Energy Storage Technology Advancement Partnership (ESTAP)

Energy Storage State Policy Update

Southwest PUC Energy Storage Workshop
Sandia National Laboratories
May 3, 2016

Todd Olinsky-Paul
Clean Energy States Alliance

Clean Energy States Alliance

Sandia National Laboratories

U.S. DEPARTMENT OF ENERGY

Energy Storage Technology Advancement Partnership (ESTAP)

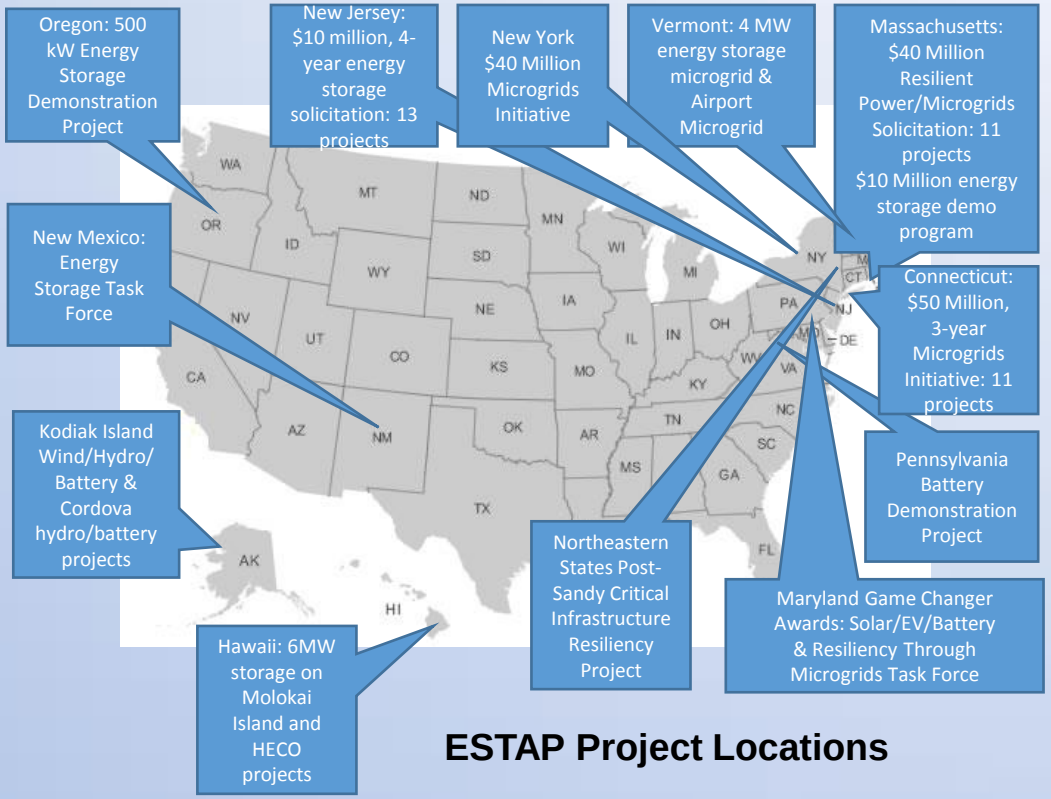
- A project of Clean Energy States Alliance (CESA), a non-profit organization providing a forum for states to work together to implement effective clean energy policies & programs
- Conducted under contract with Sandia National Laboratories, with funding from US DOE-OE

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

Clean Energy States Alliance

Sandia National Laboratories

U.S. DEPARTMENT OF ENERGY

Thank You:

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

Dan Borneo
Sandia National Laboratories

CleanEnergy States Alliance

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U.S. DEPARTMENT OF ENERGY

Resilient Power Project

CleanEnergyGroup
Innovation in Finance, Technology & Policy

- 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

THE JPB FOUNDATION

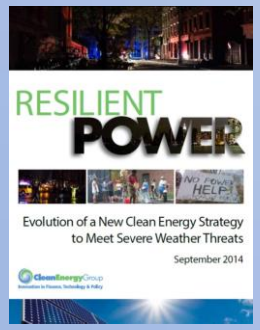
CleanEnergy States Alliance

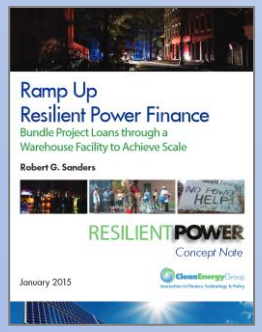
Meridian Institute
Connecting People to Solve Problems

