreach** - Leading publications and meetings to **help** educate the Grid Energy community

*Nanoscopic*



*Macroscopic*



## **Energy Storage System Project Technical Support**

- Conduct analysis, perform modeling, and provide data on applications, ES sizing, and technologies that best solve the client's problem.
- Assist in developing and reviewing a client's request for Information and Proposals (RFI & RFP).
- Assist in the design, procurement specifications, and construction of ESS'.
- Assist in the design of Data Acquisition Systems (DAS).
- Assist in developing the ESS commissioning plan.
- Analyze operational test data and develop system optimization algorithms.

# SNL Industry Acceptance Capabilities (Contd.)



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## **ES Testing and Analysis**

- Cell and module analysis, up to 48 VDC 2000 A within a controlled environment (chamber)
- Spectral impedance measurement
- Test ESS up to 1.0 MW 480 V 3-phase AC
- On-site (Vendor) acceptance testing support
- Safety evaluations
- Provide third party independent ES system evaluations, analysis, and reports

## **Industry Outreach**

- <http://www.cesa.org/webinars/>

# DOE-OE Industry Acceptance and ESS Demonstration Program: Ongoing Programs



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## **Clean Energy States Alliance – CESA**

- Alaska – Cordova Electric Co-Op
- Connecticut DEEP
- Clean Energy Center – Division of Energy Resources
- Massachusetts
- NYSERDA
- Oregon Dept. of Energy
- Sterling Power
- Vermont

## **CEC/Hawaii**

- California CEC/PUC
- Hawaii projects
- Sunpower
- UCSD

## **International Collaborations**

- BELCO
- Bermuda Electric
- Grid Work Projects
- WEICan

## **Demonstrations/ Optimization/ Commissioning**

- DCICON
- Electric Power Board
- Group Nire, TX
- GS Yuasa
- Helix
- Los Alamos, NM
- NY Board of Public Utilities
- Primus Power
- UET

**FY16- 25 Projects**

**FY15- 25 Projects**

**FY14- 22 Projects**

# Industry Acceptance Program Overview



- **State initiatives and Public education**

1. Through our Clean Energy States Alliance (CESA) partnership:
  - Provide Technical consulting to Various State Agencies
    - Connecticut DEEP; Massachusetts DOER, New York, California CEC, Hawaii DBEDT, New Mexico, and Vermont
    - Market rules, Policy and system monetization
  - Develop projects, provide technical consulting and provide limited cost share to innovative technologies
    - Vermont
    - Oregon Department of Energy
    - Hawaii Energy Office
    - Innovative technologies – Helix, Aquion, Ceramatech, UniEnergy Technologies (UET)
2. Partner with the ES industry, Academia, Consumers and others to provide education and act as ES information **clearinghouse**:
  - Energy Storage Handbook
  - Various Sand Reports
  - Conduct ES related webinars

# Industry Acceptance - Summary of EES Projects: Field Demonstrations



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## **COMPLETED**

- Fort Devens Base Camp Integration Lab (BCIL)
  - 30-75 kW 0.5-1hr Lead Acid
- SunPower ES Installation
  - 125kW 4hr Zinc Bromide
- University of California San Diego (UCSD) Energy Storage Initiative
  - 2.5 MW 2hr
- NELHA
  - Aqueous sodium - PV Support

# Industry Acceptance - Summary of EES Projects: State Initiatives

## COMPLETED

- Green Mountain Power
  - 4MW with 1MWh Li-ion, and 2.4MWh LA
- Connecticut Deep
  - Microgrid resiliency
- Cordova Electric Co-op
  - Energy Storage/Utility/Grid
- Clean Energy Center. - Division of Energy Resources
  - DOER \$40M grid resiliency
- Oregon Department of Energy
  - Utility resiliency and upgrade deferral
- California –CEC/PUC
  - 1.3 GW initiative
- New Mexico Dept. of Energy
  - Renewable integration



# Industry Acceptance - Summary of EES Projects: Optimization, Testing, and Industry Support

## COMPLETED

- Duke Rankin Site
  - FIAMM Sodium Nickel Chloride
- Enervault AMB2
  - Iron Chrome Flow
- SustainX
  - ICAES AMB4
- Aquion Energy
  - Aqueous Sodium
    - Cell Test Completed – System demonstration at HELCO
- Helix
  - Flywheel
    - Completed: GS Rescu Unit commercially available
- GS Yuasa
  - LA/Ruggedized ES mobile unit Li-Ion testing
- Hawaiian Electric Company
  - 60-200 MW ES
- Electric Power Board
  - 100kW 4hr Vanadium Flow
- NYSERDA
  - \$40M NY prize – Grid Resiliency
- NY Board of Public Utilities
  - \$10M ES for critical infrastructure and \$200M NG Energy Resilient Bank
- NM Los Alamos County
  - 1.8MW/8.3MWh ES
- Group Nire – TX
  - 1MW 1hr Li-Ion

## Slide 9

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**AMB2** Do you want Enervault deleted since they are out of business? Or should we leave it since its is complete?

Mollo, Ana-marie, 4/20/2016

**AMB4** I could not read what you wrote for Sustain X...."AQ....."

Mollo, Ana-marie, 4/20/2016

Mention of our SNL Sponsor – DOE/OE -  
Grid Energy Storage Program, managed by  
Dr. Imre Gyuk

**Thank You!**

- **Dan Borneo - [drborne@sandia.gov](mailto:drborne@sandia.gov)**
- **Ana-Marie Beare – [amollo@sandia.gov](mailto:amollo@sandia.gov)**

## Slide 10

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**AMB3**

Want me to add Ben, Summer, David and Ray to this slide since they are PIs on your projects?

Mollo, Ana-marie, 4/20/2016