Energy Storage Technology Advancement Partnership (ESTAP)

Energy Storage State Policy Update

Southwest PUC Energy Storage Workshop
Sandia National Laboratories
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Todd Olinsky-Paul
Clean Energy States Alliance
Energy Storage Technology Advancement Partnership (ESTAP)

• A project of Clean Energy States Alliance (CESA), a non-profit organization providing a forum for states to work together to implement effective clean energy policies & programs
• Conducted under contract with Sandia National Laboratories, with funding from US DOE-OE

ESTAP Key Activities:

1. Disseminate information to stakeholders
   • ESTAP listserv >3,000 members
   • Webinars, conferences, information updates, surveys.

2. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment

3. Support state energy storage efforts with technical, policy and program assistance

ESTAP Project Locations

- Oregon: 500 kW Energy Storage Demonstration Project
- New Jersey: $10 million, 4-year energy storage solicitation: 13 projects
- New York: $40 Million Microgrids Initiative
- Vermont: 4 MW energy storage microgrid & Airport Microgrid
- Massachusetts: $40 Million Resilient Power/Microgrids Solicitation: 11 projects $10 Million energy storage demo program
- Connecticut: $50 Million, 3-year Microgrids Initiative: 11 projects
- Pennsylvania Battery Demonstration Project
- Maryland Game Changer Awards: Solar/EV/Battery & Resiliency Through Microgrids Task Force
- Hawaii: 6MW storage on Molokai Island and HECO projects
- Kodiak Island Wind/Hydro/Battery & Cordova hydro/battery projects
- Northeastern States Post Sandy Critical Infrastructure Resiliency Project
Thank You:

Dr. Imre Gyuk
U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability

Dan Borneo
Sandia National Laboratories
Resilient Power Project

• Increase public/private investment in clean, resilient power systems
• Engage city officials to develop resilient power policies/programs
• Protect low-income and vulnerable communities
• Focus on affordable housing and critical public facilities
• Advocate for state and federal supportive policies and programs
• Technical assistance for pre-development costs to help agencies/project developers get deals done
• See www.resilient-power.org for reports, newsletters, webinar recordings

www.cleanegroup.org
www.resilient-power.org
The Landscape for Storage: a patchwork quilt of markets, regulations, utility programs and state incentives

Oregon
ES capacity mandate

California
• ES capacity mandate – 1.3 GW by 2020
• SGIP incentive
• AB-693 $1B multifamily affordable housing solar roofs program

Hawaii
Net metering cap, high electricity rates

• Demand charge management
• State incentives
• High electricity prices/net metering caps

Northeastern Resilient Power Programs
MA, NJ, NY, CT

PJM wholesale frequency regulation market
• Premium for fast response resources
• Lowered barriers to entry for distributed resources
State energy storage incentives and policies

- **California:**
  - 1.3 GW energy storage utility mandate
  - SGIP incentive program includes energy storage
- **Connecticut:**
  - Microgrids grant and loan program
  - Clean Energy RFP (includes energy storage > 1MW anywhere in New England)
- **Hawaii**
  - HECO energy storage RFP
  - Proposed energy storage incentives
- **Massachusetts:**
  - Energy Storage Initiative (Energy storage study and demonstration projects)
  - Community Clean Energy Resilience Initiative
  - Grid modernization initiative
State energy storage incentives and policies (cont.)

- New Jersey:
  - Distributed energy storage + renewables resiliency grants and rebates
  - Energy Resilience Bank
- New York:
  - NY Prize microgrids program (now in project design phase)
  - REV grid modernization (allows utilities to own storage in certain circumstances)
  - NYSERDA-ConEd load reduction program (nuclear retirement - includes storage incentives)
- Oregon:
  - 5 mWh energy storage utility mandate
- Puerto Rico
  - Energy storage mandate for renewable energy developers
- Washington:
  - Clean Energy Fund grid modernization grants
### Frequency Regulation in PJM