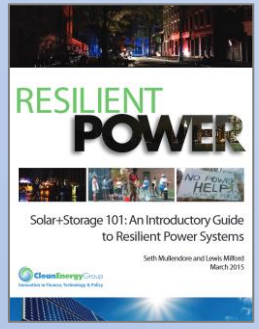
Cummings Foundation

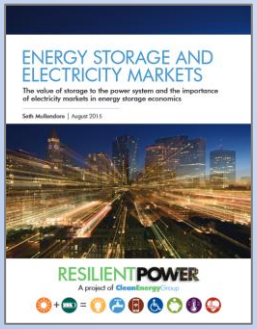
Barr Foundation

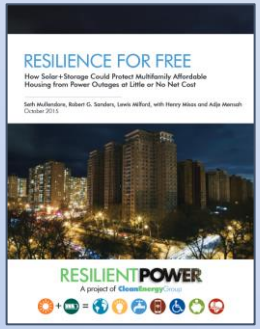
THE KRESGE FOUNDATION









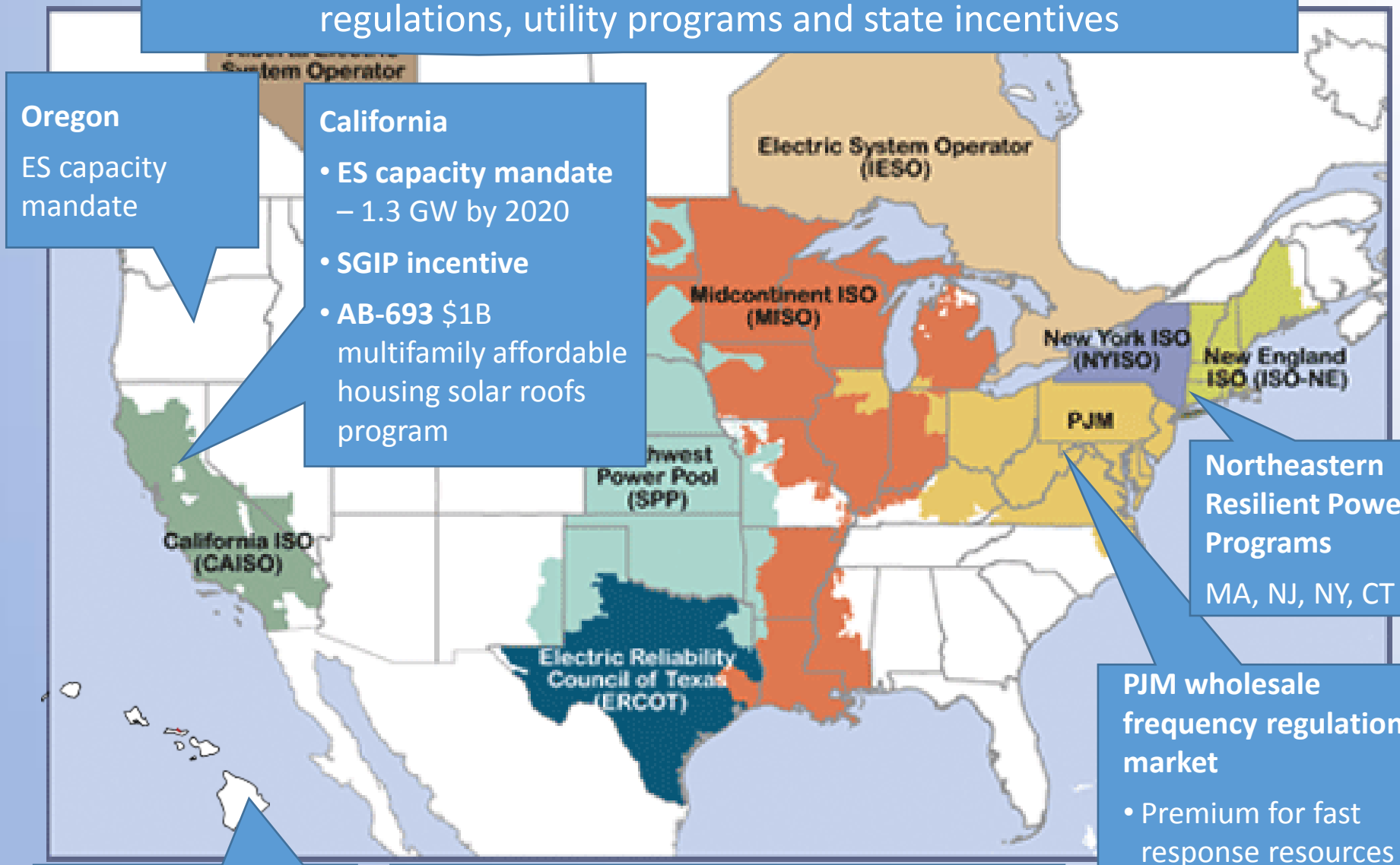


www.cleanegroup.org

www.resilient-power.org

SURDNA FOUNDATION
Fostering sustainable communities in the United States

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

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

Hawaii

Net metering cap, high electricity rates

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

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.)

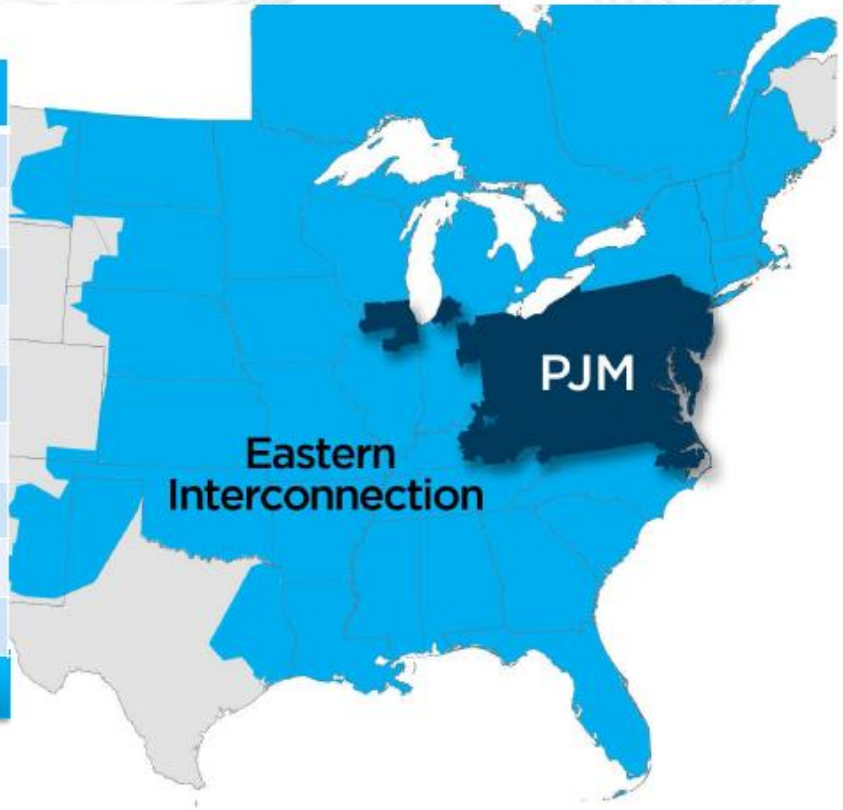
- New Jersey:
  - Distributed energy storage + renewables resiliency grants and rebates
  - Energy Resilience Bank
- New York:
  - NY Prize microgrids program (now in project design phase)
  - REV grid modernization (allows utilities to own storage in certain circumstances)
  - NYSERDA-ConEd load reduction 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