#### PJM as Part of the Eastern Interconnection

<table>
<thead>
<tr>
<th>Key Statistics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member companies</td>
<td>960+</td>
</tr>
<tr>
<td>Millions of people served</td>
<td>61</td>
</tr>
<tr>
<td>Peak load in megawatts</td>
<td>165,492</td>
</tr>
<tr>
<td>MW of generating capacity</td>
<td>171,648</td>
</tr>
<tr>
<td>Miles of transmission lines</td>
<td>72,075</td>
</tr>
<tr>
<td>2014 GWh of annual energy</td>
<td>792,580</td>
</tr>
<tr>
<td>Generation sources</td>
<td>1,304</td>
</tr>
<tr>
<td>Square miles of territory</td>
<td>243,417</td>
</tr>
<tr>
<td>States served</td>
<td>13 + DC</td>
</tr>
</tbody>
</table>

21% of U.S. GDP produced in PJM
Pay for performance implemented:

- September 2012: PJM introduces a second, fast moving regulation signal (RegD)
- October 2012: Regulation requirements reduced

Market clearing prices:

- $13.75 MWh
- $38.75 MWh

Dynamic fast responding resources (REGD):

- October 2012: 6 MW
- October 2013: 19 MW
- Increase to 450 MW of dynamic fast, responding resources

Regulation requirements (MW):

- Graph showing fluctuations from Jan to Dec

PJM coordinates frequency regulation through two different control signals:

RegD - Fast moving dynamic regulation (e.g., batteries, flywheels)
RegA - Traditional regulation resources (e.g., single cycle gas turbines)
Grid-Scale Energy Storage – 250+ MW in Operation

Invenergy’s Beech Ridge 32 MW energy storage project paired with 100 MW wind energy in West Virginia

Source: PJM
<table>
<thead>
<tr>
<th>Regulation</th>
<th>Zone</th>
<th>January 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations</td>
<td>RTO</td>
<td>293</td>
</tr>
<tr>
<td>MW</td>
<td>RTO</td>
<td>22</td>
</tr>
</tbody>
</table>

Note: Percent of CSP Reported Load Reduction MWs
FY2015 Renewable Electric Storage Incentive Solicitation Results

October 22, 2014 - Board Approved Solicitation & Evaluation Process
December 08, 2014 - Applications Due; 22 Received => Evaluated
March 18, 2015 – Board Approved 13 Applications for Incentive Award

- 22 Applications Received
- $4,694,642 Requested
- $70,000 to $468,708 per
- $323,585 to $1.86 million
- 13,430 kW total capacity
- 250 kW to 1,500 kW
- 19 Li-ion & 3 Lead Carbon
- 18 public & critical, 4 not

- 13 Applications Approved
- $2,908,804 Awarded
- $70,000 to $468,708 per
- $330,766 to $1.855 million
- 8,750 kW total capacity
- 250 kW to 1,500 kW
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NJCleanEnergy.com
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4 Projects Remain
Take-Aways

- Energy storage is installed and operational in many states
  - Utility scale
  - Behind the meter

- Energy storage is providing many valuable services
  - Demand charge management
  - Demand response
  - Frequency regulation
  - Renewables integration
  - Resilience
  - T&D investment displacement/deferral
  - Arbitrage
  - Cost savings and revenues

- Services provided by energy storage must become properly valued by markets and monetizable by developers

Stacking benefits can be challenging
May require regulatory reforms
Take-Aways (cont.)

- Energy storage can compete today in open markets under pay-for-performance conditions
- As prices continue to fall, energy storage will find new markets and applications
- State policymakers and regulators play a significant role in laying the groundwork for energy storage to compete
  - Demonstrations projects, incentives
  - Regulatory and policy changes that open markets
  - Pay for performance
- Demonstration projects are important, not only for demonstrating new technologies and applications, but also the economic performance of energy storage
- State incentive programs exist to stimulate market development, and should render themselves unnecessary over time
Thank You

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ESTAP Website: http://bit.ly/CESA-ESTAP