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

21% of U.S. GDP produced in PJM



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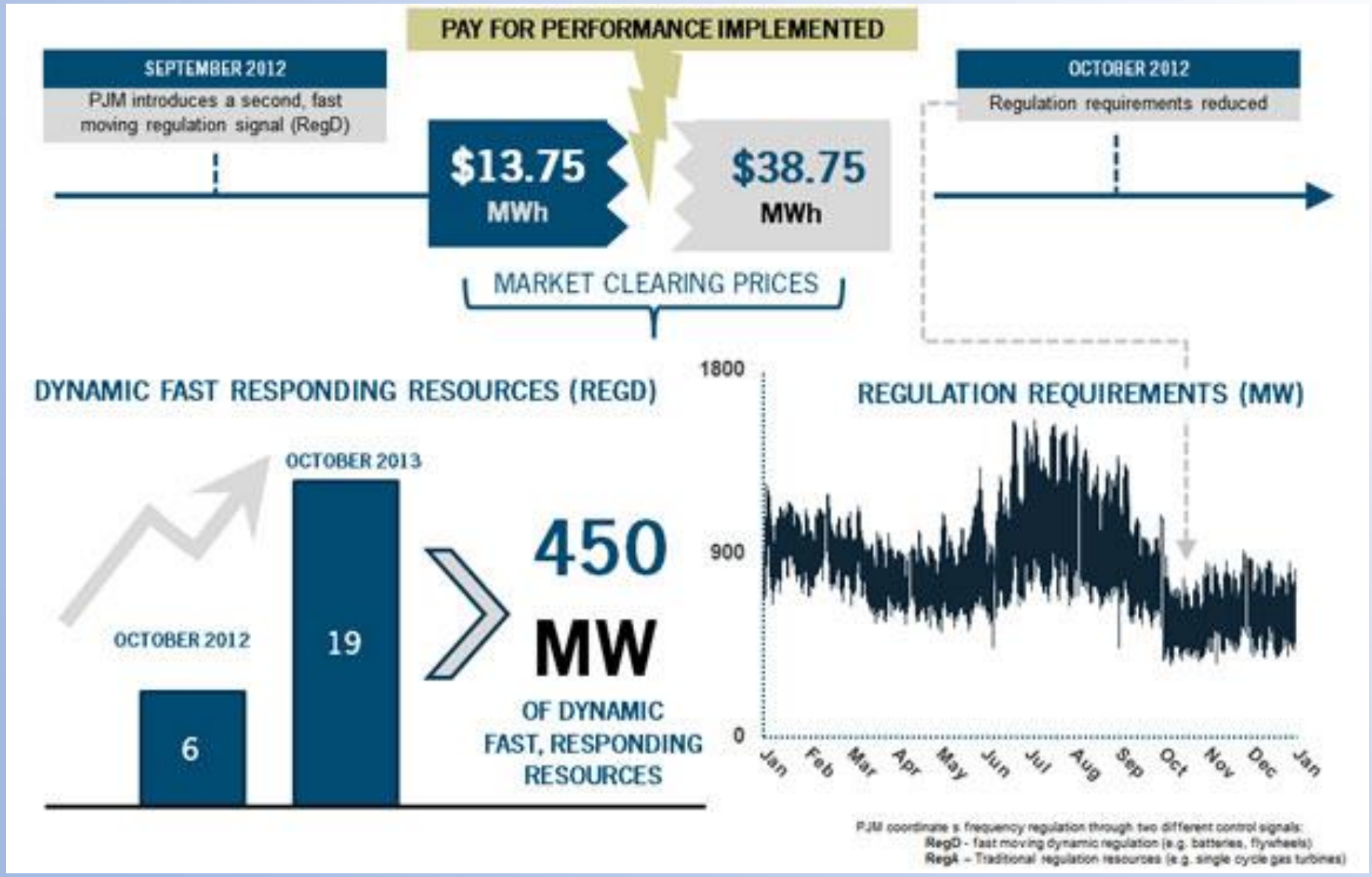
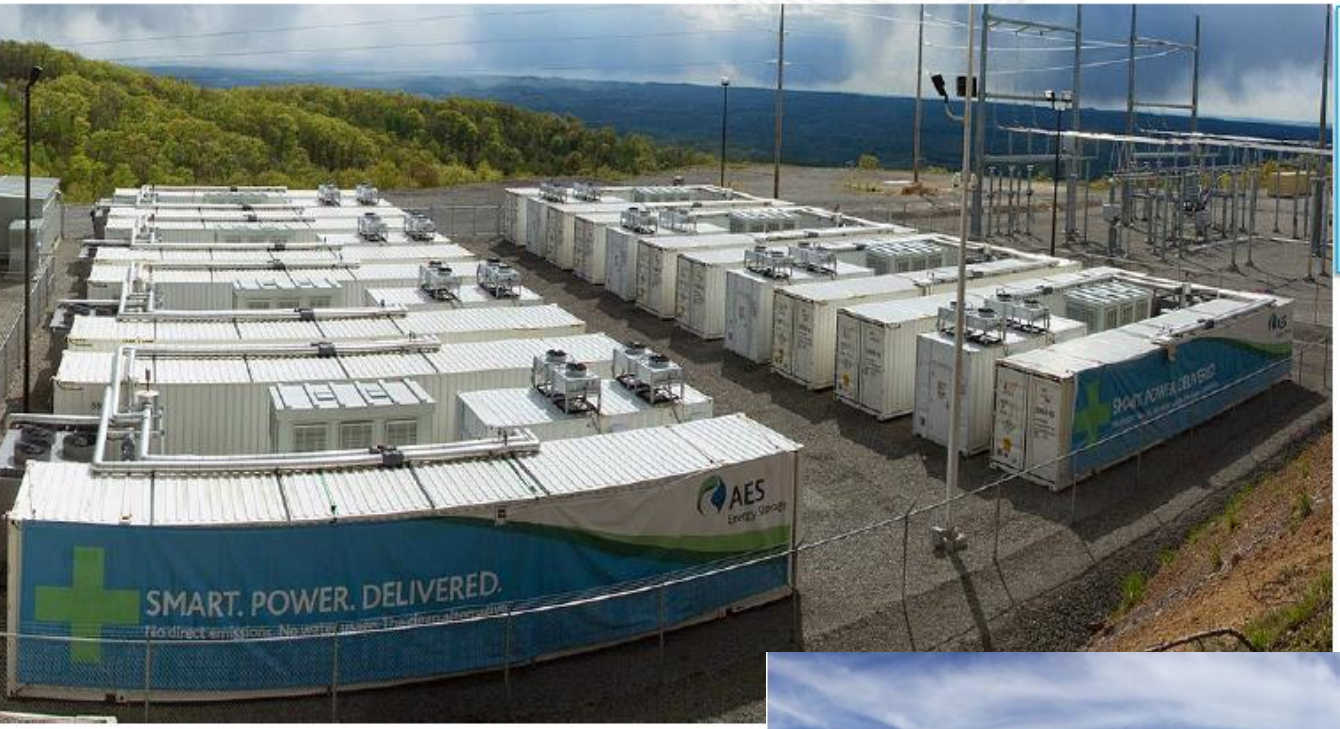

PAY FOR PERFORMANCE IMPLEMENTED
SEPTEMBER 2012
PJM introduces a second, fast moving regulation signal (RegD)
$13.75 MWh
$38.75 MWh
OCTOBER 2012
Regulation requirements reduced
MARKET CLEARING PRICES
DYNAMIC FAST RESPONDING RESOURCES (REGD)
OCTOBER 2013
OCTOBER 2012
6
19
450 MW
OF DYNAMIC FAST, RESPONDING RESOURCES
REGULATION REQUIREMENTS (MW)
1800
900
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
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



Total Advanced Storage

Grid Connected – 263 MW
Under Construction – 53 MW
Under Study – 674 MW*

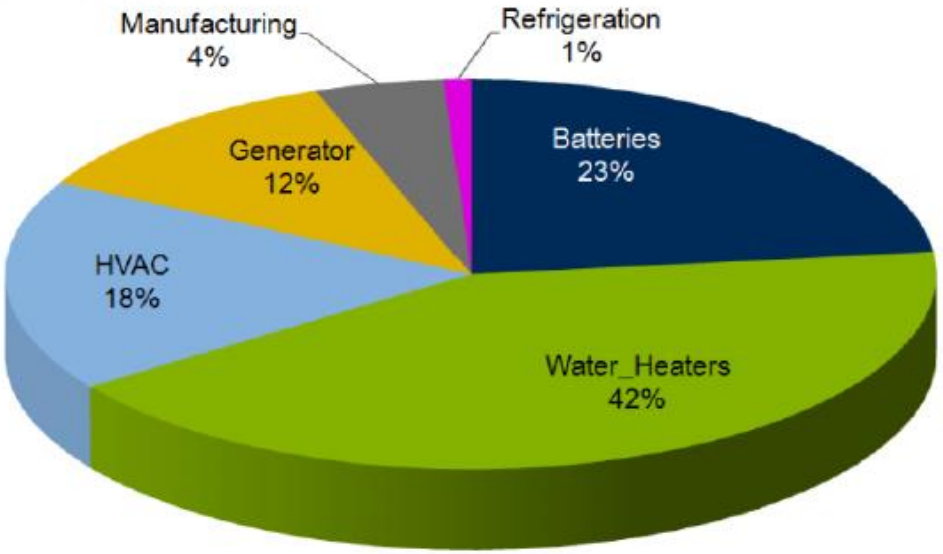
32 MW AES energy storage facility at 98 MW Laurel Mountain Wind Farm, WV
-Source: PJM

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

Source: PJM

DR Market Participation: Regulation Market

Regulation	Zone	January 2016
Locations	RTO	293
MW	RTO	22



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
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- $330,766 to $1.855 million
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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

Stacking benefits can be challenging
May require regulatory reforms

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

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

Todd Olinsky-Paul

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CEG/CESA

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

ESTAP Listserv: http://bit.ly/EnergyStorageList

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